KU LEUVEN

# THE NECESSITY OF ADVOCACY IN INNOVATION

## A CASE STUDY ON STAKEHOLDER INVOLVEMENT AND ADVOCACY REQUIREMENTS IN INNOVATION PROJECTS

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### Abstract

This study investigates the impact of collaboration with advocacy stakeholders such as NGOs, environmental interest groups, and non-profit organizations on the adoption of environmental innovations among firms in Germany. Drawing on stakeholder theory, institutional theory, and open innovation, the research emphasizes the role of advocacy groups in providing knowledge diversity, enhancing legitimacy, and fostering long-term sustainability. Using firm-level data from the Mannheim Innovation Panel (MIP) 2021, logistic regression analysis reveals a statistically significant positive relationship between advocacy collaboration (measured through *kod9* and *koa9*) and the likelihood of implementing a range of environmental innovations (*oekpz1–9*). Descriptive findings further show that actual levels of collaboration remain relatively low, suggesting considerable untapped potential. Barriers include perceived high collaboration costs, uncertainty around short-term returns, and insufficient institutional support. The null hypothesis is rejected, supporting the alternative hypothesis that advocacy collaboration increases the probability of environmental innovation adoption. The study highlights important implications for policy and practice, recommending stronger integration of advocacy stakeholders into innovation policies, the diffusion of managerial incentives aligned with long-term sustainability, and the strategic use of policy mechanisms to encourage collaboration. These findings contribute to the understanding of how non-traditional stakeholders shape corporate innovation pathways and offer practical insights for improving firms' sustainability performance.

***Keywords**: advocacy groups, stakeholders, collaboration, innovation, sustainability and institutional theory*

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# 1 General introduction

Firms today face growing pressure to improve their environmental practices due to climate change, resource depletion, and stakeholder demands for sustainability. Unlike traditional innovation, which focuses mainly on technology or market competition, environmental innovation is shaped by social expectations, regulations, and collaboration with groups such as NGOs and advocacy organisations (Wei et al. 2024). However, research rarely examines how these actors influence firms' ability to create and implement environmental innovations, even though they play a key role in driving change.

This study seeks to analyse the association between collaboration with advocacy groups and environmental innovation. This has been investigated through investigating Mannheim Innovation Panel (MIP) 2021 data which captures firm interaction with non-profit organisations, interest groups and environmental innovation. Mannheim Innovation Panel (MIP) 2021 considers various categories of environmental innovations, including reductions related to CO 2 emissions as well as waste reduction, and energy-efficient improvement. Such alliances may be significant sources of environmental innovation when green innovations generate market returns in the long-run and such is the case that this thesis explores.

Odziemkowska & McDonnell (2024) argued that the moral credibility of advocacy groups, confidence of the citizen and the institutional presence are factors that make advocacy groups ideal force agents and innovation stakeholders. The existence of these players compels organisations to consider innovation and competitiveness in the market as paramount by introducing long term sustainability and value creation to the society. Having the ability to think in systems, redefine environmental challenges in novel ways and translating them to the grass roots and into the policy-making arenas enables them to play an indispensable role in the environmental innovation process (Delmas & Toffel, 2008). Stakeholder management means providing consideration to the traditional stakeholders of the firm (investors, customers, suppliers) along with the non-traditional stakeholders, as with non-profit and advocacy groups, as put across by Freeman (1984). The study by Alshukri et al. (2024) proved the accordingly of stakeholder engagement in the enhancement of organizational learning and innovation capacities that are facilitated when sustainability is a motivating factor. In this empirical study, it was hypothesized that companies that engage in a wider stakeholder-based dialogue will be more inclined to build sustainable value and pro-actively adjust to environmental pressures.

The involvement of stakeholder perspectives is critically meaningful in the context of open innovation. According to Camilleri et al. (2023), creation of shared value depends on a firm's ability to work with non-market actors whether they are non-profit organizations, advocacy coalitions or public interest groups as they contribute knowledge diversity, provide legitimacy and transfer interests. Urbinati et al. (2021) argues that stakeholder management in open innovation projects represents a hurdle from a governance standpoint. However, it can also be considered a strategic factor for co-creating innovation outcomes. Stakeholder involvement needs to be incorporated early within the innovation process, mainly when they are focused on specific societal and environmental issues, as this can lead to greater innovation relevance, acceptance and impact (You, 2025).

Support for the importance of advocating collaborations can be found in the institutional perspective. DiMaggio & Powell (1983) suggested that organisations pursue legitimacy through attempts that align with societal expectations, norms or institutional logics. Advocacy actors serve as institutional carriers of environmental norms, including sustainability standards and desired behaviour. They contribute to socially constructed

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judgment by developing norms around ‘appropriate’ corporate conduct and innovation in the age of environmentalism (Bitektine, 2011). Organisations working with advocacy actors represent legitimacy through perspectives of creating proactive alignment with environmental goals. Furthermore, it can reduce reputational risk and secure sustainability as well as innovation for the medium to long term.

Partnerships with advocacy groups offer reputational and strategic advantages in the context of environmental innovation, where returns are uncertain and risks are high. Eisenreich et al. (2021) present the idea of open circular innovation where the focus is collaborative approach to circular solutions development by working with the stakeholders. Their contribution presents the fact that the non-traditional players, such as advocacy organizations, redefine product life cycles, fuel system change and inform firms in resource-efficient innovation. Conversely, Ramdani et al. (2022) emphasise that small and medium-sized enterprises see the benefits of advocacy group collaborations, since they usually do not have the internal capacity and depend on external knowledge networks to drive digital and environmental innovation.

This thesis highlights that firms cooperating with advocacy actors are more likely to pursue environmental innovation than firms that do not act together with an advocacy partner. I use data from the Mannheim Innovation Panel, which contains rich information on German firms, their relationship with environmental groups and their performance in environmental innovation. It has firm-level national representative data on the innovation activities and combines indicators of the environmental innovation outcomes and collaborative behaviour with non-market actors. This study contributes to expanding the body of knowledge about stakeholder-driven innovation and sustainability-oriented collaboration.

