WITH A LITTLE HELP FROM A STRANGER: THE IMPACT OF EXTERNAL CHANGE AGENTS ON CORPORATE SUSTAINABILITY INVESTMENTS

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ABSTRACT

We investigate the role external change agents, e.g., consultants, play in stimulating corporate sustainability investments. Using data on more than 5,300 energy efficiency investment decisions by 462 firms, we find that firms that draw more strongly on external change agents seize significantly more sustainable investment opportunities. We show that external change agents are more effective in stimulating investments if they broadly search for investment opportunities and are more strongly involved in the implementation of change initiatives. Moreover, surprisingly, we do not find that using internal change agents in parallel to external ones enhances the effectiveness of external change agents. Our findings have important implications for the literature on corporate sustainability as they point to external change agents as an important means of steering firms onto more sustainable pathways. Additionally, we shed light on the conditions under which external change agents can be used to most effectively overcome organizational path dependencies.

Keywords: Corporate sustainability, investments, change agents, path dependencies, lock-ins, inertia, sustainable development, energy efficiency

INTRODUCTION

A core question in the literature on corporate sustainability is what drives organizations to engage in sustainability-related initiatives, i.e. initiatives that simultaneously contribute to economic, social, and environmental goals. Previous work suggests that a firm's decision to embrace sustainability depends on both firm-external and firm-internal factors, such as institutional pressures or organizational resources and capabilities (Bansal and Roth, 2000; Colwell and Joshi, 2013; Dangelico and Pontrandolfo, 2015). This research implies that sustainability initiatives are undertaken as soon as they enhance a firm's legitimacy, generate economic value, or reduce costs (Ervin et al., 2013). Yet recent studies show that in many cases firms do not even undertake initiatives that provide a clear win-win opportunity, i.e., simultaneously contribute to short-term economic *and* environmental or social goals (Lyneis and Sterman, 2016). It has been argued that organizations may not pursue such investment opportunities because they experience cognitive barriers, organizational inertia, or a lack of complementary assets (Christmann, 2000; Lyneis and Sterman, 2016). For example, organizations may be too preoccupied with their daily business to notice win-win opportunities or may experience path dependencies (e.g., due to organizational routines) that prevent them from making the corresponding investments (Sydow et al., 2009).

The literatures on organizational change and path dependencies propose that one way to break routinized behavior is to make use of external change agents. For example, according to organizational change literature, bringing in new CEOs provides a means of dealing with the cognitive inertia firms might experience in times of abrupt environmental change (Virany et al., 1992). Similarly, the literature on path dependencies suggests that organizations can bring in knowledgeable agents that are not under the regime of path dependence, are able to reflect on its drivers, and may thereby help overcome organizational lock-ins (Sydow et al., 2009). However, extant studies provide limited empirical evidence about whether and when the use of external

change agents may help facilitate organizational search for profitable investment opportunities in sustainability. In particular, while external change agents have the advantage of bringing an outsider's perspective, which may help overcome cognitive and organizational inertia, it remains open whether organizations should use external change agents to identify investment opportunities, implement identified measures, or both. Moreover, external change agents might lack the detailed firm knowledge and legitimacy required to identify and reap investment opportunities (Birkinshaw et al., 2008). This would suggest that, in parallel to external change agents, firms might also have to make use of internal change agents to stimulate sustainability investments.

In this paper we address the lack of research by investigating *the impact of external change agents on corporate investments in sustainability*. Toward this end, we draw on data on more than 5,300 investment decisions in energy efficiency measures from a cross-industry sample of 462 German firms. This setting is particularly well suited to our study since energy efficiency measures contribute to the achievement of environmental goals, while often offering short-term economic benefits. Whereas energy efficiency investment have thus been described as win-win opportunities for firms (Lyneis and Sterman, 2016), they are often not undertaken due to company-internal cognitive or structural barriers.

Our study makes several contributions to the literature on corporate sustainability and path dependencies. First, we show that external change agents can play an important role in overcoming inertia that hinders organizations from embracing sustainability. The extant literature has pointed to cognitive and structural inertia as barriers to sustainability but, so far, has provided limited evidence on how to overcome them. We show that external change agents significantly increase investments in sustainability and might therefore play an important role in steering organizations onto more sustainable pathways.

Second, we contribute to the literature on path dependency and organizational change by providing insights into the conditions under which external change agents help organizations reap investment opportunities in sustainability. The extant literature posits that knowledgeable outsiders may help organizations escape cognitive and behavioral lock-ins. We show that these outsiders prove particularly useful if they are given the mandate to engage in broader searches and if they are more strongly involved in the implementation of change initiatives. We argue that the former finding is due to organizations' inability to correctly define a scope of external intervention, e.g., due to cognitive lock-ins. The latter finding may reflect the fact that over time organizations often build structures and incentives that prevent employees from implementing change initiatives from within. Moreover, interestingly, our results indicate that using internal change agents in parallel to external ones does not increase the effectiveness of external change agents in stimulating investments.[1] A potential explanation for this finding is that pairing external with internal change agents narrows external change agents' search scope or leads to competition for scarce organizational resources.

The rest of the paper is organized as follows: Section 2 provides an overview of the relevant literature and derives a number of hypotheses. Section 3 describes the research setting, data collection, and data analysis. Section 4 presents the results. Finally, section 5 discusses the implications for the literature and outlines directions for future research.

THEORY AND HYPOTHESES

The question of what drives firms to invest in sustainability-related initiatives is one of the most fundamental questions in the literature on corporate sustainability (Bansal and Roth, 2000; Ervin

[1] The goal of the paper is to investigate the impact of external change agents on firm investments in sustainability. For reasons of simplicity we therefore use the phrase "effectiveness of external change agents" throughout the paper to describe the extent to which external change agents stimulate firm investments in sustainability.

et al., 2013). While some research has pointed out that sustainability may be driven by norms and regulations (Colwell and Joshi, 2013), the majority of studies assume that for firms to engage in sustainability, initiatives need to create direct economic value for the firm, e.g., by reducing costs and risks or enhancing profits. For example, under the umbrella question "does it pay to be green?," a long stream of research has sought to investigate if sustainability investments are linked to increased financial performance (Hart and Ahuja, 1996; King and Lenox, 2001; Lewandowski, 2017; Martínez-Ferrero and Frías-Aceituno, 2015; Stefan and Paul, 2008; Yadav et al., 2017). The assumption underlying much of this research is that if one can show that sustainability pays, this will sooner or later lead to a more widespread adoption of sustainability practices in firms (Dowell and Muthulingam, 2016; Trumpp and Guenther, 2017).

The literature provides evidence that economic motives are indeed an important driver of sustainability-related initiatives (Bansal and Roth, 2000; McWilliams and Siegel, 2011). More recent work, however, also shows that in many cases sustainability initiatives are not undertaken even if they are profitable (Dowell and Muthulingam, 2016). For example, investments in energy efficiency measures are often connected with negative costs, implying that investments would not only benefit the environment but would also contribute to financial performance (Lyneis and Sterman, 2016). Still, studies show that many companies do not invest in energy efficiency measures (Backlund et al., 2012).

