Examsining the Role of Top Management in Corporate Sustainability: Does Supply Chain Position Matter?

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Abstract: A burgeoning stream of sustainability research explores the role of companies’ top management team (TMT) characteristics in corporate sustainability efforts, while another stream investigates the effect of a company’s supply chain position on its likelihood of engaging in sustainability. This study shows the importance of integrating the two research streams by demonstrating that supply chain position moderates the relationship between TMT characteristics and sustainability and thus establishes boundary conditions for this relationship. By matching 758 corporate sustainability initiatives with control observations, our results show that the size of the top executive team and the average age of its members, two well-known predictors of corporate sustainability, are distinctly moderated by supply chain position. While business-to-business (B2B) companies are less likely to report a sustainability initiative compared to business-to-consumer (B2C) organizations, we found that B2B TMT size has a greater positive effect on sustainability initiative likelihood than B2C TMT size. Conversely, average B2C TMT age has greater predictive power in explaining sustainability initiative likelihood than average B2B TMT age. The implications of these findings in advancing corporate sustainability and organizational change are discussed.

Keywords: supply chain; sustainability; top management team

1. Introduction

Scientific advances in our understanding of the relationship between climate change and the global economy over the past decade have created new roles and responsibilities for business, as well as a market environment in which sustainable practices are no longer optional [1,2]. Whereas only 20 percent of Fortune 500 companies reported their sustainability performance in 2011, that number grew to 86 percent in 2018 [3]. The growth of corporate sustainability initiatives has also been driven by increasing pressure from stakeholders for whom companies reactively reducing the risk of reputational damage is not enough—instead, demands for proactive action on the part of businesses to establish themselves as “good citizens” are growing [4]. Based on the upper echelons theory, which states that organizational outcomes can at least partially be explained by top management teams’ (TMT) characteristics, research in both business ethics and strategy has found a significant effect of company leadership on corporate sustainability initiatives and performance [5,6].

Despite the important strategic role of TMTs in shaping their companies’ sustainability behavior, and in spite of a predominantly positive effect of corporate sustainability on firm performance [7], adoption of sustainability practices is conspicuously lagging behind or lacking altogether in large portions of the global economy, and company size and industry are not sufficient to fully account for...
these gaps [8]. Recent studies identify supply chain position as an important factor in explaining these uneven outcomes, a term that distinguishes between upstream business-to-business (B2B) companies, and downstream consumer-facing businesses (B2C) [9]. In particular, upstream B2B suppliers have been found to experience less stakeholder pressure for sustainability due to their lack of proximity to consumers and other key stakeholders, and to gain less from sustainability initiatives in terms of both reputation and performance than their consumer-facing counterparts [10,11]. The theory of chain liability has been used to explain the complex relationship regarding sustainability between supply chain partners on one hand and supply chain partners and stakeholders on the other [12]. Specifically, chain liability builds on attribution theory to show that in contrast to B2B companies, B2C firms stand to experience both greater performance gains from sustainability efforts and higher risk of reputational damage because of increased stakeholder visibility and pressure [12]. Suppliers are thus faced with a double bind, experiencing increased demand for sustainability from their B2C partners seeking to guard themselves against having to take the blame for a supplier’s misstep, and having to reconcile with the prospect of little to no performance gains [11].

Given these contrasting market forces, the lack of sustainability studies integrating TMT characteristics and supply chain position with respect to corporate sustainability efforts constitutes a critical theoretical omission which may conceal important boundary conditions regarding the magnitude of TMT influence on sustainable strategy. Researchers considering the role of TMT characteristics in environmental performance have called for expanding the scope of studies beyond focal companies’ sustainability strategy to include supply chain partners as well [13]. On the other hand, the supply chain management literature has found that companies at different stages of the supply chain are subject to different institutional pressures from government agencies, customers, and competitors, which translate into different TMT strategic responses, depending on supply chain position [14]. To the best of our knowledge, no study thus far has analyzed the influence of TMT characteristics on corporate sustainability while distinguishing between these differing supply chain positions. This paper aims to fill the gap at this intersection by expanding upper echelons theory to account for supply chain position through the concept of chain liability. The central research questions of the study are therefore the following:

**Research Question 1.** Does supply chain position play a role in the relationship between TMT characteristics and the likelihood of announcing a sustainability initiative?

**Research Question 2.** If it does play a role, is its impact uniform across TMT characteristics, or is it more influential for some characteristics than it is for others?

To test the hypothesized moderating effect of supply chain position in this relationship, we collected financial, market, and executive management data from publicly-traded companies announcing a sustainability initiative between 2003 and 2018 and constructed a set of control firms that did not announce sustainability efforts during this period. The final sample contains 411 company-initiative observations across 218 unique companies, compared to 2703 control observations. We fit a conditional logit model to examine the direct effects of TMT characteristics on corporate sustainability efforts and the potential differences in the role of TMTs on sustainability initiative likelihood between B2B and B2C companies. With regards to the direct effects of TMT characteristics on sustainability efforts, our findings support previous research which has established that executive teams with a lower average age and a larger size are more likely to announce a sustainability initiative than older and smaller executive boards. A novel finding extending the sustainability literature from an upper echelons theory perspective is the significant role supply chain position plays in the relationship between TMT age and sustainability. Whereas average TMT member age does not have a strong impact on B2B likelihood of announcing a sustainability initiative, this differential is pronounced for B2C companies.

