

Endosymbiosis in the boardroom and ESG performance: A generational perspective

Abstract

This paper introduces an endosymbiotic framework for studying the role board's generational composition on firm's ESG performance. The board and the generations comprising the board are conceptualised as two distinct organisms with the firm (the third “parent” organism), all with mutual dependencies. Accordingly, we frame the ESG performance (dependent variable) as the outcome of the symbiotic relationships among the generational diversity of the board (independent variable), the characteristics of the board (control variable; e.g., board size, education level, female representation and cultural diversity) and the characteristics of the firm (control variable; e.g., industry, ROA, sales growth, total assets, intangible assets, and leverage). The framework has been empirically tested with three propositions following the three outcomes of endosymbiosis; *parasitism* (significant negative ESG) *commensalism* (insignificant ESG) and *mutualism* (significant positive ESG). In total we used complete financial, ESG and board data for an unbalanced panel of 24,202 firm-year observations containing 4,364 firms publicly traded in the Anglo Saxon cultural cluster; namely the United States, United Kingdom, New Zealand, Canada, and Australia between the fiscal years 2005 and 2019. Using panel data regressions and various robustness checks, (e.g., sensitivity analysis, placebo tests and endogeneity controlling) we found that generational composition has a parasitic effect on ESG performance composite score, the Environmental (E) performance score, the Social performance score (S) as well as the ESG controversies score. Only the Governance score was insignificant signifying a commensalism effect. Further interaction tests revealed that this parasitic effect stems from the members of Generation X. However, when the generational diversity of the board interacts further with female participation, thus increasing the diversity, the effect shifts to mutualism signifying the need for further inclusion of females in board decision making.

Keywords: ESG performance; Generational diversity, Endosymbiosis theory, Women representation, Generation X, Cognitive diversity

JEL Classification: G11; G3; Q5

It is no longer optional. It's now—and forevermore—imperative. Board members must possess the Holy Grail of boardroom leadership and productivity; a generational gearbox.
(Underwood, 2020, 168, p.4)

1 Introduction

Currently, three generations — younger Traditionals, all Baby Boomers and older members of Generation X — dominate most U.S. boardrooms (He et al., 2020). The opening quote epitomises the narrative of an ever-growing popular press coverage in publications such as the *Forbes*¹ and *Wall Street Journal*², which claim that better understanding of the boardroom's generational composition can lead to better performance. Yet, academic interest in boards' generational diversity has not followed through.

To date, an increasing range of disciplines in management science have drawn attention both to the significance of diversity and its various codified and explicit forms in terms of board's decision-making (Rixom et al., 2022; Weck et al., 2021; Krause and Miller, 2020; Liu, 2021), particularly in terms of the firm's Environmental, Social and Governance (ESG) performance (Girardone et al., 2021). For most observers diversity “is expected to generate a broader range of task views and work experiences among directors, [which] in turn will enable more balanced and higher quality board decision making” (Weck et al., 2021)³. Emphasis has therefore been placed on demographic (observable) characteristics of diversity usually based on age and female representation (Girardone et al., 2021).

Set against the outpouring of papers on board's demographic diversity, work concerning cognitive (non-observable) characteristics such as generational diversity has, until recently, been lagging. One reason for this is that most board diversity initiatives were aimed at demographic characteristics rather

¹In the article, it is argued that generational diversity, which sources cross-section of strategic thinking and expertise, is instrumental in successfully perpetuating an organisation. Indeed, although the average age of independent board directors is 63.1 years, Millennials constitute the largest labour force in the U.S. Therefore, failure to integrate Millennials into boards and upper echelons can pose a significant threat to an organisation's existence. Please see <https://www.forbes.com/sites/averyblank/2016/05/24/jolt-your-corporate-board-with-a-millennial-like-starbucks/?sh=78ca50f766a3>

²The presence of generational diversity in a board of directors can signal improved career prospects and thus can motivate and inspire junior, younger employees to advance their careers and, consequently, engage in high-performing, high-rewarding tasks. Please see <https://deloitte.wsj.com/articles/the-missing-perspective-in-the-boardroom-millennials-1426478524?responsive=y&tesla=y&tesla=y>

³It is worth noting that higher gender diversity within the board may not necessarily lead to improved organisational performance. In fact, female directors' task engagement incentives are driven by two relational interfaces: the director-board interface and the director-CEO interface (Weck et al., 2021). The former implies that female directors can show less task engagement since gender constitutes a diffuse status cue that creates status differentiation within the first interface. According to the latter, female directors receive lower-status ratings than male directors. Lower status, in turn, explains perceived lower task engagement of female directors.

than cognitive (Ng and Sears, 2020). Furthermore, the growing interest given to the generational composition of the workforce in management science has been followed by an increasing number of studies that challenge the validity of empirical evidence for generational differences (e.g., Costanza et al., 2021; Rudolph et al., 2020). For instance, the continued proliferation of cross-sectional designs is being debated as fundamentally flawed (Parry and Urwin, 2021).

There are signs of change as exemplified by He et al.'s 2020 empirical evidence who using a sample of 10,670 firm-year observations over the period from 2007 to 2017 found that the percentage of Gen Xers on the board is positively and significantly related to firm performance. The aim of the paper is to extend some of the ideas set out by He et al. (2020) with the examination of the firm's ESG performance (a composite score of environmental, social and governance score discounted for significant controversies impacting the corporation). In particular our paper is guided from the following research question: What is the role of board's generational composition on firm's ESG performance? By answering this question we are contributing to the board's decision making literature in a threefold manner.

First, our paper is innovative because it conceptualises the board's generational composition as a cognitive type of diversity (see figure 1). We provide greater emphasis to the dynamic and complex process of generational identity formation and we move away from the rather limit view of focusing solely on year of birth expressed by He et al. (2020). In particular, each generation is represented by a collective set of values, symbols and practices that emerge as a consequence from the successive entry into adulthood (Vincent, 2005). This set is distinct to each generation, it endures and continues to shape work-related attitudes of the generational group in later years (Joshi et al., 2010). Although considering generational diversity in organisations as a demographic characteristic represented solely by the year of birth has dominated research and practice, this rather over-simplified approach ignores the key tenets of social theory that have merit to advance our understanding of generational diversity as an organisational phenomenon (Lyons and Kuron, 2014; Parry and Urwin, 2021). By contrast our approach of generations on board is based on four inter-related components; a sequence of collectivities, a lived-through experience, a set of continuing relationships between the groups through time and the competition for access to resources (Edmunds and Turner, 2002; Eyerman and Turner, 1998; Mannheim, 1952; Vincent, 2005). Therefore, we respond to the recent call from Parry and Urwin (2021) who conclude their provocation paper by stressing that instead of abandoning the generational perspective "a more nuanced approach to its research and application is desperately

needed in order to discard the reliance on unsubstantiated categories based upon year of birth”

