

Hörisch, Jacob; Wulfsberg, Isabell; Schaltegger, Stefan

Article — Published Version

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Business Strategy and the Environment

Provided in Cooperation with:

John Wiley & Sons

Suggested Citation: Hörisch, Jacob; Wulfsberg, Isabell; Schaltegger, Stefan (2019) : The influence of feedback and awareness of consequences on the development of corporate sustainability action over time, Business Strategy and the Environment, ISSN 1099-0836, Wiley, Hoboken, NJ, Vol. 29, Iss. 2, pp. 638-650,
<https://doi.org/10.1002/bse.2394>

This Version is available at:

<https://hdl.handle.net/10419/230209>

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RESEARCH ARTICLE

The influence of feedback and awareness of consequences on the development of corporate sustainability action over time

Jacob Hörisch  | Isabell Wulfsberg | Stefan Schaltegger

Centre for Sustainability Management,
Leuphana University of Lüneburg, Lüneburg,
Germany

Correspondence

Jacob Hörisch, Centre for Sustainability
Management, Leuphana University of
LüneburgUniversitätsallee 1, Lüneburg 21335,
Germany.
Email: hoerisch@leuphana.de

Abstract

The current level of corporate sustainability is insufficient for overcoming pressing environmental and social issues. Research is therefore needed about processes that lead to increased corporate action that fosters sustainable development. This study investigates the influence of feedback and corporate awareness of consequences on the development of corporate sustainability action over time. It uses action regulation theory to quantitatively analyse data of 59 large German companies measured at two points in time. The results reveal a positive temporal development of corporate sustainability action, and awareness of consequences positively mediates the relationship between corporate sustainability actions in two different time periods. Feedback acts as a moderator between the positive effect of corporate sustainability action in the first period on corporate awareness of consequences in the second period. Based on these findings, recommendations for organisations include the importance of seeking and processing feedback.

KEYWORDS

action regulation theory, awareness of consequences, corporate sustainability, feedback, panel data

1 | INTRODUCTION

Corporate engagement for sustainability can be considered a precondition for sustainable development. For example Heede (2014) points out that nearly two thirds of all historic CO₂ and methane emissions were caused by no more than 90 corporations. Likewise, corporations and their global supply chains are closely linked to some of the most pressing social sustainability challenges, such as forced labour (e.g., New, 2015). Given this importance of corporations for sustainable development, it does not surprise that corporations increasingly engage for sustainability. This is for instance reflected in a growing percentage of corporations in the Fortune 500 index (Brown, Vetterlein, & Roemer-Mahler, 2010) and in the number of companies that take sustainability action by adopting a certified environmental management system according to ISO 14001 (Federal Environment Agency, 2018).

However, existing research literature has highlighted that the current level of corporate engagement for sustainability is insufficient

for staying within the planetary boundaries (Whiteman, Walker, & Perego, 2013) or for overcoming the most pressing social evils in supply chains (Wickert, 2016). Thus, a higher level of corporate engagement for sustainability is needed. Past literature has shown an increase in corporate sustainability action over time (e.g., Doluca, Holzner, & Wagner, 2018), however, not for all companies and not at the same pace (Cramer, 2005; Doluca, Holzner, & Wagner, 2018; Doluca, Wagner, & Block, 2018; Siebenhüner & Arnold, 2007). Still, relatively little is known on the processes that lead to increased corporate action fostering sustainable development. On this ground, the current paper applies concepts of action regulation theory (Frese, 2007; Frese & Zapf, 1994) and Schwartz's (1968) norm activation model to analyse the organisational learning process of corporate sustainability action and regards feedback and awareness of consequences as two possible influencing factors. Against this theoretical background, it can be assumed that an organisations' engagement with corporate sustainability triggers its awareness of consequences about corporate

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sustainability, which in turn increases the respective organisations' engagement. Furthermore, the feedback corporations receive on their sustainability actions can be expected to moderate the influence of corporate engagement on the awareness of consequences. Building on these assumptions, this research addresses the following research question: How does feedback and corporate awareness of consequences influence corporate sustainability action?

This research extends the existing literature in several ways. First, the analysis addresses the research need expressed by Papagiannakis, Voudouris, and Lioukas (2014), who suggest to deeper investigate why and how changes in corporate sustainability occur. Applying action regulation theory in this context is novel because it provides a new perspective for explaining this organisational learning process. Second, earlier studies can be validated by using a different database, drawing on the German Corporate Sustainability Barometer (Schaltegger, Harms, & Windolph, 2010; Schaltegger, Hörisch, Windolph, & Harms, 2012). Third, this analysis uses data of the same corporations over two points in time and is hence one of the few studies allowing to analyse the temporal development of corporate sustainability. By paying special attention to the role of feedback and awareness of consequences as well as to the development of a corporation's engagement in sustainability over time, this analysis provides insights into why some organisations reach a high level of corporate sustainability faster than others.

The findings of this study reveal a positive development of corporate sustainability action over time. In particular, corporate sustainability action in the first period exerts a positive effect on corporate awareness of consequences in the second period, and this link is moderated by the extent of feedback a corporation receives (in Period 1). In turn, corporate awareness of consequences positively influences corporate sustainability action (in Period 2). Hence, the study shows that feedback and corporate awareness of consequences are important influencing factors, which determine the extent and pace at which an organisation develops with regard to corporate sustainability.

The remainder of the paper is structured as follows. The next section presents the extant literature on how corporate engagement for sustainability changes over time, summarises key aspects of the theoretical framework informed by action regulation theory and the norm activation model, and builds hypotheses based on both streams of literature. Section 3 describes the quantitative methodology employed for the empirical analysis, explaining the two waves of surveys conducted, the measurement constructs used, and the resulting data set. In Section 4, the results of the hypotheses testing are presented. Section 5 discusses these findings and draws conclusions for theory and practice.

2 | LITERATURE REVIEW

2.1 | Development of corporate sustainability over time

The level of corporate sustainability has increased steadily for the past decades. Thereby, corporate sustainability can be defined as "company activities – voluntary by definition – demonstrating the inclusion of

social and environmental concerns in business operations and in interactions with stakeholders" (van Marrewijk, 2003, p. 102). As, for instance, indicated by a growing number of companies implementing environmental management systems, the level of corporate sustainability has increased for the past decades (Brown et al., 2010; Federal Environment Agency, 2018). Similarly, Doluca, Holzner, and Wagner (2018) report an overall increase of corporate sustainability actions and environmental management systems established in German and British organisations between 2001 and 2016.