There are several reasons why companies may not undertake investments that provide both short-term financial and environmental benefits. First, firms may fail to recognize investment opportunities due to limited cognition and knowledge (Grégoire et al., 2010; Hahn and Aragón-Correa, 2015; Hockerts, 2015). As stressed in the behavioral theory of the firm, when actors are making decisions, they usually cannot consider the entire range of possible alternatives, since doing so would require a large amount of knowledge and cognitive processing capacity (Cyert and March,

1963). Therefore, in reality, actors usually engage in "satisficing" rather than "optimizing" behavior: They locally search for solutions that provide a satisfactory answer to a problem at hand. This bounded search, in turn, is strongly driven by actors' mental maps as simplified cognitive representations of reality (Cornelissen and Werner, 2014; Walsh, 1995). Based on past experience, actors build mental representations of how reality works, which guide their decision making in a complex and uncertain environment. For example, an organization seeking to replace the lighting in its factory might select a more expensive option despite a cheaper alternative being available, since the person in the purchasing department considers purchasing price—rather than long-term energy savings—the most important criterion, or is not aware of the alternative.

Second, even if firms recognize investment opportunities, they may not seize them due to organizational inertia rooted in organizational structures, routines, or resources (Gilbert, 2005; Kaplan, 2008). The literature on path dependencies claims that often firm decisions are strongly influenced by past decisions, which may constrain firms in ways that lead to seemingly irrational decisions (David, 1994; Sydow et al., 2009; Vergne and Durand, 2010). For example, firms may have structures or processes in place that prevent a person from implementing a new technology, as doing so would violate organizational norms or could lead to major disruptions in operations (Dowell and Muthulingam, 2016; Koch, 2011). Similarly, organizations might simply lack the necessary financial or human resources to make investments, since resources are committed to other activities (Lepoutre and Heene, 2006). Together, path dependencies and associated cognitive, routine, and resource inertia may lead to situations where organizations become locked into a state where even win-win opportunities are not seized, resulting in organizational inefficiencies (David, 1994; Sydow et al., 2009; Tang et al., 2012).

While we have begun to understand the factors that may inhibit profitable investments in sustainability, we currently know very little about how organizations can overcome inertia and path

dependencies to seize win-win opportunities in sustainability. The literature suggests that a solution to path-dependent behavior lies in "path breaking," which in line with Sydow et al. (2009) we define as a situation where the limited choice set an organization experiences, due to cognitive or routine-based constraints, is broadened by the addition of at least one better alternative. Thus far, however, there is a clear lack of empirical studies that investigate the means organizations can use to break path dependencies and enlarge the scope of decision making (Dobusch and Schüßler, 2012). Initial studies suggest that critical reflection (Araujo and Harrison, 2002), creativity (Rothmann and Koch, 2014), and a change of perspective (Gryszkiewicz et al., 2013), including "reframing" problems, may help organizations escape cognitive and structural lock-ins. Moreover, scholars have pointed out that breaking path dependencies may require exogenous shocks or interventions by outsiders (Gryszkiewicz et al., 2013; Hess et al., 2010; Sydow et al., 2009; Vergne and Durand, 2011; Vergne and Durand, 2010; Virany et al., 1992). However, the literature to date on path breaking is largely conceptual, such that (to our knowledge) scholars have not provided empirical tests of its antecedents. For example, in a recent review of the literature on path dependency, Berthod and Sydow (2013, p. 211) state that "there are no reliable explanations for path breaking yet."

In the following we therefore derive a number of hypotheses on the role of external change agents as a potentially important measure to breaking path dependencies. We focus on external change agents since they are commonly employed in practice, e.g., in the form of external consultants. The literature on organizational change has long stressed that change agents may play an important role in facilitating change (Birkinshaw et al., 2008; Weick and Quinn, 1999). Weick and Quinn (1999, p.365), for example, identify "definition of the role of change agent" as one of five foundational properties of change theories. Similarly, Ford and Ford (1995, p.543) point out that intentional change takes place when "a change agent deliberately and consciously sets out to

establish conditions and circumstances that are different from what they are now and then accomplishes that through some set or series of actions and interventions either singularly or in collaboration with other people." Still, the academic debate so far has been surprisingly silent on whether external change agents are an effective means for dealing with organizational inertia in the sustainability context. Providing more detailed insights into the effectiveness of external change agents thus offers the potential to derive important implications for both theory and practice.

External Change Agents and Sustainability Investments

As the starting point, we argue that the extent to which firms use external change agents (irrespective of the specific task the change agents fulfill, e.g., searching for investment opportunities or assisting with implementing measures) is positively related to corporate sustainability investments. The idea that outsiders with a different perspective may help organizations overcome inertia and stimulate change has long been recognized. In the literature on organizational learning, for example, March (1991) points out that bringing in individuals from outside the organization is important to induce exploratory behavior and update the organization's knowledge code. The literature on organizational change suggests that hiring new leaders from outside the company provides a means for dealing with cognitive inertia, which firms might experience in times of abrupt environmental change (Virany et al., 1992). Similarly, the literature on path dependencies suggests that knowledgeable outsiders, who are not under the regime of path dependence, may be important for breaking organizational lock-ins (Gryszkiewicz et al., 2013; Sydow et al., 2009).

There are several reasons why external change agents are particularly well suited to overcoming cognitive or structural inertia. First, external change agents usually bring a cognitive perspective that differs from that of organizational members, allowing them to identify

opportunities that organizational members may overlook (March, 1991). Additionally, individuals within an organization are usually socialized in a way that leads them to hold similar world views (Cornelissen and Werner, 2014; David, 1994; Huff, 1990) and take for granted the way things are currently seen or done (Saffold, 1988). As a result, organizational members usually have greater trouble recognizing and tackling path dependencies because they themselves operate under its regime (Sydow et al., 2009). External change agents, in contrast, have usually been socialized in a considerably different manner than organizational members. Their outside perspective allows them to critically reflect upon organizational routines from a distance (Moon, 1999). According to the literature on path dependence, this critical reflection on practices—or second-order observation (Foerster, 1991)—is the necessary first step to identifying and ultimately breaking path dependencies (Sydow et al., 2009).

Second, external change agents may also provide organizations with knowledge and expertise important for change (Birkinshaw et al., 2008). In fact, as the literature on open innovation has shown, organizations cannot develop all necessary knowledge internally (Chesbrough, 2003; Hu et al., 2017; Laursen and Salter, 2006). Rather, to be able to compete in the market, organizations need to integrate external expertise, e.g., on technologies (Karim and Mitchell, 2000; Teece et al., 1997). While there are several ways to integrate external knowledge, making use of external change agents may be particularly effective if the knowledge is complex and tacit (Polanyi, 1962). In this case, personal interaction with knowledgeable experts may be necessary for an organization to implement organizational change. Given that external change agents have the above advantages, we would expect them to play an important role in breaking path dependencies, which might prevent firms from making sustainable win-win investments. We thus hypothesize:

H1: The use of external change agents is positively associated with firms' sustainability investments.