The second novelty of our paper is the development of a symbiotic framework for studying the topic (see Figure 2). Endosymbiosis is a process that is always already highly charged with rich metaphor, entailing a ‘host’ that is in an ‘exchange’, ‘relation’ or ‘merger’ with a ‘guest’ – a form of ‘living together’ that becomes ‘close’ over time [Campbell et al. \(2019\)](#). In the same vein, we conceptualise the board (host for generations but guest for the organisation) and the generations comprising the board (guests) as two distinct organisms within the firm (the third “host” organism), all with mutual dependencies. Accordingly, we frame the ESG performance (dependent variable) as the outcome of the symbiotic relationships among the generational diversity of the board (independent variable), the characteristics of the board (control variable; e.g., board size, education level, female representation and cultural diversity) and the characteristics of the firm (control variable; e.g., industry, ROA, sales growth, total assets, intangible assets, and leverage). Moreover, the symbiotic framework in board research as recently noted by [Obermann et al. \(2020\)](#) is that it can be further performed between principle-agent theory (PAT) and stewardship theory (SST) without altering the key assumptions of either theory.

The third added value of the paper is that the framework can be empirically tested with three propositions following the three outcomes of endosymbiosis; *parasitism* (significant negative ESG), *commensalism* (insignificant ESG) and *mutualism* (significant positive ESG). Accordingly, we empirically tested these three propositions using a panel data for publicly traded firms in the Anglo Saxon cultural cluster; namely the United States, United Kingdom, New Zealand, Canada, and Australia between the fiscal years 2005 and 2019. In total we used complete financial, ESG and board data for an unbalanced panel of 24,202 firm-year observations containing 4,364 firms. The findings provide first time evidence for the role of board’s generational composition on ESG performance contributing to the rapidly growing ESG literature ([Kim et al., 2019](#)).

The rest of the paper is structured as follows: Section 2 describes the data, sample, and variables of the study. Next, the methodology and the results are presented along with several robustness checks before the concluding remarks. .

[Figure 2](#) presents the symbiotic framework for studying the role of board’s generational composition on firms ESG performance.

Figure 1: Generational Timeline

Notes: ^a Being at the age of 12 -early adulthood- at the time of the event, ^b first year of observation, ^c last year of observation.

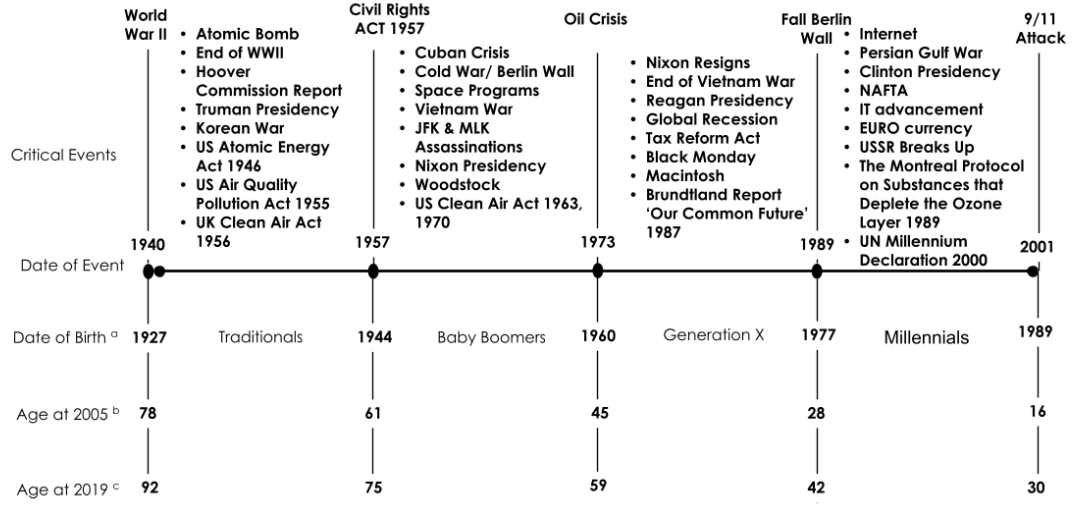
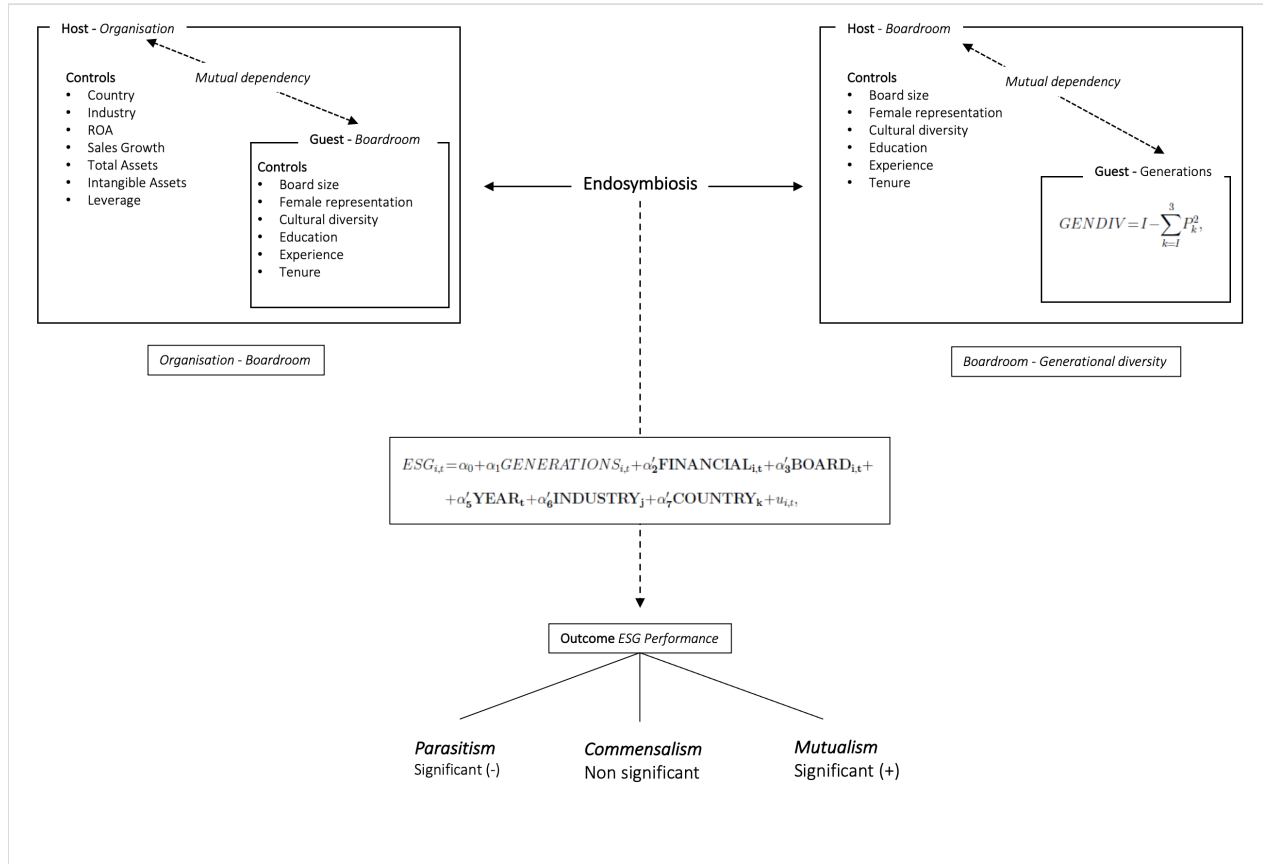