To better understand the reasons for such increases of corporate sustainability action, the learning process of businesses on corporate sustainability is of crucial importance. A study by Cramer (2005), for example, monitored Dutch companies in different phases of integrating corporate sustainability into their business practices and stresses that the corporate learning process towards sustainability, especially in large companies, leaves much to be desired. She concludes that sustainability learning processes in organisations mainly occur on individual or group level. However, learning processes at the level of the whole corporation remain rare (Cramer, 2005), that is, processes that are integrated throughout the organisational hierarchy from the top management to each single department. A major reason for this rather hesitant learning process is the lack of support and understanding within the organisation. Similar findings by Siebenhüner and Arnold (2007) emphasise that large companies mainly focus on small-scale measures, although radical changes can predominantly be identified among medium-sized companies. However, Doluca, Holzner, and Wagner (2018) find that the resulting level of corporate sustainability increases with the size of an organisation, possibly due to the availability of resources (cf., Gallo & Christensen, 2011). Furthermore, Doluca, Wagner, and Block (2018) report that family firms in Germany lag behind nonfamily firms with regard to implementing sustainability-related measures in the first waves of measurement; nevertheless, they catch up at a later stage.

Based on these studies, it becomes evident that not all organisations reach the same level of corporate sustainability at the same time and pace. Therefore, influencing factors should be considered. So far, only few analyses of corporate sustainability over time exist, which mainly have been conducted using data from the European Business Environment Barometer (e.g., Doluca, Holzner, & Wagner, 2018; Doluca, Wagner, & Block, 2018). However, these earlier studies use pooled cross-sectional data (i.e., building on different companies for each point in time) instead of panel data (i.e., a data set "that follows a given sample of individuals over time, and thus provides multiple observations on each individual in the sample" (Hsiao, 2014, p. 1). Consequently, Doluca, Holzner, and Wagner (2018) highlight the need for further analyses of temporal developments of corporate sustainability. Likewise, Papagiannakis et al. (2014) identify the need to deeper investigate why and how changes in corporate sustainability occur. Therefore, the use of data drawing on the same companies at different points in time represents a major contribution to existing literature on the temporal development of corporate sustainability. By examining data from the German Corporate Sustainability Barometer surveys 2010 and 2012 (Schaltegger et al., 2010; 2012), this study

addresses the research call expressed by Doluca, Holzner, and Wagner (2018) and Papagiannakis et al. (2014). Thus, in comparison to earlier studies, methodological novelties of this paper are to analyse the same organisations over time, to apply a different theoretical framework, and to use another database.

2.2 | Feedback and awareness of consequences

An important driving factor for corporate learning for sustainability is the awareness of corporations about the consequences of environmentally and socially (un)sustainable development for the respective corporation. Awareness of consequences refers to the belief that a specific condition is of importance for a relevant object, as it has consequences for this object (Papagiannakis & Lioukas, 2017). On the basis of Schwartz's (1968) norm activation model, De Groot and Steg (2009) and Zhang, Wang, and Zhou (2013) highlight the importance of the awareness of consequences as they find that actors develop positive norms, that is, feelings of moral obligation, towards a certain action in case they become aware of the consequences this action implies. With regard to corporate sustainability, past literature has indicated a positive influence of awareness of consequences of top managers on the organisations' sustainability engagement (Papagiannakis & Lioukas, 2017).

Another crucial factor for the improvement and development of corporate sustainability management is feedback. Past literature has identified feedback as a major influencing factor in organisational learning (e.g., Barlas & Yasarcan, 2006; Greve, 2003; Wong, Cheung, & Leung, 2008). Mayfield and Mayfield (2011), for example, highlight the importance of performance feedback on the individual and group level for receiving a learning and evaluation effect on the organisational level. Earlier research has also investigated the influence of feedback on corporate sustainability. By acting upon feedback and being aware of the consequences corporate actions imply, stakeholder pressures can be addressed, which plays a vital role for organisations in developing its corporate sustainability strategy (Madsen & Ulhøi, 2001; Perez-Batres, Doh, van Miller, & Pisani, 2012). Branzei, Ursacki-Bryant, Vertinsky, and Zhang (2004) and Papagiannakis et al. (2014) apply control theory to explain the impact of feedback on the sustainability learning process of corporations. According to Branzei et al. (2004), feedback is particularly important in the early stages of implementing corporate sustainability. Likewise, focusing on the environmental dimension of corporate sustainability, the findings by Papagiannakis et al. (2014) suggest that the evolution of an organisations' corporate sustainability strategy "is driven by a feedback process wherein outcomes of the environmental decisions of an earlier time influence environmental decisions of a later time" (Papagiannakis et al., 2014, p. 266). However, when it comes to feedback processing, control theory primarily focuses on discrepancy-reducing feedback that interrupts a certain action, in case the goal has not been achieved (Carver & Scheier, 1985; cf., Locke, 1991; Zacher & Frese, 2018). Action regulation theory (Frese, 2009; Frese & Zapf, 1994) extends control theory in this respect, as it takes a broader perspective on feedback, not restricted to discrepancy-reducing feedback. It thus

provides a promising path for analysing the influence of feedback on the temporal development of corporate sustainability.

2.3 | Action regulation theory

Although learning and planning are important steps in corporate sustainability, actual sustainability-related problems such as climate change or unhealthy working conditions can ultimately only be successfully reduced or eliminated by taking action. In this context, action regulation theory (e.g., Frese, 2007; Frese & Zapf, 1994; Hacker, 1985) provides a powerful approach in understanding why and how actors regulate their actions. Action regulation theory builds on and extends control theory (Zacher & Frese, 2018). Previous applications of this theory have primarily focused on entrepreneurial individuals (e.g., Frese, 2009; Frese, Gielnik, & Mensmann, 2016; Gielnik et al., 2015), but it is also applicable for actors in established corporations (e.g., Diestel & Schmidt, 2012; Raabe, Frese, & Beehr, 2007; Zacher, Schmitt, Jimmieson, & Rudolph, 2018). Although these studies investigated the behaviour of specific individuals within a corporation, such as employees or supervisors, action regulation theory has not yet been applied to explain actions of an organisation as a whole. Past literature provides evidence for the applicability of control theory on the organisational level (e.g., Branzei et al., 2004; Papagiannakis et al., 2014). A research gap, however, remains to test action regulation theory at the organisational level of analysis as it represents a valuable extension of control theory. Such application in the field of corporate sustainability is valuable, as action regulation theory allows addressing developments over time. Zacher and Frese (2018) highlight that such a perspective is only rarely taken and recommend to further apply action regulation theory based on data sets surveying the same objects at different points in time.