Moderating Effect of Search Scope

The previous section suggests that the use of change agents may help organizations overcome cognitive or structural inertia that prevent them from seizing profitable investment opportunities in sustainability. Yet thus far we have not considered that in this process change agents may assume different tasks. Specifically, organizations may use external change agents to identify investment opportunities, implement identified measures, or both. In the following, we therefore present additional hypotheses that specify the way in which external change agents search for investment opportunities and involvement in the implementation phase affects the degree to which firms invest in sustainability.

Regarding the search for opportunities, one key decision that may influence the effectiveness of change agents is the extent to which they search broadly or narrowly within the firm. External change agents might be hired to broadly scan the organization (e.g., to analyze shortcomings and identify possible investment opportunities in a field), or they might have a very specific mandate (e.g., calculate the profitability of one specific investment option). A narrower search scope appears to be useful if the organization already has a good understanding of its current state and investment options. If, however, a firm does not know its opportunities in advance, a broader search might be necessary to identify the range of options before evaluating them in more detail (Ahuja and Katila, 2004; Katila, 2002).

We argue that, in the case of sustainability investments, the use of a broader search scope by external change agents leads to their intervention having a higher effectiveness due to the distributed and complex nature of corporate sustainability. Sustainability is an issue that touches

upon all organizational domains, reaching from logistics, operation, and marketing to finance, human resources, and research and development (Hart, 1995). This makes it difficult for organizational members to identify the most promising ways that investing in sustainability might contribute to short-term cost savings (Gadenne et al., 2009; Grégoire et al., 2010; King and Lenox, 2002). If organizational members define a narrow search scope for the intervention of external change agents, the latter might work on areas that do not bear the most profitable investment opportunities. We would thus expect a broader search scope for external change agents to be related to a higher number of sustainability investments in firms:

H2: A broader search scope for external change agents enhances the positive impact of external change agents on firms' sustainability investments.

Moderating Effect of External Change Agents' Implementation Involvement

In addition to searching for investment opportunities in sustainability, external change agents often help firms implement sustainability initiatives. As discussed above, firms may suffer from both cognitive and structural inertia, which prevent them from making profitable sustainability investments (Christmann, 2000; Lyneis and Sterman, 2016). Even if a firm recognizes an investment opportunity, it might not be able to capitalize on this option since organizational members might lack the necessary expertise, be too preoccupied with their daily work, or be constrained by organizational structures that prevent changes in organizational routines (Gilbert, 2005; Gryszkiewicz et al., 2013; Kaplan, 2008; Koch, 2011).

Due to the outsider perspective that external change agents possess, they may be in a good position to help organizations overcome these structural inertia. External change agents usually bring considerable expertise from previous projects in other firms and are less constrained by an organization's structure (Birkinshaw et al., 2008). There are, of course, limits to the extent to which

external change agents (just like organizational members) can redesign organizations without causing major disruptions in operations. However, external change agents can be assumed to be less influenced by vested interests or politics that may keep organizations clinging to the status quo (Sydow et al., 2009). Moreover, change agents may provide legitimacy for new solutions that go against existing organizational norms (Mol and Birkinshaw, 2014; Volberda et al., 2014). In sum, we would therefore expect external change agents to have a stronger effect on firms' investments in sustainable win-win opportunities if they are more strongly involved in the implementation of firm initiatives. While at first glance testing the impact of external change agents' involvement in implementation on investments may appear trivial or tautological, the relationship between the two variables is not straight forward. This is because firms may implement measures themselves (which may turn out to be more effective) or investment decisions may not be taken despite external change agents assisting with the implementation (e.g., because external change agents cannot overcome organizational inertia).

H3: A stronger involvement of external change agents in the implementation of sustainability initiatives enhances the positive impact of external change agents on firms' sustainability investments.

Moderating Effect of Internal Change Agents

Finally, the effectiveness of external change agents may depend on the degree to which the company simultaneously makes use of internal change agents. As highlighted above, a core strength of external change agents lies in their outsider perspective and expertise. A core disadvantage of external change agents, however, is that they usually do not possess a good understanding of the firm context, and may lack the necessary legitimacy among organizational

members to implement change (Birkinshaw et al., 2008). Previous work has pointed out that implementing sustainability practices is a complex undertaking that often requires changes in mindset, routines, and organizational structures (Winn et al., 2012). If external change agents lack the necessary knowledge of firm processes and the buy-in of organizational members, initiatives may quickly fail. This failure may in turn reduce management's commitment (Slawinski et al., 2016; Vidal et al., 2012) and may contribute to sustainability-related investments being perceived as costly and in conflict with economic goals (Hahn et al., 2010; Hahn et al., 2015; Hoffman and Bazerman, 2007; Van der Byl and Slawinski, 2015). While their distance from the organization may thus help external change agents to reflect on practices and identify investment opportunities, it may simultaneously lead to problems during the implementation phase (Birkinshaw et al., 2008; Garud et al., 2010).

To mitigate the weaknesses of external change agents, the previous literature recommends pairing external change agents with internal change agents who are more knowledgeable about the specific conditions of their organization (Birkinshaw et al., 2008; Lunenburg, 2010). Compared to external change agents, internal change agents are characterized by a higher physical and psychological proximity to organizational members, which may allow them to more effectively drive sustainability initiatives. We would thus expect external change agents to be more effective in those organizations that make simultaneous use of internal change agents. We therefore state our fourth hypothesis:

H4: The use of internal change agents enhances the positive impact of external change agents on firms' sustainability investments.

METHODS

Research Setting

We investigate the impact of external change agents on sustainability investments in the context of corporate energy efficiency practices. Energy efficiency is ideally suited as a setting for our analysis since it contributes to firms' environmental performance, while often being connected with short-term economic benefits (Lyneis and Sterman, 2016). First, as previous research demonstrates, enhancing energy efficiency is one of the most important levers to reduce the environmental footprint of companies (Bos-Brouwers, 2010; Bunse et al., 2011; Cagno and Trianni, 2013). Typical examples of energy efficiency measures include the exchange of old equipment, use of LEDs, reconfiguration of processes, optimization of insulation, heating and ventilation, as well as behavioral changes. As Enkvist et al. (2010) demonstrate, using current technologies and practices it is already possible to reduce global carbon emissions by around one third. Moreover, energy efficiency measures contribute to improving local air conditions (Lyneis and Sterman, 2016; Mills, 2011). Due to the environmental improvements that result from energy efficiency, it represents a form of corporate sustainability (Montiel and Delgado-Ceballos, 2014). In fact, several studies stress that energy efficiency is one of the most frequent and successful outcomes of environmental management in companies (Morrow and Rondinelli, 2002).

Second, in line with the idea that sustainability simultaneously contributes to economic, environmental, and social goals, energy efficiency measures have been demonstrated to often come with negative costs. By saving energy, companies can reduce their resource consumption, which not only improves the company's environmental impact but also provides short-term financial savings (Christmann, 2000; Eichholtz et al., 2010; Hart, 1995). Moreover, energy efficiency improvements can have further indirect effects, such as improving a firm's reputation and

stakeholder relations (Barnett, 2007; Freeman, 2010), which contribute to a firm's competitive advantage in the longer run (Christmann, 2000; Porter and Kramer, 2006).