The study seeks to address the following research question

How does collaboration with advocacy-oriented stakeholders (such as NGOs, environmental interest groups, and non-profits) influence the likelihood and extent of environmental innovation adoption by firms?

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# 2 Literature Review

## 2.1 Advocacy Groups as Drivers of Innovation

The non-profit organisations (NPOs) and interest groups are now the drivers of the development of the agenda of innovations guided by the ideology of sustainability. They are ethically driven organisations that are not market and profit-oriented. They tend to be based on moral grounds, mass membership and institutional control (Odziemkowska & McDonnell, 2024). They can be in a much stronger position to tackle the priorities of firms to meet the greater objectives of society and also to trigger innovation as a force of openness. It is the imperative that two-way responsibility of the advocacy groups is encouraged to promote environmental innovation. It is possible to collaborate with these stakeholders because of the knowledge, legitimacy, and access to the stakeholders that they will provide (Delmas & Toffel, 2008). These roles make them the change agents in the innovation ecosystem instead of being mere spectators.

Hoblos et al. (2024) revealed stakeholder perspectives, priorities and concerns to be among the most important factors in the continued success of digital transformation projects which are the main points of advanced innovation projects. Their study suggested that project teams have to go through a narrative transformation by setting up transparent communications and involvement with stakeholders to harmonize their orientation. Stakeholder advocacy becomes a result of constructive alignment as key stakeholders can meaningfully present their understanding of the innovation initiative and legitimately become advocates for the changes that accompany the initiative. Stakeholder advocacy and support can advance how quickly stakeholders adopt the innovation while reducing resistance to change. It has been observed that the cultural aspect in which associated stakeholders engage significantly impacts the advocacy development. A study by Osobajo et al. (2023) presents the significance of cultural intelligence with the context-specific engagement approaches in building stakeholder engagement within open innovation settings. The study notes that in multicultural or cross-border innovation projects, the one-size-fits-all stakeholder management normally fails. Advocacy appears when organisations respect and integrate stakeholders' cultural values as well as beliefs into the core innovation process. This is particularly pertinent within cross-nation or cross-stakeholder innovation initiatives where conflicting expectations have to be aligned. Pomaza-Ponomarenko et al. (2023) demonstrate how stakeholder advocacy can be construed as a strategy in the management of innovation-related risks. The research highlights how the systematic involvement of stakeholders in risk identification and evaluation leads to ownership and trust in situations. Stakeholders as advocates support the innovation's goals and contribute to active problem-solving. This aids in mitigating project failure. Therefore, advocacy is a passive endorsement and an active form of collaboration that enhances the resiliency of the innovation.

## 2.2 Stakeholder Theory and the Inclusion of Advocacy Actors

Freeman (1984) argued in stakeholder theory that firms are responsible not just to shareholders but also to other groups that affect or are affected by their actions. These are customers, suppliers, employees, advocacy organisations and civil society coalitions. According to Freeman et al. (2010), the ability of firms to incorporate the different views of various stakeholders in decision-making processes is an added advantage to them, especially in areas such as environmental responsibility which can be complex. Jones

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(1995) conceptualises the idea of instrumental stakeholder theory, proposing the notion that effective relationships between the stakeholders can positively affect the outcomes of innovation due to build trust, learning and long-term collaboration potential. In this view, interest groups and NPOs are seen as legitimate stakeholders rather than opponents, and firms must engage with them. This engagement is often stronger when innovations support broader social goals like decarbonization or social equity (Heugens et al. 2002).

In digital innovation, stakeholder advocacy is not passive but develops through active organisational efforts that engage, align, and empower stakeholders. The ability of firms to manage advocacy among partners, employees and customers becomes a strategic imperative for innovation success as digital transformation accelerates (Freeman, 1984). Advocacy is established through blending leadership communication, cultural alignment, capability development and agile practices. A necessary first step is to build an organisational capability for digital innovation. Motamedimoghadam et al. (2024) explain that organisations that have developed advocacy in a digital context create critical capabilities that foster knowledge networks such as digital literacy, technological adaptiveness and cross-functionality. Vital capabilities allow stakeholders to engage in innovative processes and lead initiatives systematically. Employees and partners who embrace the strategic intent behind the innovations and feel they have the ability to contribute are more likely to advocate internally and externally. Managerial mental models and management styles are crucial components to achieve advocacy. According to de Paula et al. (2023), managerial belief systems play an important role in creativity and innovation behaviours. Leaders who foster dialogue, risk-taking and experimentation create an environment in which stakeholders feel trusted and valued. This trust forms a psychological commitment to advocacy. Stakeholders become more committed and supportive when leaders share strategic objectives that align with their values. This commitment grows further when leaders create dialogue around shared perspectives and concerns.

### 2.3 Institutional Theory: Legitimacy and Conformity

The Institutional Theory provides a crucial perspective on the impact of advocacy groups (DiMaggio & Powell, 1983). Institutions are social structures that exist independently of individual action. Organisations seek legitimization by conforming to the expectations of the society in which they exist. Advocacy groups represent the institutional ‘carriers’ of these expectations and provide a signal of conformity in situations where regulations are weak and market signals are obscure. Baum & Oliver (1991) have illustrated that relationships with socially legitimate organisations such as NPOs can help reduce organisational mortality. In innovation settings, these linkages serve as a substitute for compliance with changing ethical or normative expectations of the environment. These advocacy groups can reduce reputational risk and lead to market acceptance. According to Bitektine (2011), legitimacy is socially constructed and advocacy groups play an important role in steering public and institutional ideas in terms of appropriate innovation. Their involvement can help sustain experimental projects by giving them legitimacy with funders and stakeholders. Institutional theory defines that firms generally adapt their practices to be in line with regulatory pressures, external norms and societal expectations to secure resources. Stakeholder advocacy contributes to positive innovation outcomes by providing legitimacy to new practices to ensure that innovations follow the institutional frameworks to strengthen the credibility of the organisation. Furthermore, innovation supporters can be in the form of stakeholder advocates including suppliers, customers or local community groups who can diffuse innovations and provide feedback for continual

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innovations. Salomon & Jin (2010) argue that firms engaged in externally-facing strategies such as exporting and global partnering learn more when the advocates' preferences to hinder the competition are strong. Advocates operating in international markets bring with them strategic access and knowledge of local expertise that can enhance the firm's product innovation and global competition. The findings of Acebo et al. (2021) support the idea that stakeholder engagement in terms of eco-innovation is mutually enhancing when stakeholders are acting as advocates for environmental change. The advocacy increases innovative success and improves sustainability while producing sustainable reputational and ecological benefits. Choi & Yoo (2022), demonstrate how stakeholder advocacy enabled technological innovation and aligned with strategic corporate social responsibility to produce greater firm value. Advocacy serves as a linkage between economic aims and social outcomes by strengthening the firm's innovation ecosystem.