Figure 2: Symbiotic Framework of the role of ESG performance with board's generational composition



2 Method

Data and Sample

Consistent with extant literature on the relationship between board diversity and firm performance ([Benton, 2021](#); [Graf-Vlachy et al., 2020](#); [Shi and DesJardine, 2021](#)) we obtained board-level data from BoardEx for the period 2005 to 2019. Data included information concerning the date of birth, gender, nationality, education, number of directors, experience and tenure of all sitting members at the date of the annual meeting.

After, we complement these data with financial information from Thomson Reuters Datastream for the same period. We supplemented these data with information for the ESG performance from Refinitiv ESG database. Refinitiv is a Thompson Reuters's subsidiary which collects information from corporate annual reports, sustainability reports, nongovernmental organizations, and news sources for publicly traded companies at an annual frequency. On the appendix at [Table A2](#), we show the composition of our sample according to country, year and industry, respectively.

Dependent Variable: ESG

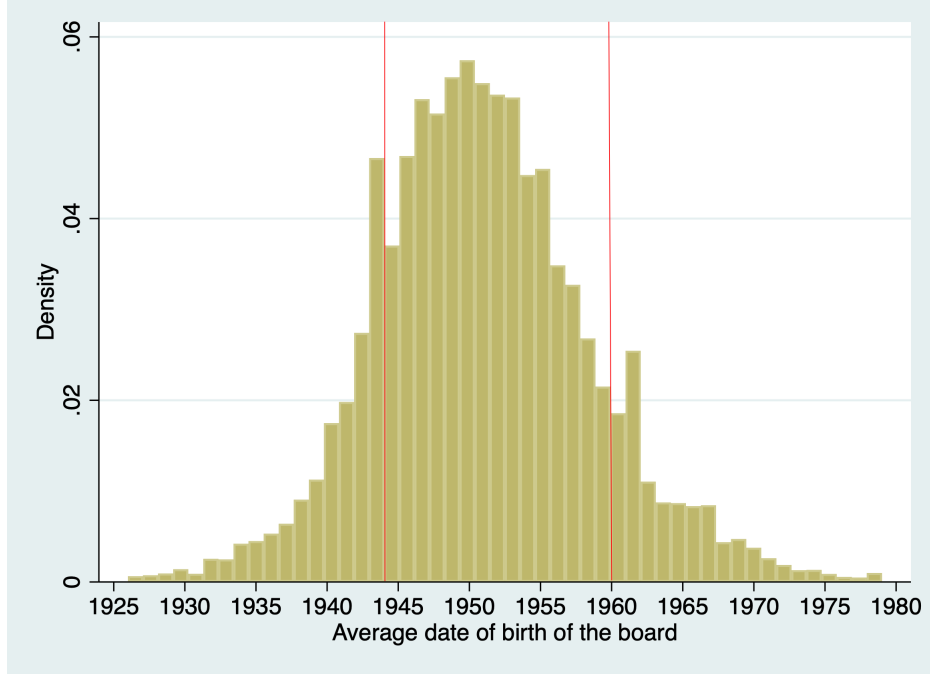
In line with previous studies *ESG performance* scores were obtained from REFINITIV ([Avramov et al., 2021](#); [Hsu et al., 2021](#)). Over 10,000 firms are covered in this scoring scheme - values are from 0 to 100, with higher values indicating higher ESG performance. Our sample includes 4,364 firms with available scores clustered into the three main themes, including ten categories: (i) environmental (resource use, innovation, and emissions), (ii) social (workforce, human rights, community, and product responsibility), and (iii) governance (management, shareholders, and corporate social responsibility strategy). We further use the ESG controversies (ESGC) score, which is calculated based on negative events about the previous aforementioned ten categories. For example, if firms are involved in scandals, lawsuits, legislative disputes, or fines related to these ten categories, then the ESGC score reports high values.

Independent Variables: Generations

We employ two different measures for our generational variables. The first measure is related to the board representation of each generation. For example, the percentage of Traditionals (TRAD),

Baby boomers (BABY), and Generation X (GENX) on the board. These three percentages sum up to 1 with Baby Boomers providing the highest representation (58%), followed by Traditionals (28%) and Generation X (14%). [Figure 3](#) shows the distribution of the sample according to the average date of birth of each board.

Figure 3: Average Date of Birth of the Board histogram



[Figure 4](#) shows the ESG performance of different combinations of generational compositions within the board. At a first glance, boards that include more baby boomer seem to achieve higher ESG scores.