Despite the widespread knowledge about energy efficiency as an attractive investment opportunity, firms still struggle when it comes to choosing and implementing the right combination of available practices, and regularly require external help (Vidal et al., 2012; Williams and Schaefer, 2013). Smaller companies, in particular, are often not aware of their own environmental impact, potential mitigation options, or the underlying business, even when implementing energy efficiency practices could create financial benefits in a short time (Aragón-Correa et al., 2008; Fleiter et al., 2012; Gadenne et al., 2009). In sum, a significant gap persists between energy efficiency potential and actual implementation. This phenomenon has become known as the "energy efficiency gap" (Backlund et al., 2012; Gillingham and Palmer, 2014).

In this article, we focus on the issue of energy efficiency in Germany. Germany is going through an economy-wide energy transition, which includes a variety of long-term environmental targets, e.g., the aim to reduce the total level of CO_2 emissions by 80% by 2050 and increase energy efficiency across industries and private households (German Government, 2014). Moreover, in recent years, industrial electricity prices have sharply increased with a growth of more than 20% since 2006 (BDEW, 2013), exceeding the European average by 24% in 2014 (BMWI, 2014). The growing likelihood of both continuously increasing electricity prices and upcoming legislative pressure creates a major incentive to implement energy efficiency practices (Williams and Schaefer, 2013). In reaction to these trends, an increasing number of firms have made use of external energy management consulting. The consulting is usually offered by experts and subsidized by the German government. The question we ask in this paper is whether this energy efficiency consulting has significantly raised the amount of investments made by firms.

Data and Sample

Our analysis draws on data from a company survey conducted by the German Chamber of Industry and Commerce (CCI) in 2014, which was supported by the German Institute for Resource Efficiency and Energy Strategies (IREES). The aim of the survey was to explore drivers and barriers that companies face when considering energy efficiency practices. It was structured along five thematic categories: structural company characteristics (e.g., size, industry, share of energy costs), energy management, energy consulting, implementation of practices, and barriers towards energy efficiency.

In May 2014, the link for the online survey was distributed to 11,000 companies via E-Mail, including all direct members of the CCI as well as members of related company networks and industry initiatives. Eligibility was not restricted to companies of a specific size or industry (see Tables 1 and 2 for the distribution of companies according to size and industry affiliation). However, due to the operational and thematic focus of the CCI, the distribution of industries in the sample reflects the CCI's focus on industrial and commercial companies, and does not incorporate IT, financial services, or other comparable service-oriented industries.

Insert Tables 1 and 2 about here

The data collection process was hosted by Netigate and all participants were guaranteed full anonymity. Of the 11,000 companies contacted, 1,056 sent responses by August 2014, implying a response rate of about 9.6%. Following detailed diagnostic checks, 594 companies were dropped due to insufficient information pertaining to the questions of interest or the absence of other relevant information. The final sample contains a set of 462 companies. Compared to the population of firms that are members of the German Chamber of Industry and Commerce, small firms are underrepresented in our sample. Given that small firms in particular may lack the

resources to identify and implement energy efficiency measures themselves, we would thus expect the role of external change agents to be underestimated in our sample compared to the population of German firms. This means that, if in our sample we find that external change agents play an important role, we would expect the impact of external change agents to also apply—and to be even more pronounced—in those firms we were not able to study.

Variables and Measures

Dependent Variable

Sustainability Investments. We measured a firm's sustainability investments by counting the number of energy efficiency categories within which the firm had made investments in 2014. For this purpose, the survey contained a list of 16 areas of energy efficiency, categories that cover the entire array of possible energy efficiency investments, including measures to reduce both heat and electricity consumption: thermal heat, process heat, compressed air, motors, air conditioning, lighting, insulation, heat recovery/utilization of waste heat, energy and process engineering, information and communication technology, cold, energy management, organizational measures, energy services, renewable energy, and cogeneration. Participants were asked to indicate whether they had invested or not in each of these areas. From these answers, we constructed a variable that ranged from 0 (if the company had invested in none of the areas) to 16 (if the company had invested in all areas of energy efficiency).

We measured sustainability investments as a count variable, and not as a continuous monetary variable, for two reasons. First, indicating which categories a firm had invested in was deemed easier for respondents than providing the detailed monetary amount. Second, measuring investments in monetary terms would have assigned a higher weight to large investments by individual firms. In order to not bias our results by putting strong weight on a small number of

cases, we decided to focus on investment decisions as the number of categories firms had invested in.

Independent Variable

External Change Agent. Similar to our dependent variable, we used a count variable to measure the extent to which firms had made use of external change agents. Toward this end, in the survey we asked respondents to indicate for each of the 16 energy efficiency categories whether they had used an external change agent. If they had made an investment in a category, respondents had to indicate whether this decision had been taken as a result of or without the support of an external change agent. Similarly, if respondents had not made an investment in a category, they were asked to indicate if this decision had been taken without or despite the support of an external change agent. To aggregate the information on the individual energy efficiency categories to the firm level, we calculated the total number of energy efficiency categories in which the firm had made use of external change agents. This resulted in a variable ranging from 0 (firm had not used external change agents in any of the energy efficiency categories) to 16 (firm had used external change agents for all of the energy efficiency categories).[2, 3]

Moderating Variables

Search Scope of External Change Agent. To construct this variable, respondents were asked to state whether the mandate of the external change agent included a comprehensive analysis of the company. Thus, we employed a binary measure, which adopted the value 1 if the scope of the consultancy was comprehensive and 0 if it was not.

[2] Please note that we do not have data on the number of external change agents that have been used by the individual firms, so we cannot draw any conclusions about whether using more consultants per area improves their effectiveness. However, the number of consultants may indirectly be reflected in our measures of search scope and implementation involvement, since a broader search scope and a stronger involvement in implementation are likely to be correlated with a larger number of external change agents per firm.

[3] As a robustness check, we also used a binary (instead of a count) measure of external change agents, which takes the value of "1" if a firm has used an external change agent in any of the 16 energy efficiency categories and "0" otherwise. The results are qualitatively similar to the ones we obtained using the count measure.

Implementation Involvement of External Change Agent. To measure the involvement of the external change agent in the implementation phase, we asked the survey respondents to indicate on a four-point Likert scale whether they had experienced a lack of support from external change agents during the implementation of their energy efficiency measures. The responses to this question were reverse coded, yielding a measure that takes values from 1 and 4, with 1 indicating that the company had received no support during the implementation phase and 4 indicating that the company had received strong support.

Internal Change Agent. In the survey, respondents were asked to indicate whether the company had appointed an energy officer in charge of energy use and generation efficiency management within the company. The change agent construct was measured as a binary variable, which took the value 1 if such an energy officer had been put in place and 0 if not.

Control Variables

We controlled for a large number of factors that the literature has found to play an important role for investments in energy efficiency measures. All control variables were measured using a four-point Likert scale, with 1 denoting "does not apply at all" and 4 denoting "does fully apply", if not indicated otherwise.