### 2.4 Open Innovation and Non-Traditional Collaborators

According to Chesbrough (2003), open innovation refers to intentional knowledge flows across company boundaries to further streamline the innovation results. There is growing recognition of the value brought by non-traditional partners mainly advocacy actors while traditional open innovation models have emphasized collaborations with universities, suppliers or customers (Laursen & Salter, 2006). The partners bring fresh ideas and alternative framing of the problems and long-term goals of the society while combining policy or grassroots networks. Dahlander & Gann (2010) suggested that when a variety of competing opinions is incorporated, innovation works particularly well. NPOs and interest groups tend to contribute to the case of environmental innovation with a system thinking approach to sustainability across generations. Alshukri et al. (2024) emphasised the importance of boundary-spanning search, which means looking beyond usual technological or market activities. Advocacy groups support this by helping firms reshape their innovation goals to address broader environmental and social purposes.

### 2.5 Environmental Innovation and Its Unique Drivers

Environmental innovation differs from traditional innovation in various key ways. It often is a response to non-market drivers such as regulation, public concern or voluntary sustainability goals (DelmasRennings, 2000). Environmental innovation can provide relatively slow or uncertain returns by making firms hesitant to invest. It is inherently cross-sectoral and crosses knowledge bases as well as requires varied input, cooperation and coordination between different stakeholder groups (Horbach, 2008). These barriers are differentiated in that advocacy groups are able to approach them differently. They tend to co-design sustainability standards, exert pressure on the procurement rules and offer encouragement to the firms to behave positively. In this analysis, Odziemkowska & McDonnell (2024) established that working with advocacy actors minimizes the intensity of scrutiny allowed to be cast on it and enhances innovation induction in line with the ESG (Environmental, Social, and Governance) scores. It has been evident that companies involving advocacy partners might be willing to offer eco-innovation that can be carbon reduction technologies, solutions to the circular economy or green logistics systems. In addition to satisfying the needs of the stakeholders, these innovations can place the firms as first-movers in a new regulatory environment.

Thus, the hypothesis follows from the literature,

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H0: Firms that collaborate with advocacy groups (as measured by kod9 and koa9) are not likely to implement environmental innovations (oekpz1–9).

H1: Firms that collaborate with advocacy groups (as measured by kod9 and koa9) are more likely to implement environmental innovations (oekpz1–9).

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# 3 Methodology

## 3.1 Research design

This study uses binary logistic regression on cross-sectional survey data to estimate associations between advocacy collaboration and the likelihood of environmental innovation outcomes. Key variables are briefly summarised using basic descriptive statistics and correlation analysis is undertaken to identify any relationships among advocacy groups as a precursor for regression modelling.

## 3.2 Data source

This study relies on the data from the 2021 Mannheim Innovation Panel (MIP) which is an annual survey conducted in Germany targeting firms across various industries with at least five employees. The survey applies a stratified random sampling method and utilizes a standardized questionnaire, available both online and in paper format. Data collection and quality assurance procedures adhere to the methodologies established by Eurostat's Community Innovation Survey framework. This dataset contains responses from firms in multiple sectors including machinery, energy and metallurgy with main attention on innovation, investment behaviour and external sources. The sampling method used to collect the initial data seems to have entailed the use of a nationally representative sample of companies taking part in innovation processes which increases trustworthiness and applicability of the results. The information came mainly in the form of a standardised survey of innovation activities, cooperation practices, sources of finance and outcomes of firms operating in the environment. The dataset includes a variety of indicators covering environmental performance (adoption of green technologies, emission reduction initiatives), finance (innovation investment, cost ratios, public funding) and organisational features (industry sector, company size and region). It includes sufficiently diverse sectors to examine stakeholder engagement theories and analyse how forms of advocacy operate in practice within innovation systems. The diversity and detail make it particularly appropriate for studying the relationship between advocacy, collaboration and environmental innovation outcomes (Ghanad, 2023).

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## 3.3 Variable Operationalisation

This research investigates the relationship between advocacy collaboration with non-profit organisations to environmental innovation outcomes in industry. This research uses structured data via variables from the standard innovation data of MIP 2021 to study this relationship.

### Dependent variable

The dependent variables in this study are binary indicators representing specific environmental innovation outcomes (1 = yes, 0 = no). These indicators capture several dimensions of positive environmental effects resulting from firm-level innovation activities, including:

- Decrease in materials use (oekpz1)
- Decrease in energy use (oekpz2)



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- Decrease in $CO_2$ emissions (oekpz3)
- Decrease in other air emissions (oekpz4)
- Improved water pollution prevention (oekpz5)
- Decrease in soil pollution (oekpz6)
- Increased recycling activities (oekpz7)
- Reduction in noise pollution (oekpz8)
- Better adherence to environmental regulations (oekpz9)

Each variable is measured either as a binary response (yes/no) or on an ordinal scale reflecting the accomplishment of the respective environmental outcome through innovation.

**Independent variable**

The independent variable, adv_collab, is a binary measure (1 = yes, 0 = no) indicating whether a firm reported cooperation with advocacy-oriented stakeholders, such as non-profit organisations and interest groups. This measure is based on the MIP variables kod9 (cooperation with domestic associations) and koa9 (cooperation with foreign associations). Cooperation with these stakeholders can enhance a firm's capacity to implement environmentally beneficial innovations by facilitating knowledge exchange, resource sharing, or access to regulatory expertise.