The second independent variable is called generation diversity (GENDIV) and measures the diversity among the three generation groups within each board. The variable is estimated by the means of Blau (1977) formula as follows:

$$GENDIV = I - \sum_{k=1}^3 P_k^2, \quad (1)$$

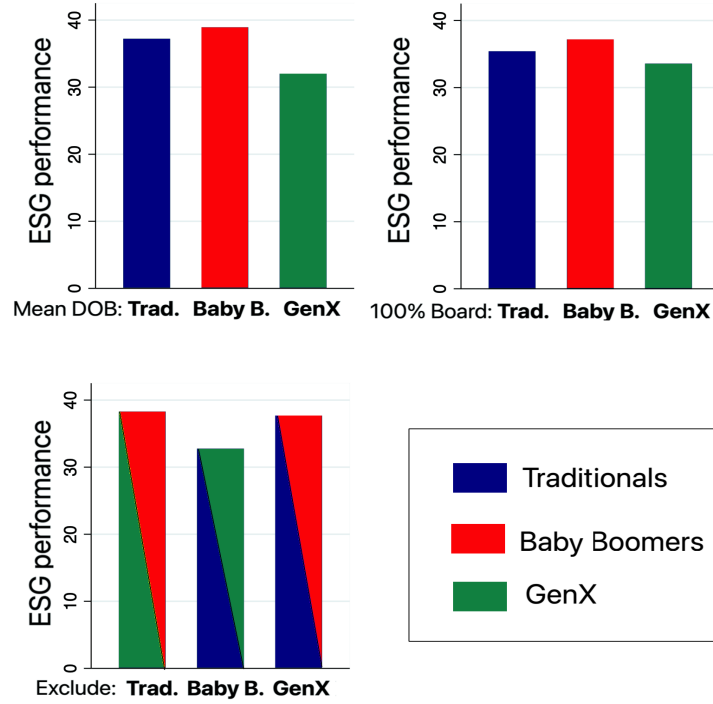
where k is a particular generation and P_k is the representation of this particular generation within the board. Higher scores indicate higher generational diversity.

Control Variables

In line with recent recommendations the following set of variables were considered for controlling our testing of ESG performance. For example, the size of the firm (SIZE) can be an important

Figure 4: Bar plots per group

Notes: Blue bars indicate traditionals, red bars illustrate baby boomers and green shows the GenX.



determinant of ESG since large firms have been found subject to more external pressure (Dyck et al., 2020). Intangible assets (INTA) can be thought of as a proxy of the firm's ESG investments (REFERENCES). Leverage (LEV) captures the riskiness of the firms, as it has been found that riskier firms undertake more ESG projects (Tzouvanas et al., 2020). Finally, both ROA and SALESG are proxies for profitability, as highly profitable firms have financial resources to invest in new technologies (REFERENCES). The second set of control variables, related to the board characteristics, are informed by Kim and Starks (2016); Delis et al. (2017); Liu (2018) and Dyck et al. (2020). Such characteristics include the board size (BSIZE), share of female CEOs on the board (GENDER), cultural diversity (CULTURE), and education (EDUC). These variables capture the experience of the board in dealing with various socio-economic problems and represent systems of values and beliefs that support specific decision making within the firms (Pan et al., 2017; Shi and Veenstra, 2020). Table 1 presents the descriptive statistics of the variables of the study. Please also see Table A1 (Appendix) for a more detailed definitions and sources of our variables.

Table 1: Summary statistics

Notes: This table presents the descriptive statistics of our unbalanced panel data set over the period from 2005 to 2019 for a total of 4,364 companies: number of observations (“Obs”), mean (“Mean”), median (“Median”), standard deviation (“SD”), minimum (“Min”), maximum (“Max”), skewness (“Skew”), and kurtosis (“Kurt”). Descriptive statistics are organized in columns, and variables are organised in rows. The computational details and measurements of the variables are outlined in Table A1.

Variable	Obs	Mean	Median	SD	Min	Max	Skew	Kurt
DOB	24,202	1950.640	1950.333	6.180	1927.000	1980.000	0.344	3.900
TRAD	24,202	0.282	0.167	0.325	0.000	1.000	0.838	2.465
BABY	24,202	0.579	0.600	0.346	0.000	1.000	-0.292	1.844
GENX	24,202	0.139	0.000	0.261	0.000	1.000	2.239	7.209
GENDIV	24,202	0.272	0.337	0.230	0.000	0.653	-0.096	1.367
E	24,200	27.663	17.150	29.091	0.000	99.100	0.708	2.146
S	24,200	43.605	39.865	21.666	0.360	98.250	0.477	2.387
G	24,200	49.269	49.890	22.882	0.160	99.290	-0.048	2.062
ESGC	24,202	88.478	100.000	25.390	0.000	100.000	-2.166	6.370
ESG	24,202	39.445	36.680	18.253	0.000	93.080	0.511	2.572
ROA	23,894	8.844	7.225	89.191	-1162.831	337.343	-4.968	48.445
SALESG	22,445	0.100	0.064	0.518	-9.338	13.075	4.481	99.055
SIZE	24,101	15.632	15.464	2.000	3.932	24.655	0.549	4.161
INTA	22,127	13.451	13.613	2.313	2.197	23.121	-0.392	3.767
LEV	23,953	0.103	0.060	0.144	0.000	1.299	3.476	19.186
GENDER	24,202	0.144	0.100	0.189	0.000	1.000	2.111	9.148
CULTURE	24,202	0.248	0.000	0.481	0.000	3.623	2.253	7.714
EDUC	24,202	0.190	0.143	0.220	0.000	1.000	1.524	5.774
BSIZE	21,293	0.944	1.000	0.230	0.000	1.000	-3.859	15.893
EXP	24,202	4.193	3.833	2.594	0.000	17.000	0.886	4.175
TENURE	24,202	7.828	7.900	3.397	0.000	18.000	0.252	2.808
NETWORK	24,202	0.135	0.100	0.177	0.000	1.000	2.299	10.359

3 Empirical Results

3.1 Model

In terms of identification of the impact of generational membership (diversity) on the ESG performance, we opt for a panel data model that considers heterogeneity across countries, industries and over time. [Equation 2](#) outlines the model below:

$$\begin{aligned}
 ESG_{i,t} = & \alpha_0 + \alpha_1 GENDIN_{i,t} + \alpha'_2 FINANCIAL_{i,t} + \alpha'_3 BOARD_{i,t} + \\
 & + \alpha'_5 YEAR_t + \alpha'_6 INDUSTRY_j + \alpha'_7 COUNTRY_k + u_{i,t},
 \end{aligned} \tag{2}$$

In Equation 2, the dependent variable, $ESG_{i,t}$, the ESG performance for firm t at time (year) t , where $i = 1, 2, \dots, N$, $t = 2005, 2006, \dots, 2019$, and $u_{i,t}$ is the random disturbance term. The key explanatory variable, $GENDIV_{i,t}$, which measures the generational diversity. Next, we include a set of **FINANCIAL** _{i,t} (ROA, SALESG, SIZE, INTA, and LEV), **BOARD** _{i,t} (GENDER, CULTURE, EDUC, and BSIZE). We also control for year, industry, and state fixed effects; thus, the intercept α_0 is referred to the base year (2005), base industry (Aerospace & Defence), and base country (Australia). The use of year fixed effects allow us to account for an unobserved time variation in the data that is not already captured by the time-varying covariates. The industry fixed effects are theoretically motivated. In this regard, pursuant to the institutional theory, organisations operating in the same industry and facing similar institutional pressures converge on institutional norms in terms of sustainable development through coercive, mimetic, and normative processes (DiMaggio and Powell, 1983; Escobar and Vredenburg, 2011). Specifically, normative isomorphism predicates that product certifications, as well as professional accreditations, conventions, and standards evolve into organisational norms at the industry level (DiMaggio and Powell, 1983). Further, the use of country fixed effects allows us to control of the interstate variation in ESG legislation, regulation, reporting, and standards, as well as diversity disclosures. We use the panel OLS estimation method to estimate Equation 2. The estimated coefficient standard errors are robust to autocorrelation and heteroscedasticity.