First, we controlled for companies' *energy cost share* because we anticipated that, with energy cost representing a larger part of total expenditures, companies would face a stronger incentive to invest in energy efficiency measures. Related to this idea, we included an *energy price expectations* variable, as we assumed that an expected rise in energy prices would further motivate companies to undertake such investments. Moreover, to ensure that there were still opportunities for investment in energy efficiency, we asked whether the company still saw *potential for improvement*.

Second, previous research has identified firm resources as an important precondition for investments in energy efficiency. We therefore added four control variables—*human resources*, *time resources, knowledge resources,* and *financial resources*—to control for the fact that companies with more resources might be more likely to make more sustainable win-win investments (Aragón-Correa, 1998; Lepoutre and Heene, 2006). Since investments might also be influenced by the expectation of future resources, we included *future profit expectations* as a control. In addition, we included *firm size* as a control. Firm size has been identified as an important influence factor for sustainability investments because firms of different sizes have different levels of accessibility to resources, power, and strategic flexibility (Lepoutre and Heene, 2006). This variable was measured by the number of employees on a five-point Likert scale, with 1 denoting a small number of employees and 5 denoting a large number.

Third, we used three variables, *management attention*, *employee attention*, and *stakeholder attention,* to control for the degree to which the most important actors driving energy efficiency measures were sensitized for energy efficiency issues. Toward this end, we asked respondents to indicate if energy efficiency was important to the management, if employees were aware of these issues, and whether energy efficiency investments would contribute to their stakeholders having a positive image of the company.

Fourth, investments in energy efficiency may depend on the internal profitability thresholds that firms use to select among alternative investment options. To control for this factor, we included two variables controlling for the *required payback period* as well as the *required return on investment*. To measure the expected payback period, we included a variable with values from 1 to 5. A value of 1 indicates that the company required investments to pay back within less than a year, whereas a value of 4 signified that the company used a payback period of more than 4 years. If a company stated that it had no expectations of payback period, the variable coded as 5. To measure

the expected return on investment, we used a variable with values from 0 and 7, with 1 indicating profit expectations of less than 5% and 7 denoting an expected return of more than 30%. If a company stated that it had no expectations regarding the return of investments, the variable was equal to zero.

Fifth, energy efficiency measures may be influenced by the *asset ownership* and *complementary investments*. If a company does not own but rents its buildings or machines, it might not have an incentive, or the right, to invest in improving its energy efficiency. Moreover, if a company is making large investments in new machinery, processes, or products, these broader changes might be used to simultaneously improve the company's energy efficiency. In our analysis, we therefore controlled for asset ownership and asked firm representatives whether they took advantage of larger changes occurring in the company to implement energy efficiency measures.

Sixth, investments may also be driven by *public policy incentives*. Therefore, in our study, we included a control that indicated to what extent companies had taken advantage of public funding programs. We assumed that participation in such programs would be positively related to investments, as these provide financial resources specifically designed for this purpose.

Seventh, the implementation of energy efficiency measures may be negatively affected by uncertainty about energy efficient technologies and their impact on the firm's existing processes and products. Therefore, we added a *product quality uncertainty* variable that captured companies' uncertainty regarding the consequences of energy efficiency measure implementation for product quality. In addition, we included a *technology uncertainty* variable that reflected companies' uncertainty about future technology and price developments (Cagno et al., 2013).

Finally, we controlled for the firm's sector since firms in some sectors might have an easier time investing in some areas of energy efficiency than in others. To account for this, we added industry dummies that control for differences in investment behavior across industries. Table 3

summarizes these variables, and provides an overview of the questions and scales used to measure our constructs.

Insert Table 3 about here

Analysis

To estimate our model, we used a negative binomial model (O'Hara and Kotze, 2010). In general, both Poisson and negative binomial models are suited to deal with count data. However, since a likelihood ratio test indicated problems with overdispersion (chi square = 77, p=0.000), we used negative binomial models instead of Poisson models. Moreover, we used robust estimation techniques to control for heteroscedasticity. Tables 4 and 5 display the descriptive statistics and the pairwise correlations. Since Table 4 revealed significant correlations among several variables, we tested for multicollinearity by calculating the variance inflation factors. The fact that the variance inflation factors do not exceed a level of 2.07 indicates that multicollinearity does not appear to be a problem in our case.

Insert Tables 4 and 5 about here

A problem frequently encountered when using a cross-sectional survey is common method bias. In our study, common method bias may result from the fact that all measures are obtained from the same source, which may make the answers subject to specific response styles of individuals. Yet previous work demonstrates that, while common method bias can inflate or deflate bivariate linear relationships, it does not inflate or deflate interaction effects (Podsakoff et al., 2012; Siemsen et al., 2010). Thus, common method bias can be ruled out for our tests of Hypotheses 2, 3, and 4. To reduce the probability that common method bias is present in our test of Hypothesis 1, in the survey we used reverse items, which has been shown to reduce the influence of response styles (Podsakoff et al., 2012). Moreover, to rule out common method bias, we used the Marker-

Variable Technique introduced by Lindell and Whitney (2001), which has gained great prominence in the literature (Malhotra et al., 2006). Toward this end, we identified the smallest positive correlation among our manifest variables and used this measure to calculate the common-method-variance-adjusted, partial correlation coefficients, as well as t-values. A comparison of the resulting coefficients with the unadjusted ones revealed that, in almost all cases, the significance of correlations remains unchanged. We therefore expect common method bias to be very limited in our study.

Finally, a potential problem when drawing on cross-sectional data is reverse causality (Antonakis et al., 2010). Specifically, instead of running from the independent to the dependent variable, the direction of causality may run from the dependent variable to the independent variable, which introduces a bias in the coefficients estimated in regression analysis. To minimize potential adverse effects of reverse causality in our study, we designed questions related to external change agents in a way that explicitly asks respondents to indicate the role of change agents for investments in energy efficiency measures (see above). By doing so, we can make sure that causality runs from "external change" agents to "investments" and not the other way around.

RESULTS

Table 6 summarizes the results of our regression analyses. For the basic model calculation, the dependent variable, sustainability investments, was regressed on the control variables (Table 6, Model 1). In order to test our hypotheses, we consecutively introduced the dependent variable and the interactions separately (Models 2 to 4). Model 6 shows the full model including all control variables, dependent and independent variables, and interactions.[4]

[4] The variables *Search Scope of External Change Agent* and *Implementation Involvement of External Change Agent* were not included separately in the regression since the variables adopt a value only if the company has employed an external change

Insert Table 6 about here

Hypothesis 1 predicted that the use of external change agents is positively associated with a firm's sustainability investments. Our analysis provides support for this hypothesis. The coefficient for *external change agent* in Model 2 is positive and highly significant (β=0.0255, $p<0.01$).

Hypothesis 2 advocated that a broader search scope for external change agents enhances the positive effect of external change agents on firms' sustainability investments. We also find support for this hypothesis. In both Models 3 and 5, the coefficient of the interaction between *external change agent* and *search scope* is positive (β=0.0509) and significant ($p<0.05$), such that overall our models offer support for Hypothesis 2. This result is consistent with Model 6 (β=0.0452, $p<0.05$).