The present study contributes to the sustainability and strategy literature in several ways. First, it extends the theory of corporate sustainability by introducing the moderating impact of supply chain position on the relationship between TMT characteristics and corporate sustainability initiatives.
Companies of different size and industry affiliation are not engaging in sustainability initiatives at the same rate. Therefore, this study points to the feasibility and, indeed, necessity of including supply chain position as an important antecedent of corporate sustainability efforts. Additionally, the study establishes boundary conditions for the effect of TMT characteristics such as team size, average team age, and the proportion of women top executives on corporate sustainability efforts. In particular, while accounting for supply chain position corroborates the direct effect of team size and average team age on sustainability found by prior research, an interesting finding is that the role of women top managers on sustainability initiative likelihood loses significance when supply chain position and company size are taken into account.

The remainder of this paper is organized as follows: Section 2 reviews the relevant literature on the relationship between TMT characteristics and sustainability on one hand, and the theory of chain liability on the other, to provide an integrated theoretical framework for the study and advance testable hypotheses to elucidate the research questions. Section 3 presents the research methodology and describes the data collection process, the operationalization of the research variables, and the descriptive statistics. Section 4 summarizes the results, and Section 5 discusses the findings in the context of sustainability research and offers practical implications. The final section concludes the study by providing an overview of the work, its limitations, and possible directions for future research.

2. Literature Review and Hypotheses

The decision of whether to engage in a sustainability initiative has traditionally been examined from the perspective of two opposing schools of thought in the economic and strategy literatures: the shareholder view and the stakeholder view of corporate social responsibility [15]. The shareholder view holds that the sole responsibility of business is profit maximization to serve its shareholders’ interests, whereas the stakeholder view contends that business has not just an economic responsibility but also an ethical one, and therefore the scope of social groups it ought to answer to is far greater than the limited number of shareholders with vested financial interest in the organization [15]. Hence, if the shareholder perspective is employed in the analysis of corporate sustainability efforts, any expenditure incurred in the pursuit of sustainability specifically will be assessed as a financial burden impeding profit maximization.

If, on the other hand, the stakeholder approach is invoked, sustainability becomes a way for a business to differentiate itself from its competitors and possibly establish a first-mover advantage. The latter perspective maintains that stakeholders, including employees and community members in proximity to the focal organization, and not just shareholders, can affect key business decisions. In accordance with this view, [16] found that the corporate social performance of a sample of Fortune 500 companies depends more on stakeholder visibility (a construct comprising the number of employees, sustainability-oriented shareholder resolutions, public affairs personnel, and news mentions) than on economic performance. According to [17], there is a similarly strong effect of stakeholder pressure from customers, suppliers, and shareholders on financial executives’ ethical decisions, and this impact is enhanced if the executives believe the code of ethics will promote a positive external image. Customers in particular have been found to play a role in shaping a company’s environmental strategy: customer capital—the long-term relationship a company forges with customers, plays a consequential role as it strengthens environmental collaboration with customers and in turn positively impacts firm sustainability commitments [18].

To examine the effect of organizational characteristics on a company’s decision to announce a sustainability initiative, this study focuses on two types of stakeholder factors: the organization’s top management team and its supply chain position with respect to the end consumer (B2B or B2C). Figure 1 illustrates the conceptual model and hypotheses regarding the influence of these two groups of factors on the likelihood of announcing a sustainability initiative.
2.1. TMT Characteristics in the Context of Sustainability

A particular group of internal stakeholders found to be central to organizational sustainability decision-making are the members of the company’s top management team (TMT)—the top-ranking executives directly responsible for its strategic vision and mission [19]. The study of the impact of TMTs on organizational outcomes has culminated in a theoretical school of thought known as the upper echelons perspective, according to which various firm outcomes, such as strategic choices and performance levels, can be at least partially predicted by managerial background characteristics [5]. This approach builds on prior research focused almost exclusively on chief executive officer (CEO) attributes and argues that organizational outcomes may depend not just on the CEO but also on the broader group of top executives reporting directly to her. The need to expand corporate leadership research to include TMT characteristics has been explained by the dynamic and changing composition of company leadership and by a marked increase of functional manager positions at the C-suite level such as chief operating officer (COO), chief financial officer (CFO), and chief information officer (CIO) [20].

More recently, due to the elevation of corporate sustainability to a top strategic priority, upper echelons theory has been used to explain organizational attitudes and behaviors vis-à-vis sustainability [21]. The role of top management becomes central through the need for substantial organizational changes necessitated by the adoption of sustainable practices [22]. How the company navigates these coordination challenges between its functional areas depends directly on the top management team’s actions and decision-making [22]. Upper echelons theory provides a framework to study the antecedents of top management’s attitudes and behaviors regarding corporate sustainability. Specifically, the appointment of chief sustainability officers to TMTs [19,20], TMT members’ gender [23,24], TMT members’ tenure [23], TMT members’ educational background [25], CEO open executive orientation [25], and transformational and authentic leadership styles [26,27] have been identified as important organizational antecedents to corporate sustainability efforts and corporate social responsibility (CSR) performance.

Implementation of sustainable practices creates an intricate organizational landscape marked by heightened uncertainty and turbulence [28]. In turbulent environments, TMT size, or the number of top executives in an organization, has been associated with better corporate performance, due to the increased need for complex information processing to deal with the added unpredictability [29]. In particular, team size parsimoniously represents a team’s structural and compositional context, and embodies the functional and cognitive resources available to the team, such that larger teams tend to be more diverse with respect to their cognitive capabilities and organizational functions [30]. TMT resource diversity has further been found to have a positive influence on companies’ triple bottom line performance, after controlling for firm size, age, location, and return on assets (ROA) [31]. Therefore, we expect that:

**Hypothesis 1a (H1a).** TMT size has a positive effect on the likelihood of sustainability initiative announcement.
Another TMT characteristic deemed crucial when evaluating organizational outcomes is the average age of top executive team members. The importance of this TMT dimension stems from its potential to represent focal executives’ past professional experience, cognitive ability, risk aversion, and motivation, all of which have been found to influence organizational choices [32]. When it comes to business strategy specifically, firms with higher average TMT age have been associated with more conservative enterprise strategies, reducing companies’ strategic shift, and setting more stable strategic goals [33,34]. The reluctance to diverge from the status quo and implement radical change has been explained with older managers’ higher degree of risk-aversion compared to younger executives who are seen as more likely to make innovative business decisions even when they are considered risky [35]. We therefore anticipate executive teams with a lower average age to exhibit a higher likelihood of announcing a sustainability initiative, since sustainability efforts are often regarded as a capital-intensive and risky business decisions [36].