3.2 Main Findings

Our preliminary analysis, as shown at Figure 5, illustrates that there are significant differences between the three generational groups. Particularly, baby boomers on boards seem to achieve the highest ESG scores, followed by traditionals and the worst ESG performance is scored by generation X boards. Importantly, the generational diversity negatively affect the ESG performance.

Visually, we can represent the coefficients as shown in Figure 6, where an increase in baby boomers percentage would increase the ESG performance. Results are in different direction when consider either GENX or GENDIX, while are uncorrelated when we examine traditionals.

Our empirical estimations validate the previous finding. Table 2 reports our main results. In column (1) our generational diversity variable (GENDIV) has a significant and negative impact on ESG performance, indicating that generational diversity creates conflicts related to ESG firms' objectives.

We continue our analysis by considering the three main ESG components. Columns (2), (3),

Figure 5: Regression discontinuity design

Notes: Mean ESG of traditionals is 39.52 and mean ESG of baby boomers is 41.35. The difference is 1.83 and it is statistically significant at 1% level (t-stat 6.4486). Mean ESG of GENX is 38.20 and has a statistical difference with baby boomer of 3.14 (1% level, t-test of 9.42), and statistical difference with traditional at 1.31 (1% level, t-stat 3.23).

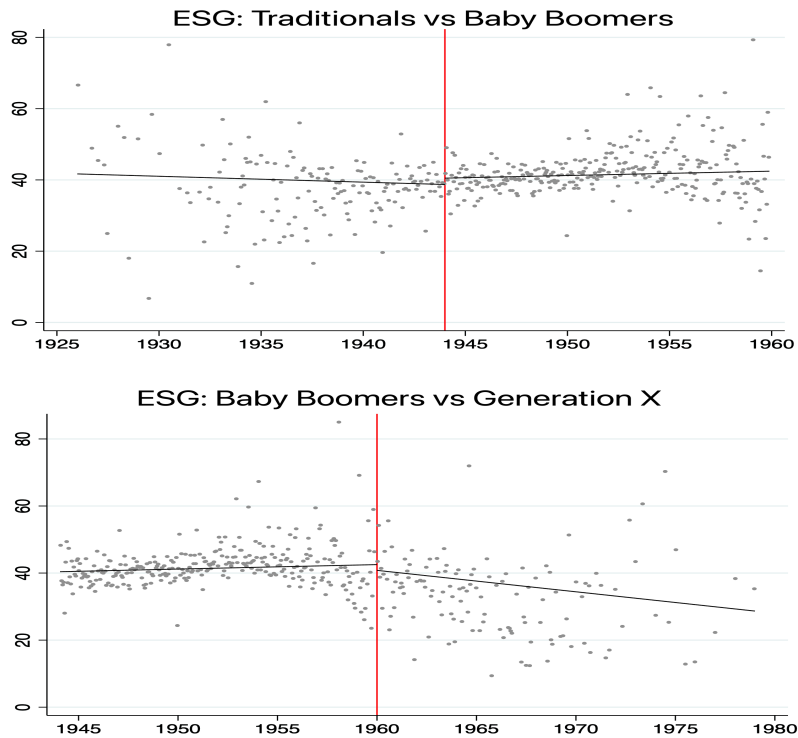


Figure 6: Fitted lines per group

Notes: Solid line indicates traditionals, dot line illustrates baby boomers, tight dot line the GENX, and dash line the GENDIV. Horizontal axis shows the percentage of each group.

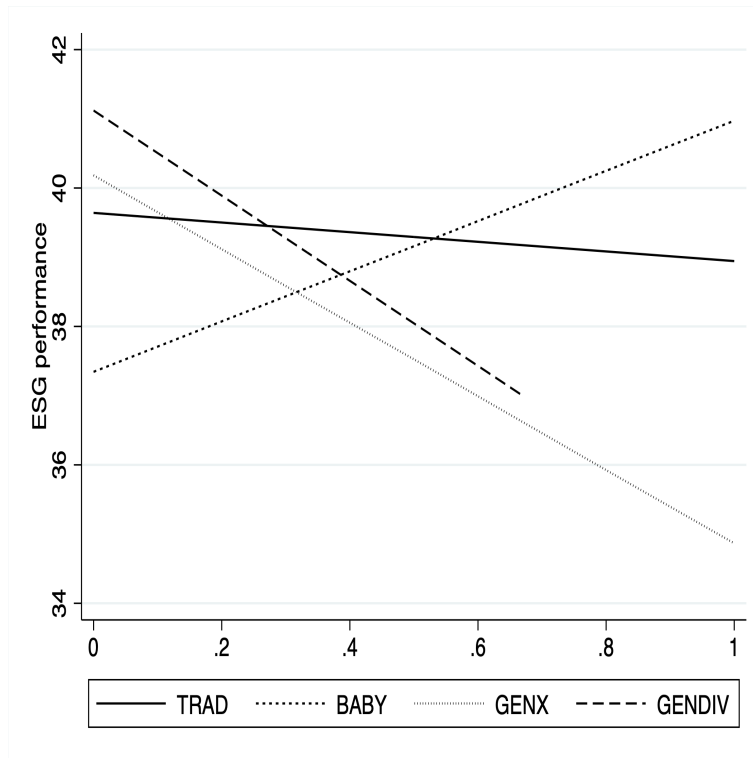


Table 2: ESG performance and generational cohorts

Notes: This table summarises the coefficient estimates of the linear panel data model, outlined in Equation 2. All variables are described in Table A1. The sample period runs from 2005 to 2019. The cross section comprises a total of 4,364 companies, with a varying number of companies in each year. The model is estimated by means of the random effects estimation methods. Robust standard errors are indicated in round parentheses. Asterisks ***, **, * denote the 1%, 5% and 10% levels of significance, respectively.