Hypothesis 3 suggested that a stronger involvement of external change agents in the implementation of firm initiatives enhances the positive impact of external change agents on firms' sustainability investments. Our models offer support for this hypothesis. As can be seen in Models 4 and 6, the coefficient of the interaction term for *external change agent* and *involvement in implementation* is positive (β=0.0237) and highly significant ($p<0.01$).

Finally, Hypothesis 4 predicted that the use of internal change agents enhances the positive impact of external change agents on firms' sustainability investments. Our models do not provide support for this hypothesis. The interaction between *external change agent* and *internal change agent* is insignificant in Models 5 and 6 ($p<0.1$), such that our data does not support Hypothesis 4.

DISCUSSION

agent. Including the variables in Model 1 would thus have reduced our sample to those firms that have made use of external change agents, thereby biasing our results. The results of the full model (Model 6) remain unaffected by this choice.

Our study makes several contributions to the literature on corporate sustainability, path dependencies, and organizational change. First, we show that change agents can play an important role in helping organizations recognize and seize investment opportunities in sustainability. The prior literature suggests that organizations may not invest in sustainability initiatives even if they are profitable in the short to medium run (Lyneis and Sterman, 2016). We show that external change agents significantly increase the extent to which firms make sustainability investments. In doing so, our work extends the literature investigating drivers of corporate sustainability investments by shedding more light on practices that may help firms deal with cognitive and structural inertia. Moreover, by investigating the mechanisms that link opportunities and action, our study holds the potential to bridge a gap between the literature investigating sustainability strategies and the literature studying the link between sustainability and financial performance. Authors studying the link between sustainability and financial performance have long pointed to the positive impact that investing in sustainability can have on a company's financial bottom line (Lewandowski, 2017; Stefan and Paul, 2008). Despite this, companies strongly differ in the extent to which they have embraced sustainability. By investigating the role of change agents as intermediaries between opportunities and corporate action, our study helps explain differences in sustainability investments across firms. Moreover, it holds direct implications for how to improve the ability of firms to both recognize and seize opportunities in a way that helps steer businesses onto more sustainable pathways.

Second, our work also makes contributions to the literature on path dependency and organizational change. The literature on path dependencies has long pointed out that organizational cognition, routines, and resources may lead to situations where decisions are increasingly based on past decisions, such that choice sets become constrained and decision makers ignore better alternatives (David, 1994; Sydow et al., 2009). While the mechanisms and outcomes of path

dependency have been demonstrated in various contexts (Gruber, 2010), thus far the literature has remained remarkably silent on how organizations can break path dependencies, i.e., broaden the narrowed choice set by re-introducing superior alternatives that organizations would not otherwise have pursued (Dobusch and Schüßler, 2012).

By showing how external change agents stimulate investments in profitable opportunities, which would not have been undertaken without external intervention, we provide one of the first tests of the conditions under which external interventions by knowledgeable outsiders help organizations resolve path dependencies. We show that such outsiders prove particularly useful if they engage in a broader search. A potential explanation for this finding is that organizations suffering from cognitive inertia might not only be in a bad position to reap opportunities themselves, but they might also be unable to define an appropriate scope for external interventions. If organizations predefine the scope for external change agents, their limited cognition may lead them to overlook promising investment opportunities. Therefore, companies might be better off not defining the scope for external change agents too narrowly but rather giving agents the opportunity to identify sustainable investment opportunities themselves.

In addition, we show that external change agents are more effective if they are greatly involved in the implementation phase of change initiatives. This finding lends support for propositions in the literature on path dependency and organizational change that inertia may result not only from the cognitive limitations of organizational members but also from organizational constraints (e.g., structures, incentives, or resources) that limit the ability of organizations to implement ideas (Sydow et al., 2009). While this argument is at the core of the idea of path dependence, we are among the first to show that engaging external change agents can serve as an effective means of overcoming the related inertia.

Finally, we also find that the use of internal change agents alongside external change agents does not significantly raise the effectiveness of the latter. The extant literature suggests that external change agents should be paired with internal change agents since both provide complementary benefits to the organization (Birkinshaw et al., 2008). We find that internal change agents by themselves appear to (slightly) raise the amount of sustainability investments. We do not, however, find evidence that they enhance the effectiveness of external change agents. Potential explanations for this finding include the possibility that internal change agents identify investment opportunities that would otherwise have been identified by external change agents, and the fact that involving internal change agents reduces the scope of search for new investment opportunities. Alternatively, it seems possible that internal and external change agents compete for scarce organizational resources, which may limit the extent to which external change agents can effectively stimulate sustainability-related win-win investments. Overall, therefore, our results provide evidence for the propositions in the literature that outsider perspectives may be an important precondition for critically reflecting on and addressing organizational path dependencies.

LIMITATIONS AND FUTURE RESEARCH

Our study has several limitations that offer opportunities for future research. First, our investigation of corporate sustainability investments is limited to the field of energy efficiency in German industrial firms. Therefore, an important question to ask is the extent to which our findings can be generalized to other types of investment or other sectors and countries. While we would generally expect our findings to hold in service sectors, and for other types of investment opportunities, a different institutional context (e.g., in terms of culture or policies) might affect the extent to which external change agents are effective or necessary. Future research could therefore replicate our study in other countries.

Second, our variance-based approach does not allow us to shed detailed light on the mechanisms behind the relationships we have identified. For example, while we demonstrate that involving external change agents positively impacts organizational investments in sustainability, our study's design does not allow us to clearly identify the reasons for this finding. Moreover, we measure the interaction between external and internal change agents by studying whether firms make simultaneous use of these two types of change agents. This indirect measure, however, neither allows us to specify whether external and internal change agents actually interacted in projects, nor to draw any inferences about the nature and quality of interactions. To provide additional insights into the role of external change agents, we therefore call for qualitative research that takes an insider's perspective and studies the role of external change agents using a process lens.

CONCLUSION

In this paper, we analyzed the impact of external change agents on firms' investments in sustainability. Building on the observation that cognitive and structural inertia may prevent firms from making sustainability-related investments that provide short-term economic benefits, we show that firms using external change agents make significantly more investments. Moreover, we provide empirical evidence that external change agents are more effective if their mandate includes a broader search scope and if they are involved in the implementation of measures, irrespective of whether companies use internal change agents in parallel. Our findings hold important implications for the literature streams on corporate sustainability, path dependencies, and organizational change. By studying the role of external change agents in overcoming cognitive and structural inertia, we contribute to a better understanding of the conditions under which firms invest in sustainability-related initiatives. In particular, our findings help explain why firms may not make investments in

sustainability even though these investments may provide short-term financial gains. Moreover, despite a widespread use of external change agents in practice, this study is among the first to investigate their impact on firm investments. By shedding light on the conditions under which external change agents are more or less effective, this study contributes to a better understanding of how external interventions can be used to overcome organizational lock-ins and path dependencies. Given that change agents are employed in a variety of corporate settings, we believe that our study can serve as an important stepping stone for future research that sheds more light on external change agents as catalyzers of organizational renewal.