Hypothesis 1b (H1b). Average TMT age has a negative effect on the likelihood of sustainability initiative announcement.

Gender is a TMT characteristic which has traditionally not received much research attention, but which has recently been studied extensively in the context of corporate citizenship and social responsibility. Historically overlooked by classical leadership theory due to the negligible presence of women in corporate leadership roles, the proportion of women on executive teams has recently been established as an important predictor of financial performance, innovation, and sustainability practices as more women have been assuming TMT positions [37]. The difference between women’s and men’s approaches to leadership is often explained by the former’s tendency to be more interpersonal, inclusive, and community-oriented, as opposed to the latter, which experiments and field studies have found to be task-oriented, competitive, and transactional in comparison [37]. Since corporate environmental efforts are perceived as community-oriented rather than shareholder-focused, it is not surprising that there is a nascent stream of sustainability research consistently finding a positive relationship between the presence of women leaders in an organization and voluntary disclosure likelihood [38], proactive environmental business strategy [13], and philanthropic and corporate social responsibility engagement [39]. We are thus expecting a positive effect of the presence of women in executive roles on the likelihood of announcing a sustainability initiative.

Hypothesis 1c (H1c). The proportion of women on the TMT has a positive effect on the likelihood of sustainability initiative announcement.

2.2. Supply Chain Position as a Moderator of the TMT—Sustainability Relationship

Despite the wealth of research on the direct effect of TMT characteristics on corporate sustainability, less is known about the interaction between the focal firm’s TMT factors and the firm’s relationship with supply chain partners in the context of sustainability. Only one study to date has specifically focused on the relationship between sustainability and TMT attributes while including outward-pointing organizational factors such as TMT supply chain management experience [13]. In light of the theory of supply chains as complex systems, i.e., intricate networks of interdependencies among different entities [40], the relationship of TMT attributes to sustainability may be driven in part by the firm’s role in this broader context. Despite the use of individual TMT members’ supply chain management experience in Kumar and Paraskevas’s (2018) study, this factor reflects only the internal organizational landscape, leaving external, supra-company network embeddedness unaccounted for. We argue that exploring supply chain position with respect to the end consumer can help establish important boundary conditions currently confounded by the analysis of companies without differentiation between B2B and B2C supply chain position. We therefore propose an empirically testable theoretical approach to remedy this omission.
The need to include this supply chain classification in the analysis of the effect of TMT characteristics on sustainability is prompted by recent findings about the differences between multinational consumer-facing or consumer goods companies and their first and second tier suppliers in the context of managing sustainability [11,41]. In particular, this stream of studies shows that as one moves up the supply chain toward the raw material supplier, i.e., away from the end-customer, the less active the corporate approach to sustainability becomes. While most consumer-facing companies tend to implement relatively proactive sustainability strategies (exhibiting a long-term sustainability orientation and committing a high level of resources to sustainability), their suppliers’ approach to sustainability is more reactive (short-term rather than long-term orientation and a lower level of resources), while that of lower-tier suppliers cannot even be classified as reactive because they often lack a sustainability strategy altogether [41]. Specifically, tier-two suppliers have been found to pose significant risks to the entire supply chain due to their passive outlook on sustainability [41]. Villena and Gioia [41] introduce the concept of passivity to complement the existing framework of proactive and reactive approaches to sustainability, defining passive approaches to sustainability as situations in which a supplier could or would not respond to or initiate an action to address sustainability problems. Among the possible reasons for sustainability passivity observed in lower-tier suppliers are lack of perceived accountability for the consequences of not addressing issues of environmental and social concern, insufficient sustainability know-how or resources to dedicate to sustainability causes, and geographic location in regions with less stringent environmental regulations and labor laws [41].

One theoretical framework used to explain the impact of multitier supply chain sustainability on consumer attitudes and behaviors and, consequently, on firm performance is attribution theory [12]. In particular, [12] introduce the concept of chain liability to explain how consumers reward or punish supply chain actions in the context of sustainability. Chain liability is driven by the responsibility consumers attribute to the consumer-facing firm for a positive or negative sustainability event, which can result in both emotional (e.g., anger) and behavioral reactions (e.g., boycotting) on the part of the consumer [12]. This line of research demonstrates the dissonance between the intricate web of interdependencies supply chains operate in and the ability of consumers to take into account this complex environment when judging supply chain (SC) sustainability.

Specifically, [12] show that due to the visibility and proximity of consumer-facing companies to the consumer market, consumers hold downstream supply chain partners accountable even when responsibility for an (in)action lies more directly with upstream supply chain actors. This mechanism puts in perspective [41]’s findings: since consumer-facing companies tend to lose more in terms of consumer trust and future sales and repurchasing, they are expected to exhibit a more proactive behavior toward sustainability; in return for their display of pro-sustainable behavior, consumer-facing firms garnish consumer approval and leniency in the case of a sustainability-related incident. These conditions create a cycle of sustainability participation: B2C companies experience the bulk of consumer reaction to SC sustainability efforts and are therefore more likely to engage in and profit from such efforts, while B2B SC actors remain on the fringes unless instigated to participate by their B2C partners, which tend to be held responsible in the case of a supplier’s misstep.