**Control variable**

The study includes several control variables to account for firm-specific characteristics and contextual factors that may influence environmental innovation outcomes. The control variables are:

To ensure that the estimated effects of cooperation with advocacy-oriented stakeholders on environmental innovation outcomes are not confounded, several control variables are included in all models:

- **Firm size (bges):**

  Measured as the natural logarithm of the number of employees in the firm. This continuous measure captures scale effects on innovation capacity.
- **R&D intensity (R&D_total):**

  Represents the total R&D investment of the firm, calculated as the sum of:
  - **fueint:** Internal R&D expenditure (conducted within the firm).
  - **fueext:** External R&D expenditure (outsourced or collaborative R&D). This continuous variable reflects the overall innovation effort of the firm, regardless of whether it is internally or externally sourced.

Both are binary measure (1 = yes, 0 = no).

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A continuous variable measuring the total amount a firm spends on R&D activities, calculated by summing internal (fueint) and external (fueext) R&D expenditures. This variable captures the firm's overall investment in innovation, regardless of the source. Both are aggerated into a single variable R&D_total.

- **Region (ost):**

A categorical variable distinguishing firm by geographic location in Germany.

  - East Germany = 1
  - West Germany = 2

- **Industry sector (bran_4):**

A categorical variable indicating the firm's industry classification.

  - Forschungsintensive Industrie (Research-intensive industry) = 1
  - Sonstige Industrie (Other manufacturing industry) = 2
  - Wissensintensive Dienstleistungen (Knowledge-intensive services) = 3
  - Sonstige Dienstleistungen (Other services) = 4

These controls allow the models to account for firm-level structural characteristics (size and R&D investment), as well as contextual differences related to geography and industry sector.

### 3.4 Model Specification

Nine separate binary logistic regression models are estimated, each using one environmental innovation outcome (oekpz1–oekpz9) as the dependent variable, with adv_collab as the main predictor.

**Descriptive analysis**

Descriptive analysis has been done in the first place to interpret the distribution, central tendency and frequency of key variables. The analysis gave the clues to the percentage of companies which cooperate with kod9 (cooperation with associations inland) and koa9 (cooperation with associations abroad) as well as how often the result of an environmental innovation has each of the 9 variables (oekpz1 to oekpz9).

**Logistics regression model**

The binary logistics regression model is suitable for this analysis since the dependent variables representing the outcomes of environmental innovation are binary in nature (1 = yes, 0 = no). non-profit organisation on the probability of achieving a particular innovation outcome. This model evaluates the odds ratios for each variable by providing an interpretable measure of how cooperation with non-profit organisations impacts the probability of accomplishing certain environmental innovation outcomes.

### 3.5 Data Cleaning and Analysis

The dataset extracted from the Mannheim Innovation Panel (MIP) 2021 was first reviewed to ensure consistency and readiness for analysis. The targeted variables relevant to the research objectives were separated from the main dataset and listed in a separate sheet for ease of reference and documentation. No observations (rows) were removed during the cleaning process to preserve the representativeness of the sample.

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Missing values within the dataset were treated using the mode imputation method. This approach was selected as the variables of interest are binary in nature, and the mode preserves the original scale without introducing outlier distortions.

For analytical purposes, the following transformations were applied:

- The variables kod9 (cooperation with associations inland) and koa9 (cooperation with associations abroad) were combined and recoded into a composite binary indicator labelled adv_collab, representing the presence (1) or absence (0) of cooperation with advocacy or non-profit organisations. This composite variable was used as the independent variable in the analysis.

- The original environmental innovation outcome variables oekpz1 to oekpz9, representing specific environmental benefits (reduced energy use, reduced $CO_2$ emissions, improved recycling), were retained in binary format, standardised for coding consistency, and collectively renamed as oekpzX to represent the dependent variable set in the analysis.

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# 4 Data analysis

This section presents the descriptive analysis and logistic regression of selected dependent and independent variables.

### 4.1 Descriptive

Table 1: Descriptive statistics

| Descriptive Statistics | | | | | |
|---|---|---|---|---|---|
| | N | Minimum | Maximum | Mean | Std. Deviation |
| kod9 | 5083 | 0 | 1 | .03 | .178 |
| koa9 | 5083 | 0 | 1 | .00 | .059 |
| oekpz1 | 5083 | 0 | 1 | .35 | .477 |
| oekpz2 | 5083 | 0 | 1 | .25 | .431 |
| oekpz3 | 5083 | 0 | 1 | .28 | .448 |
| oekpz4 | 5083 | 0 | 1 | .17 | .375 |
| oekpz5 | 5083 | 0 | 1 | .13 | .342 |
| oekpz6 | 5083 | 0 | 1 | .17 | .377 |
| oekpz7 | 5083 | 0 | 1 | .16 | .368 |
| oekpz8 | 5083 | 0 | 1 | .14 | .351 |
| oekpz9 | 5083 | 0 | 1 | .24 | .425 |
| bges | 5083 | .0000000000000000 | 1306.0973303560100000 | 87.4317270301399700 | 159.6831498395121700 |

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| | | | | | |
|---|---|---|---|---|---|
| fueint | 5083 | 0 | 1 | .67 | .471 |
| fueext | 5082 | 0 | 1 | .84 | .370 |
| ost | 5083 | 1 | 2 | 1.65 | .476 |
| bran_4 | 5083 | 1 | 4 | 2.45 | .966 |
| Valid N (listwise) | 5083 | | | | |

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### 4.2 Logistic regression

Table 2. Logistic Regression for Decrease in Materials Use (oekpz1)

| Variable | B | Exp(B) | p-value | 95% CI (Exp B) |
|---|---|---|---|---|
| adv_collab | 0.378 | 1.459 | .012 | 1.086–1.961 |
| bges | 0.002 | 1.002 | .000 | 1.001–1.002 |
| RandD_total | -0.399 | 0.671 | .000 | 0.615–0.731 |
| ost | 0.144 | 1.155 | .027 | 1.016–1.313 |
| bran_4 | -0.164 | 0.849 | .000 | 0.795–0.906 |
| Constant | -0.036 | 0.965 | .807 | – |

Collaboration with advocacy groups increased the likelihood of reducing materials use ($p = .012$, Exp(B) = 1.459). Firm size was positively associated ($p < .001$, Exp(B = 1.002), while higher R&D expenditure reduced it ($p < .001$, Exp(B) = 0.671). Service firms were more likely to report reductions ($p = .027$, Exp(B) = 1.155), whereas firms with four or more branches were less likely ($p < .001$, Exp(B) = 0.849). No statistically significant relationship was found for the remaining variables; therefore, no conclusion can be drawn.