Action regulation theory distinguishes between three different components that can be used to explain how actors regulate their actions: (a) sequence of action, (b) structure, and (c) focus (Frese, 2007, 2009). In the following analysis, special attention is paid to the *sequence of action*, as this aspect of action regulation theory has not been applied in sustainability-related actions of organisations. Additionally, sequence of action is particularly relevant for corporations, specifically to the role of *feedback* within the action regulation process over time, and feedback has proven to be a particularly relevant influencing factor in the context of corporate sustainability (Hörisch, Johnson, & Schaltegger, 2015). Thus, considering the sequence of action extends studies on corporate sustainability using control theory (Branzei et al., 2004; Papagiannakis et al., 2014). Although control theory and action regulation theory agree on the theoretical aspects of hierarchical levels (*structure*), both differ particularly with regard to the *action sequence* (Zacher & Frese, 2018).

According to action regulation theory, the following different, possibly iterative, *sequences of action regulation* exist: (a) goal development, (b) orientation, (c) plan development and selection, (d) monitoring of execution, and ultimately, (e) feedback processing (Frese, 2009; Frese & Zapf, 1994; Zacher & Frese, 2018). Action starts with developing an overarching goal and various different subgoals,

followed by mapping its environment and developing a plan in order to achieve these goals. Afterwards, the process of execution needs to be monitored and feedback from consumers, investors, suppliers, and so on has to be processed (Frese, 2009). These sequences of action do not necessarily occur in the exact order but can also take place simultaneously or are repeated before turning to the next sequence of action. During this process, a continuous provision on feedback concerning actions takes place. Thus, the last sequence of the action regulation process, feedback processing, is of utmost importance as actors are informed about their current state of achieving the predefined goals. This enables them to regulate their actions in order to reduce any inconsistencies on this path (Zacher & Frese, 2018). Thus, the extent to which actors receive feedback on their action is of crucial relevance in action regulation theory. Feedback is defined as “information about how far one has progressed toward the goal” (Frese & Zapf, 1994, p. 279), but feedback also holds the power to change goals in a constructive way. As stated by Frese (2007), feedback is one of the most important components of the corporate learning process, although it has not yet enjoyed much attention in literature. Particularly, the influence of the extent of feedback provision on the development of corporate sustainability has not been sufficiently investigated by previous applications of action regulation theory.

2.4 | Development of hypotheses

Corporate sustainability is a steady learning process for organisations (e.g., Benn, Edwards, & Williams, 2014; Linnenluecke & Griffiths, 2010a; Schaltegger, Beckmann, & Hansen, 2013), demanding flexible adaptations and fast responses to present and future environmental and social issues. Consequently, sustainability-related goals need to be regularly adapted, extended, or changed (York, 2009). Based on the sequences of action suggested in action regulation theory, corporations pass stepwise cognitive processes iteratively, in order to reach their sustainability-related goals. In so doing, routines and expertise are being built in the field of corporate sustainability (Baker & Schaltegger, 2015). According to Frese (2007), increasing routinisation opens the opportunity to deal with additional demands as routinised action happens on a rather (semi)unconscious level and thus demands less effort and time for the actor to carry out this action. As a result, the actor is capable to concentrate on further action. On this basis, it can be expected that corporate sustainability enjoys a continuous improvement with time. Similar findings have been reported by past literature. Studies by Cramer (2005) and by Siebenhüner and Arnold (2007) provide support for the positive development of corporate sustainability over time. However, surveys among corporations show relatively large differences between organisations with regard to their level of corporate sustainability (e.g., Banerjee, Iyer, & Kashyap, 2003; Doluca, Holzner, & Wagner, 2018; Doluca, Wagner, & Block, 2018). Although, overall, the level of corporate sustainability increases (e.g., Doluca, Holzner, & Wagner, 2018), it cannot be expected that all organisations reach the same level of corporate sustainability at the same time but that it will be influenced by prior levels of corporate

sustainability of the respective organisation. In this vein, Jové-Llopis and Segarra-Blasco (2018) found that corporations that engage with innovations positively affecting the environment in the previous year are more likely to also engage with such innovations in the following year. Likewise, Papagiannakis et al. (2014, p. 257) argue in the context of corporate environmental management that “higher outcomes would trigger higher goals that [...] would lead to an increase in subsequent environmental decisions”. Consequently, corporate sustainability action can be expected to be path dependent. In other words, the level of corporate sustainability at a later stage can be expected to depend on the level of corporate sustainability action at an earlier stage. Therefore, Hypothesis 1 is formulated as follows:

Hypothesis 1. *The higher the level of prior corporate sustainability (in Period 1), the higher the level of subsequent corporate sustainability action (in Period 2).*

Extant literature suggests that corporate actions concerning an issue lead to higher levels of corporate awareness of the consequences concerning this issue (Papagiannakis & Lioukas, 2017; Zhang et al., 2013). In the context of corporate sustainability, Papagiannakis and Lioukas (2012) stress that the awareness of consequences of individuals within an organisation is important in regulating future action. At the organisational level, Qian and Schaltegger (2017) find for the context of carbon reporting that improving disclosure quality leads to higher carbon performance in the subsequent time period, as the organisation becomes aware of the consequences the issue of climate change has for this organisation. Given the consequences, (un)sustainable development can have for corporations (e.g., Linnenluecke & Griffiths, 2010b; Winn, Kirchgeorg, Griffiths, Linnenluecke, & Günther, 2011), corporate awareness of consequences is highly relevant. Therefore, based on Papagiannakis and Lioukas (2017) and Zhang et al. (2013), this work examines in how far prior levels of corporate sustainability action lead to a stronger awareness concerning the consequences of (un)sustainable development. We thus hypothesise that the level of prior corporate sustainability action positively influences the subsequent awareness of consequences. Accordingly, Hypothesis 2 is formulated as follows:

Hypothesis 2. *The higher the level of prior corporate sustainability action (in Period 1), the higher the subsequent corporate awareness of consequences concerning sustainability (in Period 2).*