This cycle has at least three implications. First, it implies that the positive impact of sustainability efforts on firm performance will be stronger for consumer-facing companies, as compared to upstream SC partners for whom that influence is expected to be less pronounced. Second, if the previous corollary holds, it would follow that B2C partners are more likely to participate in sustainability initiatives because they have an incentive or direct obligation to do so with respect to consumer market repercussions, whereas due to the increased distance from responsibility attribution, B2B firms would be less likely to engage in sustainability initiatives, ceteris paribus. This proposition is borne out in general management literature which finds that the external environment faced by B2B companies differs starkly from B2C organizations. Specifically, a B2B firm has a client base consisting of a small number of companies, compared to the mass market faced by B2C companies [42]. In unison with the principle of chain liability, a B2B firm often faces greater uncertainty when adopting a sustainability
practice because of the need for substantial capital-intensive production process changes, the equivalent of which may not bind on B2C partners, and because of the lack of visibility to the B2C partners’ consumer markets, inhibiting any reward for sustainability along that dimension [41].

Thus, while we predict a positive overall effect of TMT size on the likelihood of announcing a sustainability initiative, we posit that this impact has a different magnitude depending on whether the organization directly faces the consumer or not. While the chain liability principle offers a conceptual model for explaining the difference in sustainability performance between B2B and B2C companies, this disparity has also been proven empirically, indicating that B2B companies are significantly less likely to engage in sustainability practices [43]. The effect of the top management team’s size which represents the functional and cognitive resources of the company’s central decision-making organizational layer [30] on corporate sustainability is therefore expected to depend on whether the focal company is B2B or B2C. Specifically, we hypothesize that the influence of top executive team size on the likelihood of announcing a sustainability initiative will be less strong if the focal organization is consumer-facing because even B2C companies with small executive teams face relatively high stakeholder pressure to engage in sustainability.

**Hypothesis 2a (H2a).** *Supply chain position moderates the effect of TMT size on the likelihood of sustainability initiative announcement, such that the positive effect will be stronger for B2B companies and less strong for B2C companies.*

Similarly, when it comes to age, chain liability would suggest that B2C teams with a higher average age, which we expect to be more risk-averse, would find it more difficult to avoid engaging in sustainability efforts and are thus more likely to announce such initiatives than B2Bs with TMT teams of similar average age. Research finds B2B firms are primarily driven by pressure from their downstream supply chain partners and other key stakeholders, or by incentives such as gaining competitive advantage, improving reputation, or strengthening employee retention [44]. As chain liability suggests, B2B organizations act sustainably primarily as a reaction to stakeholder pressure, while B2C organizations implement sustainable practices as a way to secure good standing even when not directly pressured by external actors [45]. The relative reluctance of B2B organizations to engage in sustainability [46], coupled with older top management teams less likely to engage in risky organizational behaviors such as the adoption of new sustainability practices [35], suggests a compounding effect when supply chain position is considered in conjunction with TMT characteristics. We therefore expect to see a smaller gap between younger and older executive teams in B2C organizations vis-à-vis sustainability announcement likelihood.

**Hypothesis 2b (H2b).** *Supply chain position moderates the effect of average TMT age on the likelihood of sustainability initiative announcement, such that the negative effect will be stronger for B2B companies and less strong for B2C companies.*

As with age and size, we expect the relationship between gender and sustainability initiative announcement likelihood to also be moderated by supply chain position. Particularly, the positive effect of the proportion of women on the executive team [13] is expected to be more pronounced for B2B companies where even a small proportion of women could still have a big influence on corporate strategy vis-à-vis sustainability, in contrast to B2C companies where stakeholder pressure and perceived benefit might incentivize TMTs to engage in sustainability initiatives regardless of the presence of women leaders.

**Hypothesis 2c (H2c).** *Supply chain position moderates the effect of the proportion of women on the TMT on the likelihood of sustainability initiative announcement, such that the positive effect will be stronger for B2B companies and less strong for B2C companies.*
3. Materials and Methods

3.1. Sample

The data used in the study were generated by extracting news announcements from Google News and BusinessWire containing the keywords “announces” OR “joins” OR “establishes” AND “sustainability” OR “CSR” AND “Initiative” OR “Alliance” OR “Consortium” OR “Group.” Although sometimes used interchangeably, corporate social responsibility (CSR) and sustainability are different, such that CSR focuses on companies’ contributions to society in the form of charitable donations and other efforts, while sustainability pertains to a strategic vision for improving the natural, social, and economic aspects of business processes [47]. To account for the media’s tendency to use the two terms synonymously, we include CSR in our keyword search to avoid omitting sustainability initiatives labeled as CSR; however, we only admit into the sample those initiative announcements focusing on one or more aspects of the triple bottom line of sustainability. The final sample contains 758 instances of companies announcing participation in a sustainability initiative between 2003 and 2018. Although the data span multiple years, they are best described as pooled cross-sectional. Table 1 shows the distribution of sustainability announcements over the period of study.

| Year | '03 | '04 | '05 | '06 | '07 | '08 | '09 | '10 | '11 | '12 | '13 | '14 | '15 | '16 | '17 | '18 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Companies Announcing Sustainability Initiatives | 4   | 15  | 11  | 11  | 33  | 19  | 32  | 38  | 49  | 56  | 60  | 62  | 118 | 97  | 78  | 75  |

The 758 company-initiative-year data points were further organized into company-year observations to avoid accounting for the same company more than once if it has announced more than one initiative in the same year. The resulting aggregation produced 679 unique company-year combinations. They were then matched with control firms using coarsened exact matching (CEM) to account for self-selection bias [48,49]. Our data form a self-selected sample because the companies in the dataset have chosen to participate in a sustainability initiative, which violates the random selection criterion. We addressed this issue through the use of CEM by creating a list of potential control firms consisting of all publicly traded companies between 2003 and 2018, except those announcing a sustainability initiative in our sample. The use of control firms allows us to simulate the relative conditions for a counterfactual: by matching the target sustainability companies with similar firms that have not announced a sustainability initiative, we can assess the effect of TMT characteristics on the decision to announce a sustainability initiative, while controlling for organizational aspects such as company size and industry.