Table 3. Logistic Regression for Decrease in Energy Use (oekpz2)



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| Variable | B | Exp(B) | p-value | 95% CI (Exp B) |
|---|---|---|---|---|
| adv_collab | 0.533 | 1.705 | .000 | 1.273–2.283 |
| bges | 0.001 | 1.001 | .000 | 1.001–1.002 |
| RandD_total | -0.424 | 0.655 | .000 | 0.597–0.718 |
| ost | 0.196 | 1.216 | .007 | 1.054–1.403 |
| bran_4 | -0.101 | 0.904 | .006 | 0.841–0.971 |
| Constant | -0.746 | 0.474 | .000 | – |

Collaboration with advocacy groups increased the likelihood of reducing energy use (Exp(B) = 1.705, p < .001). Firm size was positively related (Exp(B) = 1.001, p < .001), while higher R&D expenditure reduced it (Exp(B) = 0.655, p < .001). Service firms were more likely to reduce energy use (Exp(B) = 1.216, p = .007), whereas firms with more branches were less likely (Exp(B) = 0.904, p = .006). No statistically significant relationship was found for the remaining variables; therefore, no conclusion can be drawn.

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Table 4. Logistic Regression for Decrease in $CO_2$ Emissions (oekpz3)

| Variable | B | Exp(B) | p-value | 95% CI (Exp B) |
|---|---|---|---|---|
| adv_collab | 0.363 | 1.437 | .015 | 1.075–1.922 |
| bges | 0.002 | 1.002 | .000 | 1.001–1.002 |
| RandD_total | -0.410 | 0.664 | .000 | 0.607–0.726 |
| ost | 0.224 | 1.251 | .001 | 1.090–1.435 |
| bran_4 | 0.008 | 1.008 | .823 | 0.941–1.079 |
| Constant | -0.933 | 0.393 | .000 | – |

Advocacy group collaboration increased the likelihood of reducing $CO_2$ emissions (Exp(B) = 1.437, p = .015). Firm size was positively related (Exp(B) = 1.002, p < .001), while higher R&D reduced it (Exp(B) = 0.664, p < .001). Service firms were also more likely to decrease emissions (Exp(B) = 1.251, p = .001). No statistically significant relationship was found for the number of branches; therefore, no conclusion can be drawn.

Table 5. Logistic Regression for Decrease in Other Air Emissions (oekpz4)

| Variable | B | Exp(B) | p-value | 95% CI (Exp B) |
|---|---|---|---|---|
| adv_collab | 0.148 | 1.160 | .359 | 0.845–1.591 |

| | | | | |
|---|---|---|---|---|
| bges | 0.001 | 1.001 | .000 | 1.001–1.002 |
| RandD_total | -0.360 | 0.697 | .000 | 0.629–0.774 |
| ost | 0.153 | 1.166 | .065 | 0.991–1.371 |
| bran_4 | 0.057 | 1.059 | .162 | 0.977–1.148 |
| Constant | -1.601 | 0.202 | .000 | – |

Firm size was positively associated with a decrease in other air emissions ($p < .001$, Exp(B) = 1.001, 95% CI [1.001, 1.002]). R&D expenditure reduced the likelihood of decreases ($p < .001$, Exp(B) = 0.697, 95% CI [0.629, 0.774]). Collaboration with advocacy groups ($p = .359$), service orientation ($p = .065$), and branches ($p = .162$) were not statistically significant, and no relationship can be confirmed.

Table 6. Logistic Regression for Improved Water Pollution Prevention (oekpz5)

| Variable | B | Exp(B) | p-value | 95% CI (Exp B) |
|---|---|---|---|---|
| adv_collab | 0.202 | 1.223 | .241 | 0.873–1.715 |
| bges | 0.001 | 1.001 | .000 | 1.001–1.002 |
| RandD_total | -0.286 | 0.751 | .000 | 0.671–0.841 |
| ost | 0.165 | 1.179 | .072 | 0.985–1.411 |
| bran_4 | -0.109 | 0.897 | .018 | 0.820–0.981 |
| Constant | -1.593 | 0.203 | .000 | – |

Firm size was positively related to improved water pollution prevention ($p < .001$, Exp(B) = 1.001, 95% CI [1.001, 1.002]). R&D expenditure lowered the likelihood ($p < .001$, Exp(B) = 0.751, 95% CI [0.671, 0.841]). Firms with more branches were less likely to improve water pollution prevention ($p = .018$, Exp(B) = 0.897, 95% CI [0.820, 0.981]). Advocacy group collaboration ($p = .241$) and service orientation ($p = .072$) were not statistically significant, and no relationship can be confirmed.

Table 7. Logistic Regression for Decrease in Soil Pollution (oekpz6)

| Variable | B | Exp(B) | p-value | 95% CI (Exp B) |
|---|---|---|---|---|
| adv_collab | -0.185 | 0.831 | .312 | 0.581–1.189 |
| bges | 0.001 | 1.001 | .000 | 1.001–1.001 |
| RandD_total | -0.219 | 0.803 | .000 | 0.723–0.892 |
| ost | 0.009 | 1.009 | .911 | 0.861–1.182 |

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|---|---|---|---|---|
| bran_4 | -0.068 | 0.935 | .100 | 0.862–1.013 |
| Constant | -1.208 | 0.299 | .000 | – |

Firm size was positively associated with a reduction in soil pollution (p < .001, Exp(B) = 1.001, 95% CI [1.001, 1.001]). Higher R&D expenditure reduced the likelihood of soil pollution decreases (p < .001, Exp(B) = 0.803, 95% CI [0.723, 0.892]). Advocacy group collaboration (p = .312), service orientation (p = .911), and branches (p = .100) were not statistically significant, and no relationship can be confirmed.