Based on action regulation theory and control theory, it can be anticipated that, besides awareness of consequences, the extent of feedback related to the progress of goal achievement is of crucial importance for corporate sustainability action. Feedback is an important influencing factor for organisational learning in general (e.g., Barlas & Yasarcan, 2006; Greve, 2003; Wong et al., 2008). With regard to the formation of environmental strategies among Chinese firms, feedback was found to be an important motivator (Branzei et al., 2004). Likewise, Papagiannakis et al. (2014) qualitatively analysed corporate environmental strategies of Greek firms over a 5-year period (2004–2008) using a multiple case study approach. Their findings also

showed that sustainability-related decisions of an earlier time influence those of a later time leading to a steadily increasing achievement of new outcomes. Moreover, Papagiannakis et al. (2014) showed that the temporal evolution of corporate environmental strategies is stimulated by a feedback process. Besides these insights gained from earlier research on corporate sustainability inspired by control theory, action regulation theory highlights the importance of feedback, as it suggests that feedback plays a vital role in action regulation (Frese, 2007; Frese & Zapf, 1994; Zacher & Frese, 2018). Thus, building on action regulation theory and the evidence gathered by Branzei et al. (2004) and Papagiannakis et al. (2014) in the context of corporate sustainability, it can be expected that feedback strengthens the positive effect of prior levels of corporate sustainability on the awareness of consequences. The more feedback an organisation receives concerning sustainability, the stronger will be the impact of prior corporate sustainability actions on the awareness about consequences of actions towards corporate sustainability. Therefore, feedback processing is assumed to act as a moderator between prior corporate sustainability actions and its awareness of consequences related to sustainability actions. On this basis, Hypothesis 3 is formulated:

Hypothesis 3. *The influence of prior corporate sustainability action (in Period 1) on subsequent corporate awareness of consequences (in Period 2) is moderated by the extent of feedback a company receives on sustainability issues.*

By considering the sequential action cycle suggested in action regulation theory, which starts with goal development (Frese, 2007; Frese & Zapf, 1994), we expect that sustainability-related goals will be adapted in order to regulate and improve future corporate sustainability. Moreover, based on the norm activation model, it can be assumed that higher levels of awareness about the consequences are a particularly important trigger for actually taking action concerning an issue

(De Groot & Steg, 2009; Zhang et al., 2013). Awareness of consequences is also found to be an important determinant in many sustainability-related settings (e.g., He & Zhan, 2018; (Sörqvist et al., 2013). With regard to corporate sustainability, past literature has confirmed a positive influence of awareness of consequences of individuals within an organisation on its engagement in sustainability-related action (Papagiannakis & Lioukas, 2012, 2017). On the basis of these insights, we expect that the awareness of consequences of an organisation enhances its engagement in sustainability-related actions. Accordingly, Hypothesis 4 is formulated as follows:

Hypothesis 4. *The higher the level of corporate awareness of consequences (in Period 2), the higher the level of corporate sustainability action (in Period 2).*

Finally, Hypotheses 1, 2, and 4 logically imply that the awareness of consequences acts as a mediator between the positive development of corporate sustainability over time, that is, between the influence of prior and subsequent levels of corporate sustainability action. The expected mediation is based on findings by De Groot and Steg (2009), who provide compelling support for the mediator effect of awareness of consequences on prosocial and proenvironmental intentions on the individual level, for instance concerning reducing car use, blood donation, and energy use. Moreover, a cyclical relationship between these variables can be expected according to the sequences of action regulation, implied in action regulation theory. This leads to the proposition of Hypothesis 5:

Hypothesis 5. *The influence of the level of prior corporate sustainability actions (in Period 1) on the subsequent level of corporate sustainability actions (in Period 2) is positively mediated by the level of corporate awareness of consequences (in Period 2).*

Figure 1 summarises Hypotheses 1–4. Hypothesis 5 results by combining Hypotheses 1, 2, and 4.

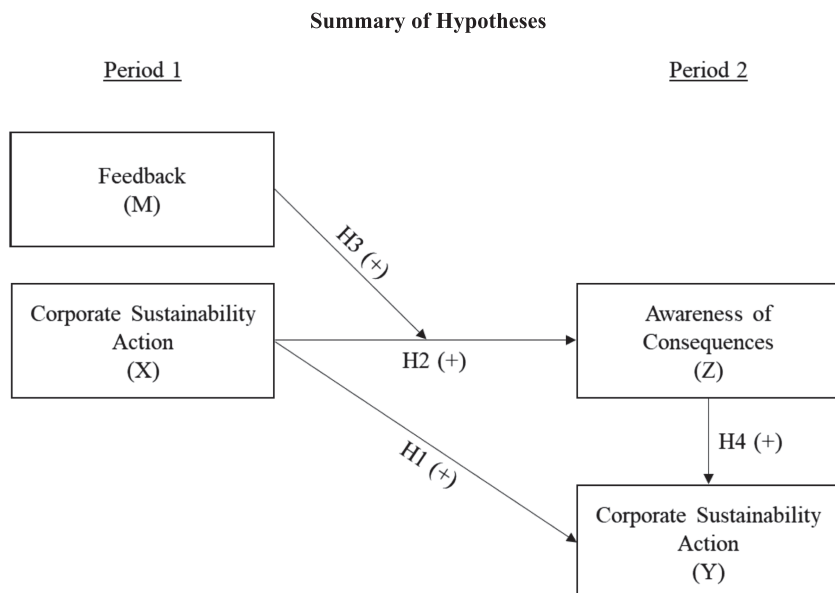


FIGURE 1 Summary of hypotheses

3 | METHOD

3.1 | Participants and procedure

This paper uses the data gathered with two published surveys among the 500 largest German companies as well as the 50 largest banks and 30 largest insurance companies (the German Corporate Sustainability Barometer; Schaltegger et al., 2010; 2012). Additionally, companies listed in the most important German stock indices (DAX, M-DAX, and S-DAX) were contacted if not already included due to the above-mentioned criteria. To avoid double counting of responses, all subsidiaries were excluded from the surveys if they do not manage sustainability issues independently from the parent company. Company size was measured by revenue (for banks and insurance companies company size was measured as balance sheet total or annual gross contributions, respectively). All companies were contacted in 2010 and 2012. By examining data from surveys in different years, this study addresses the research call expressed by Doluca, Holzner, and Wagner (2018), highlighting the need for further analyses of temporal developments of corporate sustainability.

For all participating companies, managers responsible for aspects related to corporate sustainability were the preferred contact persons. Surveying individuals who act as representatives for the whole organisation is a common procedure (e.g., Branzei et al., 2004; Hörisch, Johnson, & Schaltegger, 2015; Papagiannakis et al., 2014) and has also been used to apply control theory on an organisational level (e.g., Branzei et al., 2004; Papagiannakis et al., 2014). We have purposefully selected sustainability managers as respondents, as these are known to have a good overview about sustainability actions, feedback, and awareness on an organisational level and thus have been previously used as respondents for surveys capturing processes on the organisational level (e.g., Hörisch, Schaltegger, & Windolph, 2015).

Participation in the survey was voluntary, the data were treated anonymously, and no sanctions were applied for nonparticipation. For the survey in 2010, 334 companies were invited based on the above criteria of which 112 companies participated in the survey

(33.5% response rate). In 2012, 152 companies participated in the survey, of 383 companies initially invited, using the same selection criteria as in 2010 (39.7% response rate). The response rates for both surveys are clearly within the standard deviation range of average response rates Baruch and Holtom (2008) identified for surveys among organisations, which were published in refereed academic journals (35.7%).