In light of a proliferation of statistical matching techniques, we adopted CEM due to its superior performance as compared to older approaches [49]. In particular, CEM is a monotonic imbalance bounding matching technique and divides matching criteria into “bins,” so a control firm is only marked as a match if it falls in the same bin as a treatment firm along all specified criteria, i.e., covariates. In CEM, the performance of each covariate, measured as the reduction in distance between a treatment and a control case, is independent from the performance of other covariates, and exact matching, as opposed to approximate matching, is possible. These conditions represent two significant improvements upon equal percent bias reducing methods such as propensity score matching [49] and are critical to our study. The CEM procedure was carried out as follows: We gathered financial data from Compustat Fundamentals Annual for all publicly traded companies in each year between 2003 and 2018 except target companies announcing a sustainability initiative in any given year. For example, if Ford had participated in a sustainability initiative in any year from 2003 to 2018, its records would be removed from the potential control sample in all years. CEM was carried out using the –cem– command in Stata MP15 (Stata Statistical Software, Release 15, Stata Corp LLC, College Station, TX, USA).
Controls were matched along three criteria: (1) fiscal year, to make sure the match is between firms from the same year of observation, (2) industry, captured by the firm’s four-digit Standard Industrial Classification (SIC) code, and (3) total firm revenue divided in quartiles, following the example of [48]. Matching in this case means that to be admitted as a match, a control firm record should be from the exact same year, industry, and total revenue quartile as a company announcing a sustainability initiative. Starting with 679 company-year observations of organizations announcing an initiative and 140,217 potential control observations, this process found a total of 9043 control firm-years for 646 announcing company-years. The complete matched sample thus includes 9689 observations, which we proceeded to match with detailed TMT information from Compustat Execucomp Monthly. Availability of data on TMT characteristics significantly reduced our sample to a final size of 3114 records: 411 announcing company-year observations and 2703 control company-years.

3.2. Measures

3.2.1. Dependent Variable

The two sets of hypotheses advanced in this study predict the likelihood of announcing a sustainability initiative. We measure this variable, SUSTAIN_INIT, as a dichotomous outcome, which takes on the value of 1 if the focal company has announced a sustainability initiative, and 0 otherwise. Descriptive statistics is reported in Table 2 below.

Table 2. Descriptive statistics and pairwise correlations (initiative ann. likelihood hypotheses sample).

|       | Mean | S. D. |
|-------|------|-------|
| 1     | SUSTAIN_INIT | 0.13  | 0.34 |
| 2     | SIZE         | 3.40  | 0.63 | 0.44 |
| 3     | SALES_GR     | 0.16  | 0.76 | −0.04 | −0.08 |
| 4     | MKT_SHARE    | 0.05  | 0.12 | 0.49 | 0.51 | −0.05 |
| 5     | AVE_TENURE   | 9.34  | 8.22 | 0.01 | 0.03 | −0.03 | 0.10 |
| 6     | SUSTAIN_FR   | 0.04  | 0.20 | −0.02 | 0.00 | −0.03 | 0.02 | −0.05 |
| 7     | SC_POSITION  | 0.55  | 0.50 | 0.03 | 0.21 | −0.04 | −0.03 | −0.03 | 0.01 |
| 8     | TMT_SIZE     | 5.50  | 1.17 | 0.07 | 0.16 | −0.08 | 0.04 | −0.12 | 0.06 | 0.16 |
| 9     | AVE_AGE      | 59.63 | 5.27 | −0.01 | 0.13 | −0.07 | 0.04 | 0.20 | −0.02 | 0.13 | 0.08 |
| 10    | P_WOMEN      | 0.09  | 0.13 | 0.08 | 0.05 | −0.05 | 0.08 | −0.08 | 0.01 | 0.10 | 0.05 | −0.10 |

N = 3114; All correlations with absolute value >0.03 are significant at the p < 0.05 level.

3.2.2. Independent Variables

The top management team (TMT) predictors hypothesized to have a direct effect on the likelihood of announcing a sustainability initiative are TMT_SIZE, average age of TMT members (AVE_AGE), and the proportion of women on the TMT (P_WOMEN). All three variables were operationalized using data from Compustat Execucomp Monthly. We calculated TMT size by counting the number of top executives per company, estimated the average age of the team by dividing the sum of team member ages by the number of members for whom age was available, and calculated the proportion of women on the team by dividing the number of women executives per organization by TMT size.