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TABLES

Table 1: Size of surveyed companies (N=462)

# Employees	1–9	10–49	50–99	100–250	> 250
# Companies	64	120	79	94	105

Table 2: Surveyed companies according to industry affiliation (N=462)

Industry	**# Firms**
Food production	33
Textile industry	15
Wood industry	13
Paper, publishing, and printing	21
Chemical products	23
Rubber and plastics	37
Glass, ceramics, and soils	19
Metal industry	78
Mechanical engineering	51
Electrical engineering	27
Food retail	7
Other retail	15
Hospitality industry	12
Automotive manufacturing	10
Automotive repair and retail	3
Self-employed	22
Other	76

Table 3: Survey questions and scales used to measure constructs

Construct	Survey Question	Likert Scale
Sustainability investments and external change agent	Please indicate in which of the following (16) energy efficiency categories you implemented measures. Please also indicate for each of the energy efficiency categories whether external consulting was the reason for the implementation of measures.	1 (yes, as result of consulting), 2 (yes, without consulting support), 3 (no, despite consulting), 4 (no, without consulting support)
Search scope of external change agent	The consulting included a comprehensive analysis of the firm.	1 (does apply), 0 (does not apply)
Implementation involvement of external change agent	We experienced a lack of support from the external consultants during the implementation of energy efficiency measures. [reverse coded]	1 (does not apply at all), …, 4 (does fully apply)
Internal change agent	Has the firm created the role of an energy officer?	1 (does apply), 0 (does not apply)
Energy cost share	Energy cost represents a large part of our total expenditures.	1 (does not apply at all), …, 4 (does fully apply)
Energy price expectations	We expect rising energy costs in the medium run.	1 (does not apply at all), …, 4 (does fully apply)
Potential for improvement	We see too little energy saving potential. [reverse coded]	1 (does not apply at all), …, 4 (does fully apply)
Human resources	We have insufficient human resources for investment realization. [reverse coded]	1 (does not apply at all), …, 4 (does fully apply)
Time resources	We do not have sufficient time to implement energy efficiency measures. [reverse coded]	1 (does not apply at all), …, 4 (does fully apply)
Knowledge resources	We do not possess enough know-how in energy efficiency issues. [reverse coded]	1 (does not apply at all), …, 4 (does fully apply)
Financial resources	We do not dispose of sufficient funds for investment purposes. [reverse coded]	1 (does not apply at all), …, 4 (does fully apply)
Future profit expectations	We expect our company to be increasingly economically successful.	1 (does not apply at all), …, 4 (does fully apply)
Firm size	Please indicate the number of employees working in your company.	1 (1–9), 2 (10–49), 3 (50–99), 4 (100–250), 5 (>250) employees
Management attention	Energy efficiency is important to the management.	1 (does not apply at all), …, 4 (does fully apply)
Employee attention	Employees are sensitized to energy efficiency issues.	1 (does not apply at all), …, 4 (does fully apply)
Stakeholder attention	Energy efficiency contributes to stakeholders having a positive image of our company.	1 (does not apply at all), …, 4 (does fully apply)

Energy management system	Does the firm have an energy management system in place?	1 (does apply), 0 (does not apply)
Required payback period	Please indicate the payback period you require for energy efficiency investments.	1 (<year), 2 (1–2 years), 3 (3–5 years), 4 (>5 years), 5 (no target)
Required return	Please indicate the return you require for energy efficiency investments.	0 (no target), 1 (<5%), 2 (5–10%), 3 (10–15%), 4 (15–20%), 5 (20–25%), 6 (25–30%), 7 (>30%)
Asset ownership	Our facilities are rented. [reverse coded]	1 (does not apply at all), …, 4 (does fully apply)
Complementary investments	We take advantage of larger organizational changes and investments to implement energy efficiency measures.	1 (does not apply at all), …, 4 (does fully apply)
Public policy incentives	We make use of public funding programs.	1 (does apply), 0 (does not apply)
Technology uncertainty	The future technology developments and prices in energy efficiency measures are uncertain.	1 (does not apply at all), …, 4 (does fully apply)
Product quality uncertainty	Implementing energy efficiency measures entails too much of a risk for product quality.	1 (does not apply at all), …, 4 (does fully apply)

Table 4: Descriptive statistics

	Mean	S.D.	Min	Max
Sustainability investments	4.615	3.582	0	16
External change agent	2.352	3.38	0	16
Search scope of external change agent	0.771	0.421	0	1
Implementation involvement of external change agent	1.817	0.888	1	4
Internal change agent	0.653	0.476	0	1
Energy cost share	2.781	1.035	1	4
Energy price expectations	3.471	0.638	1	4
Potential for improvement	2.749	0.968	1	4
Human resources	2.611	1	1	4
Time resources	2.366	0.891	1	4
Knowledge resources	2.716	0.906	1	4
Financial resources	2.375	1.061	1	4
Future profit expectations	3.318	0.72	1	4
Firm size	3.064	1.378	1	5
Management attention	3.607	0.643	1	4
Employee attention	2.885	0.796	1	4
Stakeholder attention	3.32	0.855	1	4
Required payback period	2.276	1.307	0	4
Required return	3.098	1.455	0	8
Asset ownership	3.327	1.079	1	4
Complementary investments	2.951	1.001	1	4
Public policy incentives	2.165	1.085	1	4
Technology uncertainty	2.608	1.019	1	4
Product quality uncertainty	2.135	1.066	1	4