The survey for 2010 was conducted from November 2009 to February 2010 and the survey for 2012 lasted from February 2012 to April 2012. In both survey waves, potential participants were first contacted via telephone. In 2010, in a second step, the survey was sent to participants by mail or e-mail. In 2012, the participants received a link to an online survey via e-mail after the initial contact by telephone. The survey included numerous aspects of corporate sustainability management, including items measuring the company's awareness of consequences with regard to sustainability, the sustainability-related action a company takes, and the feedback it receives regarding its corporate sustainability activities.

For the purpose of this paper, only those 60 companies that participated in both surveys were considered. To verify that this selection does not result in a substantial bias, it was tested whether there are significant differences with regard to key variables (i.e., revenue, the number of employees, nondomestic sales, and the question whether the respective company is family run) between those companies that participated only in 2012 and those that also responded to the survey in 2010. For none of these variables any significant differences could be observed. One company needed to be excluded *ex post*, as the respective questionnaire from 2012 was incomplete. The final data set thus comprises data from 59 companies. The descriptive statistics and the correlation matrix for these companies are displayed in Table 1.

3.2 | Measures

The measurement of the degree to which a company takes action related to sustainability (SustAct) is based on multiple items. First, the respondents were provided a list of different standards in

TABLE 1 Descriptive statistics and correlation matrix of the sample

Variable	1	2	3	4	5	6	7
1. SustAct2010	1.000	.438	.436	.332	.231	-.021	.324
2. Feedback2010		1.000	.198	.289	.211	.181	.411
3. SustAct2012			1.000	.494	.224	.065	.085
4. Aware2012				1.000	.121	.159	.347
5. Revenue					1.000	-.160	.002
6. Family business						1.000	.001
7. Industry							1.000
Mean	0.000	-0.005	0.000	0.000	0.483	0.328	0.525
SD	1.000	1.008	1.000	1.000	0.504	0.473	0.504
Minimum	-2.079	-2.915	-3.031	-2.380	0.000	0.000	0.000
Maximum	1.945	1.345	2.203	2.570	1.000	1.000	1.000
N	59	59	59	59	58	58	59



sustainability management and indicated which of these standards their company follows (AA 1000; EFQM; EMAS; Global Reporting Initiative Guidelines; ISO 14001; ISO 9000; OECD Guidelines; SA 8000; Sigma Guidelines; UN Global Compact). The standardised number of standards followed was used as a first variable in the construct *SustAct*. Furthermore, the sustainability managers were asked to evaluate the intensity to which the company implements seven core sustainability management measures (see Table A1). Each core sustainability management measure was assessed on a 5-point rating scale (ranging from *never applied* to *always applied*). Together with the first variable on the implementation of sustainability management standards, the seven standardised variables on the implementation of core sustainability management measures were used to build the construct *SustAct* using principal component analysis, resulting in one continuous latent variable. In case of missing values concerning the key sustainability measures, the average value was computed.¹ The reliability analysis showed sufficiently high values for both survey waves (Cronbach's $\alpha_{\text{SustAct2012}} = .737$; Cronbach's $\alpha_{\text{SustAct2010}} = .678$), given that the number of items is smaller than 10 (Loewenthal, 2004).

As described in the theory section, the awareness of corporations about the consequences of environmentally and socially (un)sustainable development for the respective corporation was expected to act as a mediator variable. To capture this variable (*Aware2012*), it was not asked directly, what consequences environmentally and socially (un)sustainable development has on the entire organisation, but the consequences for specific organisational units were surveyed. Therefore, the sustainability managers participating in the survey were first asked to assess the degree to which different functional units are affected by environmental issues on a 5-point rating scale, to monitor in how far the organisation is aware of consequences environmental issues have for specific functional units. Using the assessment of representative individuals within the organisation for assessing the awareness of the organisation is a common procedure, also applied by Papagiannakis and Lioukas (2017). For the eight functional units displayed in Table A1, the average score was calculated and standardised. If an organisational unit did not exist in a company (e.g., production in a service company), this variable was excluded from calculating the average score. For the same organisational units, the respondents also indicated the units' degree of affectedness by social issues, and again the average score was calculated and standardised. For these two variables (i.e., average affectedness by first environmental and second social issues of different organisational units), a principal component analysis was used to calculate one single factor, i.e., one continuous latent variable. Again, reliability analysis revealed sufficiently high values (Cronbach's $\alpha_{\text{Aware2012}} = .748$) (Loewenthal, 2004).

To measure the extent to which a company receives feedback about how far it has progressed towards its sustainability-related goals in the first period (*Feedback2010*), the respondents indicated whether the company measures its influence on six different environmental issues, seven social issues, and the influence of its sustainability action

on seven issues relevant for business success (for an overview of these issues, see Table A1), as it can be expected that the more aspects of corporate sustainability a company measures, the higher will be the degree of feedback it receives. These variables (number of environmental aspects measured, number of social aspects measured, and number of economic aspects measured) were all standardised and used to compute one single, continuous construct by means of principal component analysis. Again, the value for Cronbach's α (.685) confirmed the reliability of the construct, given the relatively low number of items included in the construct (Loewenthal, 2004).

To control for possible interfering effects, the following control variables were considered, which were highlighted to influence corporate sustainability action in previous research (e.g., Doluca, Wagner, & Block, 2018; Gallo & Christensen, 2011). First, a dummy variable was used to separate companies with annual revenues of more than €2.5 billion (*revenue* = 1) from those with revenues of 2.5 billion or less (*revenue* = 0). Second, service and trade companies on the one hand (*industry* = 0) were differentiated from producing companies (*industry* = 1). Lastly, the variable *family* indicates whether the company is a family run business (*family* = 1) or not (*family* = 0).

4 | ANALYSIS AND RESULTS

The conceptual model displayed in Figure 1 was tested using the Process Macro version 3.3 (Hayes, 2018), which builds on OLS regressions. For all constructs and all models analysed, normal distribution of the variable and its error terms were confirmed using histograms and Q-Q plots. Additionally, based on the tests suggested by Backhaus, Erichson, Plinke, and Weiber (2011), it was made sure that the data set and the analyses are not affected by problems related to heteroscedasticity. Lastly, multicollinearity was tested for based on the variance inflation factor values, and the data set was found to not to be affected by problems connected to multicollinearity as defined by Kennedy (1992).