The moderating role of supply chain position is captured through a dichotomous variable, SC_POSITION, which assumes the value of 1 if the focal company is a consumer-facing, B2C organization, and 0 for upstream B2B supply chain partners. To classify companies according to their supply chain position, we adopted a two-step procedure. First, we inspected each company’s 4-digit SIC code. Companies with SIC codes in the ranges 100–4100 (life sciences, mining, oil and gas exploration services, and manufacturing), 5000–5211 (wholesalers and lumber dealers), 6500–6798 (real estate developers and investment trusts), and 9997 (conglomerates) are considered upstream and assigned a value of 0. Although SIC groups 4231, 4412, 4610, and 4922 are not B2C, no companies from these groups were present in our sample; therefore, the 4210–4991 SIC range (transportation
and public utilities) is marked as B2C, as are the 5271–5990 (retail), 6021–6411 (financial institutions), and 7011–8742 (services) SIC groups; companies with SIC codes in these ranges receive a value of 1. Following this initial assignment step, we focus on companies in the B2B group. While companies with B2B SIC codes are, from a technical standpoint, always to be considered upstream supply chain partners, we relax this assumption somewhat to take into account the reality of some manufacturers developing a direct relationship with consumers. To this end, we check the list of companies initially classified as B2B against two publicly available lists: “Top 100 Consumer Goods Companies of 2019” and Forbes’ “The World’s Most Valuable Brands” [50,51]. In the case of a match, we re-classify the focal company as B2C and ascribe to it a value of 1. This process resulted in a total of 115 reassignments. The final count of B2C organizations is 1974, as compared to 1623 B2B companies.

3.2.3. Control Variables

Despite at least partially controlling the variation in sustainability initiative announcement likelihood attributable to year, industrial differences in SIC designation, and company revenue through CEM, we nonetheless introduce several company-level controls known to have an effect on organizational outcomes in the supply chain management and strategy literature. In particular, we control for firm size \( \text{SIZE} = \text{log of total sales} \), market share \( \text{MKT\_SHARE} = \text{the ratio of the focal company’s sales and the total sales in the company’s 4-digit SIC category} \), and sales growth \( \text{SALES\_GR} = \text{the change in sales from last year} \), since all three have been found to have an impact on the likelihood of engaging in corporate sustainability efforts [52–54].

On the TMT level, we control for the average tenure of TMT members \( \text{AVE\_TENURE} = \text{the sum of the number of years since a TMT member joined the team as of the year of reporting, divided by the number of TMT members at a company} \), since prior research has shown that TMT tenure has an impact on organizational innovativeness and sustainability [6,55]. We also control for the presence of a TMT functional role related to sustainability, following the example of Henry, Buyl, and Jansen (2019). In particular, we introduce a dichotomous variable, sustainability functional role \( \text{SUST\_FR} \), which takes on the value of 1 if a company has at least one TMT position title related to sustainability or environmental safety or compliance, and 0 otherwise [31].

3.3. Model Specification

To test Hypotheses 1a–c and 2a–c, we group the data on matching strata ID—a variable generated by the CEM procedure described in Section 3.1. Matching strata ID indicates which control firms have been matched with each of the 218 unique companies announcing sustainability initiatives. Following the approach used by [48], we use the matching strata ID as a condition group to fit a conditional logit model—a common method for evaluating binary outcomes with matched samples [56]. The conditional logit model allows us to estimate the likelihood of a company announcing a sustainability initiative in a given year relative to other firms with similar company characteristics. Since the effect of the characteristics used to match companies in the CEM procedure (fiscal year, 4-digit SIC code, and annual revenue) on the outcome is canceled out by the conditional grouping, we are able to focus specifically on the impact of the TMT predictor variables on announcement likelihood. The model specification is as follows:

\[
\text{SUSTAIN\_INIT}_{it} = \beta_0 + \beta_1 \text{SIZE}_{it} + \beta_2 \text{SALES\_GR}_{it} + \beta_3 \text{MKT\_SHARE}_{it} + \beta_4 \text{AVE\_TENURE}_{it} + \beta_5 \text{SUST\_FR}_{it} + \beta_6 \text{SC\_POSITION}_{it} + \beta_7 \text{TMT\_SIZE}_{it} + \beta_8 \text{AVE\_AGE}_{it} + \beta_9 \text{P\_WOMEN}_{it} + \beta_10 \text{SC\_POSITION}_{it} \times \text{TMT\_SIZE}_{it} + \beta_11 \text{SC\_POSITION}_{it} \times \text{AVE\_AGE}_{it} + \beta_12 \text{SC\_POSITION}_{it} \times \text{P\_WOMEN}_{it} + \alpha \text{CEM\_STRATA}_{t} + \epsilon_{it}
\]

where the dependent variable, \( \text{SUSTAIN\_INIT}_{it} \), takes on the value of 1 if company \( i \) in stratum \( t \) has announced a sustainability initiative, and 0 otherwise; \( \text{SIZE}_{it}, \text{SALES\_GR}_{it}, \text{MKT\_SHARE}_{it} \) are
company-level controls, and \( \text{AVE\_TENURE}_t \) and \( \text{SUST\_FR}_t \) are TMT-level covariates; \( \text{SC\_POSITION}_t \), \( \text{TMT\_SIZE}_t \), \( \text{AVE\_AGE}_t \), and \( \text{P\_WOMEN}_t \) constitute the direct effects of the four predictors on the likelihood of sustainability initiative announcement, and \( \text{SC\_POSITION}_t \times \text{TMT\_SIZE}_t \), \( \text{SC\_POSITION}_t \times \text{AVE\_AGE}_t \) and \( \text{SC\_POSITION}_t \times \text{P\_WOMEN}_t \) represent the interaction between supply chain position and each of the three TMT covariates. The CEM strata ID fixed effects are captured by \( \text{CEM\_STRATA}_t \)—the group variable in the conditional logit model. To ensure the robustness, we demonstrate the consistency of our results by fitting a generalized linear model (GLM) with a binary outcome variable and CEM strata ID fixed effects in addition to the conditional logit model.