Table 5: Pearson pairwise correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Sustainability investments	1.00																							
External change agent	0.28	1.00																						
Search scope of external change agent	0.02	0.13	1.00																					
Implementation involvement of external change agent	0.02	0.07	0.09	1.00																				
Internal change agent	0.29	0.05	0.12	0.00	1.00																			
Energy cost share	0.19	0.01	0.03	-0.18	0.17	1.00																		
Energy price expectations	0.04	0.10	0.07	0.09	-0.04	0.00	1.00																	
Potential for improvement	0.17	0.03	0.06	-0.09	0.13	0.40	0.14	1.00																
Human resources	-0.03	-0.03	-0.07	-0.32	-0.08	0.11	-0.01	0.24	1.00															
Time resources	0.00	-0.02	-0.09	-0.24	0.02	0.12	0.03	0.30	0.45	1.00														
Knowledge resources	0.01	-0.15	-0.09	-0.38	0.08	0.00	-0.03	0.11	0.37	0.42	1.00													
Financial resources	0.02	-0.01	0.05	0.23	-0.03	-0.05	0.11	-0.06	-0.18	-0.13	-0.28	1.00												
Future profit expectations	0.09	0.03	0.03	0.00	0.08	-0.05	0.16	0.09	0.06	0.08	0.07	-0.16	1.00											
Firm size	0.27	0.06	-0.11	-0.07	0.31	0.04	-0.06	0.10	-0.21	-0.02	0.02	-0.14	0.04	1.00										
Management attention	0.18	0.05	0.07	-0.04	0.19	0.12	0.16	0.23	0.12	0.15	0.05	-0.01	0.20	-0.07	1.00									
Employee attention	0.11	0.03	-0.02	-0.09	0.18	-0.01	0.15	0.14	0.18	0.18	0.20	-0.11	0.30	-0.06	0.37	1.00								
Stakeholder attention	0.22	0.06	0.00	0.01	0.16	0.04	0.18	0.23	-0.01	0.06	-0.01	0.06	0.23	0.05	0.50	0.32	1.00							
Required payback period	0.06	0.07	0.05	0.02	0.04	0.04	0.07	0.09	0.06	0.02	-0.02	0.04	0.01	-0.02	0.05	-0.01	0.01	1.00						
Required return	0.08	0.08	0.00	0.00	0.07	0.11	-0.01	0.04	-0.01	-0.06	-0.09	0.15	0.04	0.09	-0.03	-0.03	0.01	0.08	1.00					
Asset ownership	0.15	0.03	-0.03	-0.22	0.12	0.31	-0.08	0.22	0.08	0.11	0.05	-0.13	0.04	0.23	0.03	-0.06	0.04	0.01	0.00	1.00				
Complementary investments	0.28	0.13	-0.01	-0.05	0.23	0.06	0.01	0.13	0.02	0.02	0.00	-0.17	0.14	0.23	0.21	0.25	0.16	0.01	-0.01	0.15	1.00			
Public policy incentives	0.13	0.22	0.17	0.12	0.05	0.07	0.16	0.16	-0.01	0.04	-0.18	0.19	0.09	-0.10	0.24	0.10	0.14	0.16	0.04	0.03	0.21	1.00		
Technology uncertainty	0.12	0.06	0.04	0.21	0.01	-0.01	0.07	-0.10	-0.22	-0.24	-0.28	0.25	-0.04	0.07	0.10	0.01	0.12	0.05	0.05	0.02	0.09	0.16	1.00	
Product quality uncertainty	0.18	0.07	0.08	0.23	0.16	0.01	0.01	-0.10	-0.34	-0.27	-0.28	0.10	0.10	0.19	0.01	-0.05	0.06	-0.08	0.10	-0.01	0.11	0.11	0.27	1.00

Table 6: Results of negative binomial regression for corporate sustainability investments

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Internal change agent	0.197**	0.193*	0.285***	0.260**	0.179*	0.300**
	(0.0763)	(0.0768)	(0.0862)	(0.0826)	(0.0778)	(0.0965)
Energy cost share	0.0774*	0.0784*	0.0303	0.0522	0.0766*	0.0476
	(0.0317)	(0.0319)	(0.0332)	(0.0322)	(0.0319)	(0.0334)
Energy price expectations	-0.0376	-0.0484	0.00649	-0.00251	-0.0488	0.00112
	(0.0440)	(0.0425)	(0.0483)	(0.0440)	(0.0423)	(0.0473)
Potential for improvement	0.00871	0.0121	0.00582	-0.0154	0.0137	-0.0114
	(0.0349)	(0.0351)	(0.0385)	(0.0377)	(0.0351)	(0.0376)
Human resources	0.0128	0.0171	0.0185	0.0267	0.0197	0.0489
	(0.0363)	(0.0364)	(0.0400)	(0.0379)	(0.0359)	(0.0394)
Time resources	-0.0582	-0.0588	-0.0732†	-0.0661†	-0.0621†	-0.0634†
	(0.0374)	(0.0375)	(0.0379)	(0.0364)	(0.0375)	(0.0385)
Knowledge resources	0.0306	0.0455	0.0437	0.0612†	0.0447	0.0541
	(0.0357)	(0.0350)	(0.0364)	(0.0329)	(0.0351)	(0.0354)
Financial resources	0.0502†	0.0551†	0.0341	0.0437	0.0551†	0.0382
	(0.0301)	(0.0298)	(0.0294)	(0.0279)	(0.0296)	(0.0289)
Future profit expectations	0.0961*	0.0932*	0.0702	0.103*	0.0962*	0.0772†
	(0.0414)	(0.0414)	(0.0435)	(0.0422)	(0.0416)	(0.0433)
Firm size	0.128***	0.126***	0.0634*	0.0666*	0.130***	0.0711**
	(0.0259)	(0.0264)	(0.0265)	(0.0259)	(0.0261)	(0.0254)
Management attention	0.127*	0.124*	0.0965	0.136*	0.127*	0.0987
	(0.0625)	(0.0623)	(0.0656)	(0.0608)	(0.0621)	(0.0645)
Employee attention	-0.00573	-0.00644	-0.0435	-0.0600	-0.00822	-0.0467
	(0.0392)	(0.0389)	(0.0424)	(0.0402)	(0.0390)	(0.0418)
Stakeholder attention	0.114**	0.113**	0.0763†	0.0976*	0.112**	0.0821†
	(0.0420)	(0.0422)	(0.0431)	(0.0411)	(0.0420)	(0.0429)
Required payback period	-0.00793	-0.0111	-0.00473	-0.0242	-0.0104	-0.0131
	(0.0240)	(0.0236)	(0.0255)	(0.0236)	(0.0237)	(0.0245)
Required return	-0.00544	-0.00751	0.00204	0.00293	-0.00711	0.00370
	(0.0203)	(0.0200)	(0.0214)	(0.0187)	(0.0199)	(0.0202)
Asset ownership	-0.0255	-0.0232	0.00640	-0.00698	-0.0236	0.0131
	(0.0332)	(0.0330)	(0.0353)	(0.0338)	(0.0329)	(0.0348)
Complementary investments	0.0848**	0.0790*	0.0836*	0.0996**	0.0768*	0.0875*
	(0.0328)	(0.0330)	(0.0360)	(0.0340)	(0.0328)	(0.0351)
Public policy incentives	0.0524†	0.0407	0.00545	0.0270	0.0415	0.0185
	(0.0271)	(0.0269)	(0.0289)	(0.0270)	(0.0268)	(0.0282)
Technology uncertainty	0.0465†	0.0439	0.0425	0.0273	0.0438	0.0274
	(0.0276)	(0.0271)	(0.0269)	(0.0262)	(0.0271)	(0.0279)
Product quality uncertainty	0.0195	0.0182	0.0594*	0.0529†	0.0190	0.0598*
	(0.0291)	(0.0293)	(0.0295)	(0.0270)	(0.0292)	(0.0296)
External change agent		0.0255**	-0.00342	0.00293	0.0248**	-0.000496
		(0.00890)	(0.00954)	(0.00905)	(0.00903)	(0.00918)
External change agent x Search scope			0.0509*			0.0452*
			(0.0213)			(0.0214)
External change agent x Involvement in implementation				0.0237**		0.0237**
				(0.00864)		(0.00843)
Ext. change agent x Int. change agent					0.0173	-0.0103
					(0.0194)	(0.0193)
Constant	-0.525	-0.488	-0.00573	-0.234	-0.498	-0.158
	(0.368)	(0.363)	(0.374)	(0.332)	(0.360)	(0.362)
Industry Controls	included	included	included	included	Included	included
Firms	462	462	271	290	462	269
Log Likelihood	-1160	-1155	-643.4	-684.2	-1155	-633.3

Note: Robust standard errors in parentheses; significance levels: *** p<0.001, ** p<0.01, * p<0.05, † p<0.1