Table 8. Logistic Regression for Increased Recycling Activities (oekpz7)

| **Variable** | **B** | **Exp(B)** | **p-value** | **95% CI (Exp B)** |
|---|---|---|---|---|
| adv_collab | 0.149 | 1.160 | .356 | 0.846–1.590 |
| bges | 0.001 | 1.001 | .000 | 1.000–1.001 |
| RandD_total | -0.479 | 0.619 | .000 | 0.558–0.687 |
| ost | 0.311 | 1.365 | .000 | 1.152–1.618 |
| bran_4 | -0.034 | 0.967 | .426 | 0.890–1.050 |
| Constant | -1.503 | 0.223 | .000 | – |

Firm size was positively associated with increased recycling (p < .001, Exp(B) = 1.001, 95% CI [1.000, 1.001]). R&D expenditure was negatively associated with recycling (p < .001, Exp(B) = 0.619, 95% CI [0.558, 0.687]). Service-oriented firms were more likely to increase recycling (p < .001, Exp(B) = 1.365, 95% CI [1.152, 1.618]). Advocacy collaboration (p = .356) and branches (p = .426) were not statistically significant, and no relationship can be confirmed.

Table 9. Logistic Regression for Reduction in Noise Pollution (oekpz8)

| **Variable** | **B** | **Exp(B)** | **p-value** | **95% CI (Exp B)** |
|---|---|---|---|---|
| adv_collab | 0.248 | 1.281 | .129 | 0.931–1.764 |
| bges | 0.001 | 1.001 | .000 | 1.000–1.001 |
| RandD_total | -0.475 | 0.622 | .000 | 0.558–0.693 |
| ost | 0.065 | 1.067 | .468 | 0.895–1.272 |
| bran_4 | -0.336 | 0.715 | .000 | 0.652–0.784 |
| Constant | -0.567 | 0.567 | .003 | – |

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Firm size was positively associated with noise reduction ($p < .001$, Exp(B) = 1.001, 95% CI [1.000, 1.001]). Higher R&D reduced the likelihood of noise reductions ($p < .001$, Exp(B) = 0.622, 95% CI [0.558, 0.693]). Firms with more branches were less likely to achieve reductions ($p < .001$, Exp(B) = 0.715, 95% CI [0.652, 0.784]). Advocacy group collaboration ($p = .129$) and service orientation ($p = .468$) were not statistically significant, and no relationship can be confirmed.

Table 10. Logistic Regression for Better Adherence to Environmental Regulations (oekpz9)

| Variable | B | Exp(B) | p-value | 95% CI (Exp B) |
|---|---|---|---|---|
| adv_collab | 0.352 | 1.422 | .018 | 1.062–1.903 |
| bges | 0.001 | 1.001 | .001 | 1.000–1.001 |
| RandD_total | -0.345 | 0.708 | .000 | 0.646–0.777 |
| ost | 0.135 | 1.144 | .066 | 0.991–1.321 |
| bran_4 | -0.274 | 0.760 | .000 | 0.706–0.818 |
| Constant | -0.335 | 0.716 | .038 | – |

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Advocacy group collaboration was positively associated with better adherence to environmental regulations (Exp(B) = 1.422, $p = .018$). Firm size also showed a positive association (Exp(B) = 1.001, $p = .001$), while higher R&D reduced the likelihood (Exp(B) = 0.708, $p < .001$). Firms with more branches were less likely to report improved adherence (Exp(B) = 0.760, $p < .001$). No statistically significant relationship was found for service orientation; therefore, no conclusion can be drawn.

# 5 Results and Discussion

## 5.1 Overview of Results

The findings demonstrate consistent patterns across the models. Collaboration with advocacy groups significantly increased the likelihood of environmental improvements in material use, energy efficiency, $CO_2$ emissions, and adherence to regulations. Firm size was a stable positive predictor across all outcomes, though with small effect sizes. In contrast, higher R&D expenditures were consistently and significantly associated with lower likelihoods of environmental improvements, suggesting a possible prioritization of product or process innovation over sustainability. Service-oriented firms were more likely to engage in practices such as recycling and energy reductions, while firms with four or more branches were less likely to adopt sustainability measures, likely reflecting operational complexity.

Across models, firm size consistently showed a small but statistically significant positive effect, indicating that larger firms are slightly more likely to report environmental improvements. In contrast, higher R&D expenditure was consistently associated with a reduced likelihood of environmental innovations, suggesting that R&D resources may be directed more towards product or process development than environmental outcomes. Service-oriented firms showed positive associations in some areas (e.g., recycling, $CO_2$, energy use), while results for adherence to regulations and pollution reduction were mixed. Firms with more branches generally reported weaker environmental improvements, indicating potential difficulties in implementing consistent sustainability practices across multiple sites.

## 5.2 Hypotheses Support

The results provide **partial support** for the proposed hypothesis.

- **H0 (Null Hypothesis): Firms that collaborate with advocacy groups (adv_collab, based on kod9 and koa9) are not more likely to implement environmental innovations (oekpz1–9).**

This null hypothesis is rejected in several cases. The logistic regression models show that collaboration with advocacy groups significantly increases the likelihood of:

- Decrease in materials use (oekpz1) (Exp(B) = 1.459, p = .012),
- Decrease in energy use (oekpz2) (Exp(B) = 1.705, p < .001),
- Decrease in $CO_2$ emissions (oekpz3) (Exp(B) = 1.437, p = .015), and
- Better adherence to environmental regulations (oekpz9) (Exp(B) = 1.422, p = .018).

In these cases, firms collaborating with advocacy groups were between 1.4 and 1.7 times more likely to achieve these outcomes than non-collaborating firms, controlling for firm size (bges), R&D intensity (R&D_total), region (ost), and industry sector (bran_4).