	ESG	ENV	SOC	GOV	ESGC
	(1)	(2)	(3)	(4)	(5)
GENDIV	-1.611*** (0.580)	-3.116*** (0.812)	-2.495*** (0.645)	-0.721 (0.831)	1.612* (0.909)
ROA	0.904*** (0.246)	1.336*** (0.341)	0.714*** (0.269)	0.766** (0.354)	0.267 (0.451)
SALESG	-1.053*** (0.146)	-2.266*** (0.202)	-1.207*** (0.159)	-0.851*** (0.210)	1.314*** (0.283)
SIZE	4.728*** (0.094)	8.006*** (0.132)	6.077*** (0.106)	4.013*** (0.133)	-4.836*** (0.134)
INTA	0.133*** (0.030)	0.272*** (0.042)	0.164*** (0.033)	-0.040 (0.042)	-0.140*** (0.044)
LEV	-1.470*** (0.113)	-1.867*** (0.159)	-1.426*** (0.126)	-0.578*** (0.162)	-0.261 (0.182)
GENDER	4.201*** (0.603)	2.826*** (0.848)	3.212*** (0.675)	8.053*** (0.862)	-1.533* (0.901)
CULTURE	0.603** (0.300)	1.011** (0.420)	0.596* (0.334)	-0.133 (0.429)	-0.461 (0.454)
EDUC	-1.322** (0.582)	-2.828*** (0.822)	-1.103* (0.658)	-0.111 (0.830)	-0.959 (0.819)
BSIZE	0.300*** (0.049)	0.389*** (0.069)	0.323*** (0.056)	0.321*** (0.070)	-0.422*** (0.067)
CONS	-33.809*** (2.542)	-97.034*** (3.707)	-60.106*** (3.059)	-2.304 (3.585)	168.434*** (2.819)
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES
Obs	21,216	21,172	21,172	21,211	21,177
R ²	0.297	0.413	0.323	0.173	0.184

and (4) show that our results are quite stable across the three different components. Although, the Environmental score seems to receive the highest impact in terms of generational diversity, the Governance score is uncorrelated with GENDIV.

Finally, in column (5) we consider the ESG controversies, which includes toxic waste spills, human rights violations, or boards' corruption. This is an inverted ESG performance score. As expected, column (5) shows that GENDIV increases these “unethical” ESG issues.

3.3 Interactions

We move to analyse some interactions between the generational membership and generational diversity. In Table 3, we observe that the interaction terms are insignificant for the case of TRAD, positive for the BABY and negative for the GENX. This finding indicates that a board which constitutes primarily by baby boomer with some generational diversity is a very good option for businesses. While, a GENX board with some generational diversity has a negative impact on ESG.

Moreover, the literature has identified that gender diversity is probably the most diversity variable.

Table 3: Generational cohorts with generational diversity

Notes: This table summarises the coefficient estimates of the linear panel data model, outlined in Equation 2. All variables are described in Table A1. The sample period runs from 2005 to 2019. The cross section comprises a total of 4,364 companies, with a varying number of companies in each year. The model is estimated by means of the random effects estimation methods. Robust standard errors are indicated in round parentheses. Asterisks ***, **, * denote the 1%, 5% and 10% levels of significance, respectively.

	ESG performance		
	(1)	(2)	(3)
TRAD	0.010 (0.622)		
BABY		0.052 (0.483)	
GENX			-0.212 (0.649)
GENDIV	-1.197 (0.748)	-5.203*** (1.127)	0.137 (0.723)
TRAD×GENDIV	-1.378 (1.795)		
BABY×GENDIV		7.696*** (1.816)	
GENX×GENDIV			-7.470*** (2.114)
ROA	0.903*** (0.246)	0.902*** (0.246)	0.904*** (0.246)
SALESG	-1.051*** (0.146)	-1.041*** (0.146)	-1.049*** (0.146)
SIZE	4.725*** (0.094)	4.701*** (0.094)	4.714*** (0.094)
INTA	0.133*** (0.030)	0.133*** (0.030)	0.133*** (0.030)
LEV	-1.468*** (0.113)	-1.461*** (0.113)	-1.469*** (0.113)
GENDER	4.178*** (0.606)	4.147*** (0.603)	4.295*** (0.604)
CULTURE	0.587* (0.300)	0.573* (0.300)	0.670** (0.300)
EDUC	-1.334** (0.582)	-1.370** (0.582)	-1.291** (0.582)
BSIZE	0.306*** (0.049)	0.296*** (0.049)	0.262*** (0.050)
CONS	-33.686*** (2.554)	-33.154*** (2.554)	-33.808*** (2.544)
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Country FE	YES	YES	YES
Obs	21,216	21,216	21,216
R ²	0.298	0.300	0.299

Table 4 shows that gender diversity always increase the ESG performance. Importantly, the interaction between gender diversity and the traditionals increase the ESG conflicts, while GENX×GENDER mitigates the relationship between GENX and ESG. Therefore, gender diversity has a positive impact on new generations and negative to old ones.

Finally, we consider triple interactions among generations, generational diversity and gender diversity. In Table 4 column (1) a fully diversified board with a traditional base appears to have conflicts in terms of ESG. In column (2), baby boomers in a fully diversified board have the most positive responses in ESG practises. Column (3) shows that GENX in a fully diversified board increase ESG too.

Table 4: Triple Interaction. Generational cohorts with female representation and generational diversity

Notes: This table summarises the coefficient estimates of the linear panel data model, outlined in Equation 2. All variables are described in Table A1. The sample period runs from 2005 to 2019. The cross section comprises a total of 4,634 companies, with a varying number of companies in each year. The model is estimated by means of the random effects estimation methods. Robust standard errors are indicated in round parentheses. Asterisks ***, **, * denote the 1%, 5% and 10% levels of significance, respectively.

ESG performance			
	(1)	(2)	(3)
TRAD×GENDER×GENDIV	-41.092*** (10.683)		
BABY×GENDER×GENDIV		48.502*** (11.781)	
GENX×GENDER×GENDIV			20.100* (11.809)
TRAD×GENDER	3.141 (3.147)		
BABY×GENDER		-3.312* (1.734)	
GENX×GENDER			4.508* (2.611)
TRAD×GENDIV	9.888*** (2.269)		
BABY×GENDIV		-5.123** (2.556)	
GENX×GENDIV			-11.737*** (3.354)
TRAD	-0.744 (0.585)		
BABY		0.802 (0.498)	
GENX			0.626 (0.997)
GENDER	5.241*** (0.846)	7.880*** (1.483)	3.353*** (1.142)
GENDIV	-2.774*** (1.002)	2.982** (1.469)	3.540** (1.039)
GENDER×GENDIV	3.277 (3.500)	-32.689*** (6.595)	-14.122** (4.147)
Net effect of significant variables	-28.737	18.24	5.642
Controls	YES	YES	YES
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Country FE	YES	YES	YES
Obs	20,821	20,821	20,821
R ²	0.322	0.323	0.324

4 Robustness

In this section, we analyse the robustness of our results. First, we examine whether our results are sensitive to the generation cut-off points. We further ask if our results remain intact when considering some endogeneity issues. Our final robustness check tests whether the age of the board drives the results. Overall, our main findings remain unaltered.