In a first model (Model I), the effect of *SustAct2010*, *Feedback2010*, and the interaction effect between these two constructs on *Aware2012* was tested. Additionally, this model includes the control variables *revenue*, *family*, and *industry*. Model II captures the effect of *SustAct2010*, *Aware2012*, and of the control variables (*Revenue*, *Family*, and *Industry*; *SustAct2012*). Lastly, to not only test the effect of *SustAct2010* on *Aware2012* as moderated by *Feedback2010* but also the direct effect of *SustAct2010* on *Aware2012*, Model III captures the effect of *SustAct2010* and of the control variables on *Aware2012*. The results of all models are displayed in Table 2.

Hypothesis 1 can be assessed based on Model II. Overall, Model II shows a good model fit, as it explains 38.3% of the variance in the dependent variable ($R^2 = .383$). As expected in Hypothesis 1, the model documents that the effect of *SustAct2010* on *SustAct2012* is indeed positive and significant ($b = .366$, $p < .01$). To assess Hypothesis 2, Model III needs to be consulted, which captures the main effect of *SustAct2010* on *Aware2012*. Again, the model has a sufficient model fit ($R^2 = .183$). The model provides indication that *SustAct2010* exerts a

¹For the 60 companies included in the sample, on average 0.15, the seven items on the implementation of core sustainability management measures were missing.

TABLE 2 Regression models

Model number	Model I	Model II	Model III
Dependent variable	Aware2012	SustAct2012	Aware2012
Independent variables			
Constant term	-.423* (.240)	.078 (.213)	-.379 (.237)
SustAct2010	.201 (.140)	.366*** (.126)	.237* (.140)
Feedback2010	.256 (.155)		
SustAct2010 * Feedback2010	.359*** (.133)		
Aware2012		.426*** (.121)	
Revenue	.106 (.250)	.220 (.228)	.156 (.259)
Family	.250 (.291)	.276 (.266)	.158 (.302)
Industry	.267 (.303)	-.497* (.270)	.476 (.300)
R ²	.289	.383	.183
N	58	58	58
p (model)	.006	.000	.028

Note. The cells display the unstandardised regression coefficients. Standard errors are reported in parentheses. Indirect effect: $b_{zx}b_{yz} = 0.101$; SE $b_{zx}b_{yz} = 0.066$;
 $*p < 0.1$. $**p < 0.05$. $***p < 0.01$.

significant effect on *Aware2012* ($b = .237$, $p < .1$). Thus, Hypothesis 2 can be accepted as well, given a probability of error of $p < .1$. In Hypothesis 3, it was expected that this influence of prior levels of corporate sustainability (*SustAct2010*) on corporate awareness of consequences (*Aware2012*) is moderated by the extent of feedback a company receives on sustainability issues. Model I captures this hypothesis, as it included the effect of the interaction term of *SustAct2010* and *Feedback2010* on *Aware2012*. Indeed, this interaction term shows a significant effect ($b = .359$, $p < .01$). Therefore, Hypothesis 3 can be supported. Figure 2 visualises this effect and demonstrates that although there is only a weak (negative) effect of *SustAct2010* on *Aware2012* if *Feedback2010* is low, *SustAct2010* has a strong positive effect on *Aware2012* if *Feedback2010* is high. This indicates that higher levels of prior corporate sustainability action lead to higher levels of awareness of consequences only if the level of feedback received by a company is high.

Hypothesis 4 assumes that *Aware2012* positively influences *SustAct2012* and can be analysed based on Model II. As the model

shows a significant effect of *Aware2012* on *SustAct2012* ($b = .426$, $p < .01$), Hypothesis 4 can be supported.

Lastly, building on the previous hypotheses, Hypothesis 5 expects that the influence of prior sustainability action (*SustAct2010*) on subsequent sustainability action (*SustAct2012*) is moderated by the awareness of consequences (*Aware2012*). Finding support for this hypothesis requires significant effects of *SustAct2010* on *Aware2012* (Hypothesis 2) and of *Aware2012* on *SustAct2012* (Hypothesis 4). Although the latter can be supported with a very low probability of error ($p < .01$), Hypothesis 2 can only be supported, given $p < .1$ is accepted. Additionally, the influence of *SustAct2010* on *Aware2012* was found to be only significant and positive in case *Feedback2010* is high (Hypothesis 3). Thus, Hypothesis 5 can only be supported with $p < .1$.

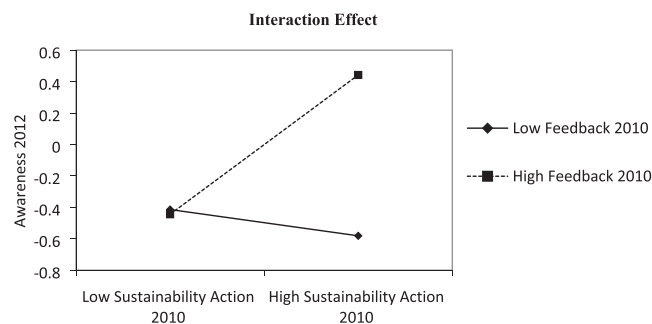
Interestingly, of the control variables only *industry* shows a significant effect and only in Model II. The lack of significance of *revenue* can be explained by the sample selection as only the largest German corporations have been surveyed. Hence, all companies included in the analysis are large corporations with high revenues.

Table A2 displays the same models as documented in Table 2 but uses an alternative operationalisation of the *Feedback2010* variable. Based on this robustness check, the results of Table 2 can be confirmed. The alternative operationalisation of the *Feedback2010* variable is documented in Table A1.

5 | DISCUSSION AND CONCLUSION

Sustainable development cannot be achieved without substantial action of corporations (cf., Heede, 2014; Shrivastava, 1995). Past literature indicated that although the overall level of corporate sustainability increases, not all organisations reach the same level within the same time (Cramer, 2005; Doluca, Holzner, & Wagner, 2018; Doluca, Wagner, & Block, 2018; Siebenhüner & Arnold, 2007). Therefore, knowledge on factors leading to an increase of corporate sustainability action is of crucial importance. This study enriches research on corporate sustainability by identifying awareness of consequences and feedback as important influencing factors. In this context, a novel theoretical lens is applied by informing the analysis with action regulation theory, which extends past research on feedback processing based on control theory. Furthermore, there is a lack of panel data sets on corporate sustainability, although such data are of high relevance for understanding the development of corporate sustainability over time. Although some qualitative, longitudinal studies on corporate sustainability exist (e.g., Cramer, 2005; Papagiannakis et al., 2014; Siebenhüner & Arnold, 2007), most quantitative analyses on corporate sustainability used pooled cross-sectional data; that is, although different points in time are monitored, the composition of the sample differs between the different measurements (e.g., Doluca, Holzner, & Wagner, 2018; Doluca, Wagner, & Block, 2018; Schaltegger et al., 2012). For this reason, a data set consisting of the same companies for two different points in time provides the basis for this empirical investigation.