To minimize the risk of collinearity, which can bias our estimates, we examined the variance inflation factor (VIF) of each predictor. Since introducing interaction effects increases the risk of collinearity, we mean-center the three TMT predictors—size, average age, and proportion of women—before forming their interaction with supply chain position, following the recommendation of Iacobucci et al. (2016) [57]. The resulting VIF values of the full interaction model with mean-centered variables range between 1.03 and 3.01, with a mean value of 2.02—well within the recommended limit of 5 [58].

4. Results

Following our modeling approach described above, the proposed hypotheses were tested using the \(-clogit-\) and \(-glm-\) commands in Stata 15 MP, with the \(\text{robust}\) option selected to produce robust standard errors. Hypotheses test results are reported in Table 3, followed by detailed interpretation.

Table 3. Conditional logit and generalized linear model (GLM) models of sustainability initiative likelihood.

| Model/Predictor | Conditional Logit | GLM |
|-----------------|-------------------|-----|
|                 | Model 1 | Model 2 | Model 3 | Model 4 |
| \( \text{SIZE} \) | 3.85 *** | 3.85 *** | 4.62 *** | 4.64 *** |
|                 | (0.29)  | (0.28)  | (0.37)  | (0.37)  |
| \( \text{SALES\_GR} \) | 0.10    | 0.12    | 0.09    | 0.12    |
|                 | (0.16)  | (0.18)  | (0.18)  | (0.22)  |
| \( \text{MKT\_SHARE} \) | −3.08 *** | −3.06 *** | −2.13 ** | −2.15 ** |
|                 | (0.83)  | (0.81)  | (1.09)  | (1.07)  |
| \( \text{AVE\_TENURE} \) | −0.01   | −0.01   | −0.02   | −0.02   |
|                 | (0.01)  | (0.01)  | (0.01)  | (0.01)  |
| \( \text{SUSTAIN\_FR} \) | −0.31   | −0.35   | −0.35   | −0.40   |
|                 | (0.36)  | (0.36)  | (0.42)  | (0.42)  |
| \( \text{SC\_POSITION} \) | 15.72 *** | 16.28 *** | 34.21 *** | 34.43 *** |
|                 | (0.29)  | (0.32)  | (0.52)  | (0.47)  |
| \( \text{TMT\_SIZE} \) | 0.13 ** | 0.29 *** | 0.16 ** | 0.38 *** |
|                 | (0.06)  | (0.10)  | (0.07)  | (0.12)  |
| \( \text{AVE\_AGE} \) | −0.03 * | 0.02    | −0.05 ** | 0.02    |
|                 | (0.02)  | (0.03)  | (0.02)  | (0.04)  |
| \( \text{P\_WOMEN} \) | 0.59    | 0.52    | 0.77    | 0.82    |
|                 | (0.60)  | (0.96)  | (0.62)  | (0.98)  |
| \( \text{SC\_POSITION} \times \text{TMT\_SIZE} \) | −0.28 ** |          | −0.36 ** |          |
|                 | (0.13)  |          | (0.15)  |          |
Models 1 and 3 focus on the main effects of TMT characteristics on the likelihood of announcing a sustainability initiative, while models 2 and 4 introduce the interaction effects between supply chain position and TMT characteristics. All four models indicate that there is a strong, positive, and statistically significant effect of TMT size on initiative announcement likelihood ($\beta = 0.13$, $p < 0.05$). In particular, converting the conditional logit coefficient of TMT SIZE to an odds ratio indicates that larger top executive teams are 13 percent more likely than smaller ones to announce a sustainability initiative. Hypothesis 1a is thus supported.

While both the conditional logit and GLM models show that the direct effect of average team age on announcement likelihood is negative and statistically significant ($\beta = -0.03$, $p < 0.1$), as predicted by the literature, the effect changes direction and loses significance when the interaction between supply chain position and average age is introduced. Hypothesis 1b is therefore only partially supported, indicating that older executive teams are about 4 percent less likely to engage in a sustainability initiative overall, although this conservatism is more readily apparent in B2C companies.

Hypothesis 1c predicts that the proportion of women in the top executive team will positively impact the organization’s likelihood of announcing a sustainability initiative. While the effect of this predictor is positive across all models, it is not statistically significant. Therefore, Hypothesis 1c is not supported.

The second set of hypotheses (Hypotheses 2a–c) pertains to the impact of the interaction between supply chain role and TMT characteristics on the likelihood of announcing a sustainability initiative. Hypothesis 2a posits that the interaction between supply chain position and the size of a company’s top executive team will have a significant influence on the likelihood of announcing a sustainability initiative. As models 2 and 4 in Table 3 indicate, the interaction effect is strong and statistically significant ($\beta = -0.28$, $p < 0.05$). Hypothesis 2a is therefore supported. To aid interpretation, Figure 2 presents graphically the interaction between supply chain position and TMT size.
Although the interaction plotted in Figure 3 however, shows the opposite effect. Due to this counterintuitive result, Hypothesis 2b is not fully but partially supported.

The last hypothesis, Hypothesis 2c, contends that the interaction between supply chain position and the proportion of women on the TMT will have an effect on the company’s likelihood of announcing a sustainability initiative. Neither interaction model however shows a significant impact. Hypothesis 2c is therefore not supported.

5. Discussion

This study integrates chain liability theory and the upper echelons perspective to explain the effect of supply chain position on the relationship between TMT characteristics and corporate sustainability.
efforts. Recognition of a company’s position in the supply chain is crucial to understanding sustainability behavior, as an emerging stream of supply chain management literature shows that different supply chain positions offer different incentives in the context of sustainability [41].