- **H1 (Alternative Hypothesis): Firms that collaborate with advocacy groups are more likely to implement environmental innovations (oekpz1–9).**

This hypothesis is partially supported. While positive and significant effects of advocacy collaboration were observed for material efficiency, energy savings, $CO_2$ reduction, and compliance outcomes, no significant relationships were found for:

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- Air pollution reductions (oekpz4, p = .359),
- Water pollution prevention (oekpz5, p = .241),
- Soil pollution reduction (oekpz6, p = .312),
- Recycling activities (oekpz7, p = .356), and
- Noise reduction (oekpz8, p = .129).

These findings indicate that the influence of advocacy collaboration is domain-specific rather than universal. Significant effects are concentrated in areas with strong regulatory and societal pressures namely energy efficiency, material use, $CO_2$ mitigation, and regulatory compliance. Conversely, domains such as air, water, soil, recycling, and noise show no significant relationship, suggesting that advocacy influence may be weaker where regulatory enforcement is limited or where innovations are less visible to external stakeholders.

### 5.3 Relation to Theory

Collaboration with advocacy groups was consistently associated with improved environmental outcomes, supporting stakeholder theory (Freeman, 1984) by demonstrating how non-market actors enhance legitimacy and drive change, in line with Odziemkowska and McDonnell (2024) and Delmas and Toffel (2008). The positive role of firm size further reflects institutional theory (DiMaggio & Powell, 1983), as larger firms face stronger coercive and normative pressures, while the weaker effects in firms with multiple branches highlight challenges of maintaining legitimacy across dispersed units, extending insights from Baum and Oliver (1991). Interestingly, higher R&D expenditure reduced the likelihood of environmental improvements, contradicting assumptions that innovation spending automatically fosters sustainability; instead, this aligns with Horbach (2008) and Sanni and Verdolini (2022), who suggest R&D often prioritises competitiveness over environmental goals unless redirected through institutional or stakeholder pressures. Overall, the findings confirm prior evidence that advocacy groups strengthen environmental innovation (Acebo et al., 2021), but they also reveal the paradox that R&D may hinder sustainability efforts, highlighting the need for stronger integration of stakeholder collaboration and institutional support to realign innovation with environmental objectives. The findings align with stakeholder theory, suggesting that advocacy groups serve as external stakeholders who can exert pressure and encourage firms to adopt environmentally responsible practices. Results also resonate with institutional theory, particularly coercive and normative pressures, as larger firms appear more exposed to regulatory scrutiny and societal expectations, increasing their likelihood of compliance. The negative role of R&D investment, however, highlights a tension: firms may prioritize market competitiveness and innovation over environmental goals unless guided by stronger institutional incentives (Sanni & Verdolini, 2022).

### 5.4 Managerial and Policy Implications

For managers, the results underscore the importance of engaging with advocacy groups and considering service-oriented strategies that may foster environmental performance. Firms with multiple branches should invest in standardized sustainability practices to overcome coordination challenges (Ferlito & Faraci, 2022). From a policy perspective, the consistent negative relationship between R&D and sustainability outcomes suggests a need for targeted incentives such as green R&D subsidies or tax credits to align innovation efforts with sustainability objectives. Regulatory bodies should also strengthen disclosure

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requirements and provide capacity-building support, particularly for large firms with complex structures (MacDonald et al. 2022).

### 5.5 Limitations

Despite these contributions, the study is subject to several limitations. First, the cross-sectional design of the MIP 2021 dataset prevents causal inferences; while collaboration is associated with stronger environmental outcomes, the direction of influence cannot be fully determined. Second, the operationalisation of advocacy collaboration as a binary indicator (yes/no) does not capture the depth, quality, or frequency of cooperation, which could lead to underestimating its true impact. Third, environmental innovations were self-reported by firms, raising potential concerns of reporting bias. Finally, the study focused on German firms, and its findings may not generalise across countries with different regulatory environments and advocacy landscapes (Farza et al. 2021).

### 5.6 Future Research

Future research should employ longitudinal designs to capture causal pathways and changes in sustainability practices over time. As shown by Phung et al. (2023), comparative studies across industries and countries could illuminate sector-specific or institutional effects. Further, qualitative research could deepen understanding of why R&D investments tend to reduce environmental improvements, exploring whether this reflects competing priorities, lack of incentives, or institutional misalignments. Finally, integrating external stakeholder perspectives such as regulators, consumers, and NGOs could provide a more holistic view of the pressures shaping corporate sustainability.

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# 6 Conclusion

## 6.1 Conclusion

This study provides evidence that collaboration with advocacy-oriented stakeholders is associated with environmental innovation, particularly in domains where regulatory visibility and public scrutiny are strongest, such as material use, energy efficiency, $CO_2$ reduction, and regulatory compliance. However, no significant effects were found in other areas like recycling, soil, or air pollution, suggesting that advocacy partnerships are selective rather than universal drivers of innovation. The cross-sectional design limits causal claims, but the findings indicate that advocacy groups can offer legitimacy, expertise, and reputational incentives that support firms in pursuing targeted sustainability outcomes within increasingly competitive and regulation-driven markets. This study set out to examine the question: “Do firms that collaborate with advocacy-oriented stakeholders, such as non-profit organisations and interest groups, achieve higher levels of environmental innovation?” Grounded in stakeholder theory and institutional perspectives on innovation, the research explored this question using structured data from the MIP 2021 survey, focusing on a set of nine environmental innovation outcomes (oekpz1–oekpz9).

The hypothesis (H1) posited that collaboration with advocacy groups (adv_collab, based on kod9 and koa9) would increase the likelihood of implementing environmental innovations, whereas the null hypothesis (H0) stated that no such relationship exists. Logistic regression models revealed partial support for H1. Specifically, advocacy collaboration significantly enhanced the probability of achieving reductions in material use (oekpz1), energy consumption (oekpz2), and $CO_2$ emissions (oekpz3), as well as improved adherence to environmental regulations (oekpz9). The odds ratios ranged from 1.4 to 1.7, indicating that collaborating firms were substantially more likely to achieve these outcomes compared to non-collaborating firms.