In good agreement with Doluca, Holzner, and Wagner (2018), our findings reveal a positive development of corporate sustainability

**FIGURE 2** Interaction effect

action over time. Reasons for this observation can be found by considering action regulation theory. Frese (2007), for example, suggested that actors receive expertise and experience routinisation by iteratively passing through a sequential action cycle. During this process, actors are enabled to deal with additional demands and are thus empowered to increase their engagement in sustainability-related actions. Moreover, the results show that corporate sustainability action positively influences corporate awareness of consequences. Our results thus support earlier findings by Zhang et al. (2013) and Papagiannakis and Lioukas (2017), who found for the context of employees within corporations that actions concerning an issue lead to higher levels of awareness about this issue and sensitise for the sustainability-related consequences of the corporations' actions. Our analysis furthermore reveals that the positive effect of corporate action on awareness for sustainability-related consequences is positively moderated by feedback. This finding is compatible with those by Branzei et al. (2004) and Papagiannakis et al. (2014), who stated that the positive evolution of corporate sustainability is driven by a feedback process. These studies therefore lend support to our assumptions based on action regulation theory and its sequential action cycle (Frese, 2007; Frese & Zapf, 1994; Zacher & Frese, 2018) that feedback processing is one of the most important components of the corporate learning process. A possible reason why feedback acts as a moderator of the relationship between corporate sustainability action and corporate awareness of consequences is that organisations are informed about their current state of achieving a predefined goal and are thus enabled to reduce inconsistencies on this path (Zacher & Frese, 2018). Our findings furthermore show that corporate awareness of consequences positively influences corporate sustainability action. According to De Groot and Steg (2009) and Zhang et al. (2013), actors develop positive feelings of moral obligation towards a certain action if they become aware of the consequences this action implies. Hence, these insights also inform and support the norm activation model by Schwartz (1968). For the context of this paper, this implies that corporations become aware of the importance of the environment and social issues for them through engaging in corporate sustainability and consequently further improve their sustainability-related actions. This finding lends support to Papagiannakis and Lioukas (2017), who also reported a positive influence of awareness of consequences of managers in Greek manufacturing companies on their engagement in corporate sustainability actions. The results are also in line with the findings by Qian and Schaltegger (2017), who found that improving disclosure on carbon information leads to improved carbon performance in subsequent periods of time. Although they do not analyse awareness, they argue that awareness and organisational learning may be reasons to be further investigated to explain their findings. Finally, a positive mediation of awareness of consequences on the relationship between corporate sustainability action of an earlier time on corporate sustainability action of a later time was indicated in our study. This finding extends those of De Groot and Steg (2009), who found evidence for the mediator effect of awareness of consequences on prosocial and proenvironmental intentions of individuals. Therefore, our study indicates that a

mediator effect can also be found on the organisational level in the context of corporate sustainability. However, it should be noted that the effect of prior levels of corporate sustainability action on subsequent levels of corporate sustainability action is only partially mediated by the level of corporate awareness of consequences.

Based on the analysis presented above, several implications can be derived for theory and practice. First, the study indicates that awareness of consequences and feedback are two important influencing factors for the development of corporate sustainability action over time. Therefore, organisations are encouraged to actively seek for feedback in order to analyse their progress towards approaching sustainability-related goals. To receive such feedback, it is advisable to enhance the measurement of different aspects of sustainability (e.g., greenhouse gas emissions, labour conditions in supply chains, and so on), as enhanced measurement of sustainability aspects over time increases the extent of feedback a corporation receives. This result is thus in line with earlier studies that revealed the importance of measuring progress in sustainability management (e.g., Bell & Morse, 2013). Relatedly, the result that awareness of consequences positively impacts corporate sustainability action highlights the importance of sensitising corporate managers for the consequences (un)sustainable development has for the respective corporation. In this context, further education concerning sustainability for managers is a promising means (cf., Hesselbarth & Schaltegger, 2014; Roome, 2005).

The study also provides several theoretical implications. It informs action regulation theory in two ways. First, action regulation theory has previously only rarely been used to explain actions on the organisational level. Past studies have applied action regulation theory nearly exclusively on the level of individual acting in organisations, for example, by considering employees, supervisors, or managers. Second, our study is the first approach to apply the theory in contexts of corporate sustainability. Hence, using action regulation theory for the context of this paper provides a novel approach to understand the development of corporate sustainability action of organisations as one entity rather than the individuals employed by that organisation. The same accounts for awareness of consequences because this variable has not been applied as an influencing factor on sustainability-related *corporate* actions before. Furthermore, this study is one of the few applications of data regarding the temporal development of corporate sustainability action. Therefore, it addresses the research need to further analyse corporate sustainability taking into account temporal developments (Dolua, Holzner, & Wagner, 2018). Most notably, this study is, to the best knowledge of the authors, the first to apply action regulation theory in the context of the development of corporate sustainability over time.

However, some limitations of the study are worth noting and should be addressed in future research. First, although the theoretical framework provides a new perspective on the temporal development of sustainability-related actions of corporations, action regulation theory was not exploited to its full potential. Concerning the sequential action cycle, most attention was paid to feedback processing. However, before processing feedback, the sequence of action implies additional processes that were not in the focus of this investigation.

Empirically approaching steps like goal development, mapping the environment, planning, and monitoring of execution could provide further insights into understanding the progress in corporate sustainability action over time. Moreover, action regulation theory includes two further components besides the sequential action cycle: structure and focus. Considering those components would have gone beyond the scope of this study. However, future research analysing the structure and focus of sustainability-related action of corporations would be highly informative. Especially hierarchical allocations of such actions (i.e., conscious vs. automatic) should be considered in future studies, in particular with respect to organisations' expertise and routinisation.

A second limitation concerns the data used for the analysis. One limitation concerning the data is that it dates back to 2010 and 2012. Thus, following the data collection and critical events such as the Paris Climate Change Agreement or the formulation of the Sustainable Development Goals of the United Nations took place. Further research should analyse in how far these events affected the influences observed in this analysis. Besides, the data are limited to large corporations and to German corporations. Therefore, the results should not be generalised to other contexts without care. Although the focus on Germany was purposefully chosen, given the fact that German corporate sustainability management was found to take a middle position when compared with sustainability management in other countries (Hörisch, Windolph, & Schaltegger, 2014), the results should not be mistaken to be equally valid for SMEs. Lastly, the data are restricted to corporate sustainability action as the dependent variable. Future research should go beyond this dependent variable and also analyse actual improvements with regard to different aspects of corporate sustainability performance (such as reductions in greenhouse gas emissions), as a result of corporate sustainability action. Similarly, this analysis does not differentiate between different aspects of sustainability management. Future research could go into more detail, analysing the temporal development of not only corporate sustainability in general but with regard to specific aspects, such as climate change, biodiversity loss, or working conditions in international supply chains. Given the European strategic long-term vision for a carbon neutral economy, particularly, the analysis of temporal developments of corporate climate action is worth studying in future research.