In general, we find that companies with larger-than-average top executive teams are 14 percent more likely to announce a sustainability activity, and management teams with a higher-than-average TMT age are 4 percent less likely to engage in a sustainability initiative. These findings are consistent with prior upper echelons research on the importance of functional diversity [31] and risk aversion [35] in top management teams with respect to sustainability strategy. Although not significant, the relationship between the presence of women on executive teams and sustainability initiative likelihood unfolds with a higher likelihood of announcing a sustainability activity. However, the key contribution of this study is the difference in the influence of TMT characteristics on sustainability initiative likelihood when examining B2B versus B2C companies.

Specifically, we find that the influence of TMT size in sustainability initiative announcements is distinctly stronger for B2B organizations, while that of average top executive team age is stronger in the context of B2C organizations, as illustrated in Figures 2 and 3. In particular, Figure 2 shows that while there is almost no difference in the likelihood of a B2C company announcing a sustainability initiative depending on the size of its top management team, B2B organizations with large executive teams are nearly 15 percent more likely to announce a sustainability initiative than B2B firms with small teams. Conversely, as Figure 3 indicates, while average TMT age does not appear to have an effect on the likelihood of a B2B company announcing a sustainability initiative, B2C organizations with younger top executive teams are nearly 10 percent more likely to engage in sustainability initiatives. Upper echelons theory explains this finding with the idea that teams with a higher average age are more risk adverse, and thus tend to respond to innovation more slowly [59]. What differs in the case of B2B vs. B2C is the underlying motivation to innovate on behalf of sustainability. B2B companies, as chain liability theory explains, are less likely to face the significant external pressure of public opinion [41], whereas B2C companies may see their market shares rise or fall through that same influence. In this context, B2C companies with younger boards are somewhat more likely to act that dynamic by introducing sustainability initiatives in pursuit of reputational reward in the consumer market. The position of a B2B company, in contrast, does not provide access to that same opportunity, and thus provides no equivalent motivation to adopt new practices, regardless of its attitude toward risk.

Despite the minimal effect of average TMT age on B2B sustainability initiative likelihood, TMT size does appear to play a role in B2B decision-making with regard to sustainability. This effect could be explained by the upper echelons concept of functional diversity embodied by the various roles on the top executive team [31], but also by the idea that the more top management roles an organization has, the more innovative knowledge assets it has access to. Innovative knowledge assets are the firm’s unique know-how reserves used to create a competitive advantage [60]. They have been found to positively affect corporate sustainability practices, especially in the presence of greater firm transparency [61]. Thus, to tackle the problem of notoriously low participation of upstream suppliers in corporate sustainability efforts, our study shows that increasing the number of functional roles among top executives of B2B leadership, perhaps by introducing a dedicated chief sustainability officer position, can assist in such an organizational change.

Our empirical findings can guide practitioners in assessing the internal and external organizational barriers to corporate sustainability. Our results show that B2C companies with relatively young top executive teams are the types of organizations most likely to announce a sustainability initiative, particularly if the team is relatively large. Overall, our study establishes the contingent role of supply chain position in the relationship between TMT characteristics and corporate sustainability, and thus points to the need of careful examination of the company’s position with respect to the end consumer when seeking to strengthen the firm’s engagement with sustainability. Stakeholder demand for sustainability, which B2B and B2C companies face to differing degrees, may be at least as important in
the decision to announce a sustainability initiative as internal characteristics such as TMT size and average age.

6. Conclusions

The goal of this study is to bring together two historically separate streams in sustainability literature: one stream investigating the organizational characteristics associated with sustainability activities, and another focused on supply chain position in the context of sustainability. In particular, we show that the effect of TMT size on the likelihood of a sustainability initiative announcement is more pronounced for B2B companies than it is for B2C organizations, while the opposite is true for average TMT age. These findings point to the need to closely examine the makeup of existing B2B executive boards to gain insight into how open an upstream supply chain partner would be to collaborating on a sustainability initiative with a downstream company. Our study confirms prior findings showing that companies with larger and younger TMT teams are more likely to engage in sustainability initiatives in general, but we also note that these results are most pronounced for B2C firms. It is therefore essential for researchers and corporate leaders to extend their analysis of organizational barriers to sustainability beyond internal corporate characteristics, and recognize the influence of supply chain position, relative to the end-consumer.

This study has several limitations, each of which invites further research. First, we acknowledge that the cross-sectional nature of the data prevents establishing causality, despite our best efforts to account for potential sources of endogeneity by introducing a control sample. Future research could focus on gathering a longitudinal dataset to further bolster causal interpretations. Second, the present study focuses on the likelihood of sustainability initiative announcements. This variable, however, only approximates the construct of sustainability, since announcing an initiative does not necessarily guarantee that a company will follow through with implementation. Future research should consider alternative ways to capture sustainability efforts by, for instance, applying content analysis to company sustainability reports. Third, we distinguished between two broad stages of the supply chain—consumer-facing and upstream—wherein all non-consumer-facing companies were subsumed under the category of “upstream firms” unless they were themselves widely recognized as a consumer brand. A more granular distinction between different tiers of upstream firms offers a promising opportunity for future research. Prior research has also found a relationship between corporate sustainability and TMT characteristics not directly considered by our model, such as the educational background of TMT members and the functional heterogeneity of the team. Future studies can be strengthened by including these characteristics in their analysis.

The intersection of organizational characteristics, supply chain position, and corporate sustainability initiatives is a complex, yet critical area of study. Research opportunities at this nexus abound. Future studies could, for instance, complement chain liability theory and the upper echelons perspective with a risk management approach to sustainability to assess the environmental and social risk of business activities at each stage of the supply chain. This practice has already been adopted by several industry sectors such as investment banking, and can be applied not just to the focal company’s operations but to those of its supply chain partners as well. We hope other researchers will join us in the effort to analyze sustainability as a phenomenon that permeates entire supply chain systems, as opposed to contained within individual companies.

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