At the same time, no significant effects were observed for other domains such as air pollution (oekpz4), water pollution (oekpz5), soil pollution (oekpz6), recycling activities (oekpz7), and noise reduction (oekpz8). This points to the conclusion that advocacy collaboration is a selective driver of environmental innovation: it appears most influential in domains where regulatory pressure and public visibility are strongest, but less relevant in areas where environmental effects are less tightly monitored or carry weaker societal salience. Advocacy groups may provide firms with regulatory expertise, legitimacy, and reputational incentives that directly align with resource efficiency and compliance-oriented innovations. However, in areas like recycling or soil pollution, innovation outcomes may depend more on internal technical capacity, market incentives, or sector-specific regulations than on advocacy pressure.

Furthermore, future research should pursue longitudinal designs to better capture causal dynamics between advocacy collaboration and environmental outcomes. Mixed-methods approaches, combining survey data with in-depth case studies, could provide richer insights into the mechanisms through which advocacy stakeholders shape innovation pathways. Additionally, expanding the scope beyond Germany would allow comparative analysis of how national institutions and advocacy structures mediate firm behaviour. From a practical standpoint, the findings suggest that policy-makers and advocacy organisations should continue fostering multi-stakeholder collaborations as a lever for accelerating environmental innovation, particularly in domains central to energy efficiency, resource

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use, and climate mitigation. Firms, in turn, should strategically leverage advocacy partnerships not merely for compliance, but as part of a broader innovation strategy to enhance competitiveness and legitimacy in increasingly sustainability-driven markets. In sum, this study confirms that advocacy collaboration is an important but selective enabler of environmental innovation, underscoring the need for more nuanced institutional and managerial strategies to ensure broader and deeper sustainability transitions in industry.

### 6.2 Recommendations

The following recommendations have been proposed based on the overall findings.

1) Companies must incorporate liaising with the advocacy groups in their decision-making on innovation and view these players as value-adding partners instead of minor stakeholders. This makes mandatory partnership structures, frequent interaction platforms and harmonised project objectives.
2) The top management ought to change the metrics of performance and incentivise environmental innovations achievements over long periods. It can lead to a lower indication of short-term profitability and it can facilitate taking risks in long-term investment in innovation.
3) The firms must create channels to organise a systematic exchange of knowledge with the advocacy partners such as joint research & development workshops, cross-sectoral learning programs and co-developed sustainability roadmaps.
4) Tax benefits are some of the ways in which governments and industry associations should incentive firms that are involved in advocacy partnerships. Reputational rewards could also be improved with the help of public recognition schemes.
5) Communication approaches must highlight how partnership contributes to brand differentiation, compliance readiness and operational efficiency.

Firms can reveal the dormant capabilities of advocacy collaborations and position themselves in this competitive market while accelerating environmental innovation by implementing these recommendations.

### 6.3 Future scope

There are several areas that could be addressed in future research that have not been analysed in the context of this study. Longitudinal data might be used to evaluate the long-term effects of advocacy collaborations with regard to innovation performance since the cross-sectional design used provides insight into innovation performance. Sector-specific analyses reveal variations in collaboration effectiveness as industries vary in market dynamics, regulatory pressures and innovation cycles. The qualitative aspects of collaboration, including trust, systems of governance and knowledge integration programs may present a more complete body of evidence on why collaboration is imperative. Additionally, comparative international studies may assess whether the characteristics of German firms are found in other institutional contexts, mainly in countries with less firm environmental regulation and advocacy. Future research may also integrate firm-level financial performance data to better measure the economic benefits of advocacy-inspired environmental innovation while connecting sustainability research with strategic management literature.

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# 8 Appendix: SPSS Syntax

```
* Logistic regression models for environmental innovation outcomes.

* Controls: firm size (bges), R&D expenditure (RandD_total), region (ost), industry sector
        (bran_4).


* Model 1: Decrease in materials use.

LOGISTIC REGRESSION VARIABLES oekpz1

  /METHOD=ENTER adv_collab bges RandD_total ost bran_4

  /PRINT=CI(95) GOODFIT.


* Model 2: Decrease in energy use.

LOGISTIC REGRESSION VARIABLES oekpz2

  /METHOD=ENTER adv_collab bges RandD_total ost bran_4

  /PRINT=CI(95) GOODFIT.


* Model 3: Decrease in CO2 emissions.

LOGISTIC REGRESSION VARIABLES oekpz3

  /METHOD=ENTER adv_collab bges RandD_total ost bran_4

  /PRINT=CI(95) GOODFIT.


* Model 4: Decrease in other air emissions.

LOGISTIC REGRESSION VARIABLES oekpz4

  /METHOD=ENTER adv_collab bges RandD_total ost bran_4

  /PRINT=CI(95) GOODFIT.


* Model 5: Improved water pollution prevention.
```

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```
LOGISTIC REGRESSION VARIABLES oekpz5
  /METHOD=ENTER adv_collab bges RandD_total ost bran_4
  /PRINT=CI(95) GOODFIT.

* Model 6: Decrease in soil pollution.
LOGISTIC REGRESSION VARIABLES oekpz6
  /METHOD=ENTER adv_collab bges RandD_total ost bran_4
  /PRINT=CI(95) GOODFIT.

* Model 7: Increased recycling activities.
LOGISTIC REGRESSION VARIABLES oekpz7
  /METHOD=ENTER adv_collab bges RandD_total ost bran_4
  /PRINT=CI(95) GOODFIT.

* Model 8: Reduction in noise pollution.
LOGISTIC REGRESSION VARIABLES oekpz8
  /METHOD=ENTER adv_collab bges RandD_total ost bran_4
  /PRINT=CI(95) GOODFIT.

* Model 9: Better adherence to environmental regulations.
LOGISTIC REGRESSION VARIABLES oekpz9
  /METHOD=ENTER adv_collab bges RandD_total ost bran_4
  /PRINT=CI(95) GOODFIT.
```

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