Third, the data on feedback of this study lack a clear distinction between positive and negative feedback but rather consider the extent of feedback as such. Therefore, it remains to be identified in how far different types of feedback (i.e., positive vs. negative; internal vs. external) have different effects on the level of corporate sustainability action and performance (cf., Barlas & Yasarcan, 2006). As the scope of such identification is limited in quantitative research, further qualitative studies should be conducted. Such studies will also help to further investigate the role of feedback in organisational learning to clarify whether feedback acts as a central driver of learning or rather as a trigger (cf., Greve, 2003; Wong et al., 2008).

The above described paths for future research can help to further investigate how the contributions of corporations to sustainable development can be increased. This research highlights that important

steps towards such increase will be to extend the feedback companies receive on their sustainability action and to raise corporate awareness about the companies sustainability related consequences.

ACKNOWLEDGEMENTS

We would like to thank Benjamin Bader and Michael Gielnik for the fruitful exchange on the idea of the paper and for guiding our attention to action regulation theory.

ORCID

Jacob Hörisch  <https://orcid.org/0000-0001-5825-1652>

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How to cite this article: Hörisch J, Wulfsberg I, Schaltegger S. The influence of feedback and awareness of consequences on the development of corporate sustainability action over time. *Bus Strat Env*. 2020;29:638–650. <https://doi.org/10.1002/bse.2394>

APPENDIX A

TABLE A1 Operationalisation of constructs

Construct	Items included	Cronbach's α
SustAct2010	Sustainability standards followed (count): 1) Number of the below sustainability management standards followed by the company: AA 1000; EFQM; EMAS; Global Reporting Initiative Guidelines; ISO 14001; ISO 9000; OECD Guidelines; SA 8000; Sigma Guidelines; and UN Global Compact Implementation of sustainability management measures (1 = <i>never</i> ; 5 = <i>always</i>): 2) Developing new customer segments (e.g., promoting environmentally friendly and socially oriented products) 3) Developing new business segments related to sustainability 4) Promoting employee motivation 5) Producing with more efficient use of resources (e.g., optimising production processes) 6) External communication of environmental and social activities (e.g., sustainability reporting) 7) Environmental and social-oriented cost management (e.g., using cost-effective recycling products) 1) Environmental and social-oriented risk management (e.g., health care at the workplace)	.678
Aware2012	1) Average degree to which the following functional units are impacted by environmental issues (1 = <i>no impact</i> ; 5 = <i>strong impact</i>): Procurement/purchasing; research & development; manufacturing; logistics/distribution; marketing; public relations/corporate communication; personnel department/HR; strategic planning 2) Average degree to which the following functional units are impacted by social issues (1 = <i>no impact</i> ; 5 = <i>strong impact</i>): Procurement/purchasing; research & development; manufacturing; logistics/distribution; marketing; public relations/corporate communication; personnel department/HR; strategic planning	.748
Feedback2010 (only included in robustness check) (only included in robustness check)	1) Number of environmental aspects measured (count): Energy consumption; water consumption; material consumption (raw materials and so on); emissions/waste water/waste; biodiversity; transport 2) Number of social aspects measured (count): Workplace/employment; occupational safety and health; training and development; diversity and equal opportunity; consumer protection; child, forced and compulsory labour (e.g., in the supply chain); freedom of association/right to collective bargaining 3) Number of economic aspects for which the company measures the influence of sustainability on these aspects (count): Costs; reputation/image/brand value; revenue/sales/profits; attractiveness as employer/job; satisfaction; innovation; efficiency/productivity 4) Number of environmental issues stakeholders demand the company to manage (count): Energy consumption; water consumption; material consumption (raw materials and so on); emissions/waste water/waste; biodiversity; transport 5) Number of social issues stakeholders demand the company to manage count Workplace/employment; occupational safety and health; training and development; diversity and equal opportunity; consumer protection; child, forced and compulsory labour (e.g., in the supply chain); freedom of association/right to collective bargaining	.685
		.713 ^a

(Continues)

TABLE A1 (Continued)

Construct	Items included	Cronbach's α
SustAct2012	<p>Sustainability standards followed (count)</p> <p>1) Number of sustainability management standards followed (AA 1000; EFQM; EMAS; Global Reporting Initiative Guidelines; ISO 14001; ISO 9000; OECD Guidelines; SA 8000; Sigma Guidelines; UN Global Compact)</p> <p>Implementation of sustainability management measures (1 = <i>never</i>; 5 = <i>always</i>):</p> <p>2) Developing new customer segments (e.g., promoting environmentally friendly and socially oriented products)</p> <p>3) Developing new business segments related to sustainability</p> <p>4) Promoting employee motivation</p> <p>5) Producing with more efficient use of resources (e.g., optimising production processes)</p> <p>6) External communication of environmental and social activities (e.g., sustainability reporting)</p> <p>7) Environmental and social-oriented cost management (e.g., using cost-effective recycling products)</p> <p>8) Environmental and social-oriented risk management (e.g., health care at the workplace)</p>	.737

^aCronbach's α for the alternative operationalisation of Feedback2010 as used in the robustness check (Appendix B).

TABLE A2 Robustness check

Model number	Model I	Model II	Model III
Dependent variable	Aware2012	SustAct2012	Aware2012
Independent variables			
Constant term	-.391 (.250)	.078 (.213)	-.379 (.237)
SustAct2010	.188 (.145)	.366*** (.126)	.237* (.140)
Feedback2010	.257 (.162)		
SustAct2010 * Feedback2010	.304** (.126)		
Aware2012		.426*** (.121)	
Revenue	.007 (.262)	.220 (.228)	.156 (.259)
Family	.425 (.304)	.276 (.266)	.158 (.302)
Industry	.174 (.315)	-.497* (.270)	.476 (.300)
R^2	.287	.383	.183
N	58	58	58
p (model)	.007	.000	.028

Note. The cells display the unstandardised regression coefficients. Standard errors are reported in parentheses. Indirect effect: $b_{zx}b_{yz} = 0.101$; SE $b_{zx}b_{yz} = 0.066$

* $p < 0.1$. ** $p < 0.05$. *** $p < 0.01$.