4.1 Sensitivity Test

Generations are constructed based on the date of birth of firms' directors. However, it might be cumbersome to determine the appropriate generation cohort cut-offs. For example, a director who is

born on year 1960 might neither be baby boomer nor generation X. In order to deal with this problem, we remove directors from the sample whose date of birth is two years around his cut-off point, in line with Egri and Ralston (2004) and therefore we consider the "core" of each generation. Table 5 shows that our previous estimations do not suffer from directors that are born very close to the cut off points.

Table 5: Sensitivity Analysis: ESG performance and "core" generational cohorts

Notes: This table summarises the coefficient estimates of the linear panel data model, outlined in Equation 2. All variables are described in Table A1. The sample period runs from 2005 to 2019. The cross section comprises a total of 4,364 companies, with a varying number of companies in each year. The model is estimated by means of the random effects estimation methods. Robust standard errors are indicated in round parentheses. Asterisks ***, **, * denote the 1%, 5% and 10% levels of significance, respectively.

	ESG performance			
	(1)	(2)	(3)	(4)
TRAD	-0.755 (0.665)			
BABY		1.010* (0.550)		
GENX			-0.949 (0.764)	
GENDIV				-3.049*** (0.765)
ROA	0.464* (0.267)	0.461* (0.267)	0.458* (0.267)	0.453* (0.267)
SALESG	-1.167*** (0.223)	-1.166*** (0.223)	-1.163*** (0.223)	-1.155*** (0.223)
SIZE	4.759*** (0.134)	4.751*** (0.134)	4.753*** (0.134)	4.751*** (0.134)
INTA	0.030 (0.041)	0.028 (0.041)	0.027 (0.041)	0.032 (0.041)
LEV	-1.334*** (0.142)	-1.335*** (0.142)	-1.340*** (0.142)	-1.325*** (0.142)
GENDER	3.207*** (0.836)	3.200*** (0.835)	3.304*** (0.833)	3.256*** (0.833)
CULTURE	1.380*** (0.397)	1.394*** (0.396)	1.412*** (0.397)	1.444*** (0.396)
EDUC	-1.445* (0.801)	-1.412* (0.800)	-1.385* (0.801)	-1.362* (0.800)
BSIZE	0.305*** (0.065)	0.302*** (0.065)	0.293*** (0.065)	0.390*** (0.069)
CONS	-30.227*** (3.320)	-30.880*** (3.303)	-30.397*** (3.305)	-30.610*** (3.299)
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Country FE	YES	YES	YES	YES
Obs	11,417	11,417	11,417	11,417
R ²	0.316	0.318	0.317	0.318

4.2 Endogeneity

It should be recognised that panel data models, in which all the variables enter contemporaneously, may not provide an accurate representation of the underlying relationship between ESG performance and generational diversity for several reasons. First, the contemporaneous relationship might be suffering from an endogeneity/reverse causality bias. Second, changes in genetic diversity might not materialise within the same period due to, e.g., decision lags. Considering that dynamic models can provide a more accurate representation of this relationship. Therefore, we estimate panel data

models where our main explanatory variables are lagged by one period.

Table 6 shows that are previous estimations are quite robust. The statistical significance as well as the magnitude of our coefficients are similar to the previous estimations and therefore we can conclude that reverse causality is not present in our estimations.

Table 6: Predicting ESG performance and generational cohorts with lagged explanatory variables

Notes: This table summarises the coefficient estimates of the linear panel data model, outlined in Equation 2. All variables are described in Table A1. The sample period runs from 2005 to 2019. The cross section comprises a total of 4,364 companies, with a varying number of companies in each year. The model is estimated by means of the random effects estimation methods. Robust standard errors are indicated in round parentheses. Asterisks ***, **, * denote the 1%, 5% and 10% levels of significance, respectively.

	ESG performance			
	(1)	(2)	(3)	(4)
TRAD _{<i>t</i>-1}	-0.360 (0.515)			
BABY _{<i>t</i>-1}		1.357*** (0.439)		
GENX _{<i>t</i>-1}			-2.041*** (0.599)	
GENDIV _{<i>t</i>-1}				-1.238** (0.620)
ROA _{<i>t</i>-1}	0.745*** (0.254)	0.743*** (0.254)	0.742*** (0.254)	0.742*** (0.254)
SALESG _{<i>t</i>-1}	-1.088*** (0.150)	-1.084*** (0.150)	-1.083*** (0.150)	-1.087*** (0.150)
SIZE _{<i>t</i>-1}	4.098*** (0.096)	4.088*** (0.096)	4.084*** (0.096)	4.097*** (0.096)
INTA _{<i>t</i>-1}	0.103*** (0.031)	0.102*** (0.031)	0.101*** (0.031)	0.103*** (0.031)
LEV _{<i>t</i>-1}	-1.465*** (0.123)	-1.461*** (0.123)	-1.463*** (0.123)	-1.462*** (0.123)
GENDER _{<i>t</i>-1}	4.693*** (0.662)	4.650*** (0.659)	4.857*** (0.659)	4.703*** (0.659)
CULTURE _{<i>t</i>-1}	0.950*** (0.322)	0.955*** (0.322)	0.996*** (0.322)	0.990*** (0.322)
EDUC _{<i>t</i>-1}	-0.292 (0.635)	-0.246 (0.635)	-0.180 (0.635)	-0.269 (0.635)
BSIZE _{<i>t</i>-1}	0.367*** (0.049)	0.374*** (0.049)	0.352*** (0.048)	0.399*** (0.052)
CONS	-21.512*** (2.652)	-22.124*** (2.641)	-21.339*** (2.638)	-21.679*** (2.638)
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Country FE	YES	YES	YES	YES
Obs	18,531	18,531	18,531	18,531
R ²	0.305	0.307	0.307	0.305

4.3 Placebo test

We finalise our robustness analysis by performing a Placebo test which is associated with the identification of the generations. It is very likely that ours results might be simply driven by the age of the board and not by its generations. For this reason, we run regressions with the average age of the board as the main independent variable. Table 7 shows that AGE is not a significant variable for ESG and therefore we can conclude that AGE of the does not really matter, but what

matters instead is the generations within the board.

Table 7: Placebo: The role of Age

Notes: This table summarises the coefficient estimates of the linear panel data model, outlined in Equation 2. All variables are described in Table A1. The sample period runs from 2005 to 2019. The cross section comprises a total of 4,364 companies, with a varying number of companies in each year. The model is estimated by means of the random effects estimation methods. Robust standard errors are indicated in round parentheses. Asterisks ***, **, * denote the 1%, 5% and 10% levels of significance, respectively.

	ESG	ESG	ESG _{t+1}	ESG	ESG
	(1)	(2)	(3)	(4)	(5)
AGE	-0.025 (0.050)	0.045 (0.033)	0.044 (0.033)	0.045 (0.039)	0.038 (0.035)
GENDIV				-0.780 (7.546)	
AGE×GENDIV				-0.013 (0.121)	
AGE×GENDER					0.069 (0.121)
GENDER	2.530** (1.157)	4.375*** (0.883)	4.877*** (0.917)	4.329*** (0.885)	0.215 (7.425)
ROA	0.863** (0.367)	0.903*** (0.333)	0.745** (0.296)	0.900*** (0.334)	0.904*** (0.333)
SALESG	-0.858*** (0.178)	-1.052*** (0.171)	-1.086*** (0.175)	-1.051*** (0.171)	-1.051*** (0.171)
SIZE	4.248*** (0.303)	4.726*** (0.186)	4.093*** (0.175)	4.722*** (0.186)	4.724*** (0.186)
INTA	0.110 (0.071)	0.130** (0.051)	0.102** (0.047)	0.131** (0.051)	0.130** (0.051)
LEV	-1.021*** (0.208)	-1.475*** (0.179)	-1.464*** (0.173)	-1.471*** (0.178)	-1.475*** (0.179)
CULTURE	0.378 (0.568)	0.598 (0.458)	0.986** (0.459)	0.637 (0.460)	0.596 (0.458)
EDUC	-1.763 (1.102)	-1.266 (0.773)	-0.227 (0.811)	-1.258 (0.771)	-1.271 (0.774)
BSIZE	0.221** (0.109)	0.246*** (0.070)	0.356*** (0.068)	0.292*** (0.073)	0.244*** (0.070)
CONS	-28.951*** (5.308)	-36.469*** (3.832)	-23.924*** (3.822)	-36.449*** (4.066)	-35.967*** (3.913)
FIRM FE	YES	NO	NO	NO	NO
YEAR FE	YES	YES	YES	YES	YES
INDUSTRY FE	NO	YES	YES	YES	YES
COUNTRY FE	NO	YES	YES	YES	YES
Obs	21,216	21,216	21,216	21,216	21,216
R ²	0.200	0.297	0.305	0.298	0.297

5 Conclusion

This paper provides empirical evidence for the popular practitioner idea that generational composition in the board can significantly affect firm's performance. It does so with the introduction of a novel symbiotic framework with testable propositions. The findings illustrate that the negative effect of generational diversity in the board can be steered in a mutual positive relationship with the additional representation of females in the board.

References

- Avramov, D., Cheng, S., Lioui, A., and Tarelli, A. (2021). Sustainable investing with esg rating uncertainty. *Journal of Financial Economics*.
- Benton, R. A. (2021). Women in the inner circle: Gender and director networks after the fracturing of the corporate elite. *Organization Science*.
- Blau, P. M. (1977). *Inequality and heterogeneity: A primitive theory of social structure*, volume 7. Free Press New York.
- Campbell, N., Dunne, S., and Ennis, P. (2019). Graham harman, immaterialism: Objects and social theory. *Theory, Culture & Society*, 36(3):121–137.
- Costanza, D. P., Ravid, D. M., and Slaughter, A. J. (2021). A distributional approach to understanding generational differences: What do you mean they vary? *Journal of Vocational Behavior*, 127:103585.
- Delis, M. D., Gaganis, C., Hasan, I., and Pasiouras, F. (2017). The effect of board directors from countries with different genetic diversity levels on corporate performance. *Management Science*, 63(1):231–249.
- DiMaggio, P. J. and Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, pages 147–160.
- Dyck, I., Lins, K. V., Roth, L., Towner, M., and Wagner, H. F. (2020). Renewable governance: Good for the environment? *Karl V. and Roth, Lukas and Towner, Mitch and Wagner, Hannes F., Renewable Governance: Good for the Environment*.
- Edmunds, J. and Turner, B. S. (2002). *Generations, culture and society*. Open University.
- Egri, C. P. and Ralston, D. A. (2004). Generation cohorts and personal values: A comparison of china and the united states. *Organization science*, 15(2):210–220.
- Escobar, L. F. and Vredenburg, H. (2011). Multinational oil companies and the adoption of sustainable development: A resource-based and institutional theory interpretation of adoption heterogeneity. *Journal of Business Ethics*, 98(1):39–65.
- Eyerman, R. and Turner, B. S. (1998). Outline of a theory of generations. *European Journal of Social Theory*, 1(1):91–106.
- Girardone, C., Kokas, S., and Wood, G. (2021). Diversity and women in finance: Challenges and future perspectives. *Journal of Corporate Finance*, page 101906.
- Graf-Vlachy, L., Bundy, J., and Hambrick, D. C. (2020). Effects of an advancing tenure on ceo cognitive complexity. *Organization Science*, 31(4):936–959.
- He, Z., Miletkov, M. K., and Staneva, V. (2020). New kids on the block: The effect of generation x directors on corporate performance. *Available at SSRN 3540512*.
- Hsu, P.-H., Liang, H., and Matos, P. (2021). Leviathan inc. and corporate environmental engagement. *Management Science*.
- Joshi, A., Dencker, J. C., Franz, G., and Martocchio, J. J. (2010). Unpacking generational identities in organizations. *Academy of management review*, 35(3):392–414.

- Kim, D. and Starks, L. T. (2016). Gender diversity on corporate boards: Do women contribute unique skills? *American Economic Review*, 106(5):267–71.
- Kim, I., Wan, H., Wang, B., and Yang, T. (2019). Institutional investors and corporate environmental, social, and governance policies: Evidence from toxics release data. *Management Science*, 65(10):4901–4926.
- Krause, R. and Miller, T. L. (2020). From strategic leaders to societal leaders: On the expanding social role of executives and boards. *Journal of Management*, 46(8):1315–1321.
- Liu, C. (2018). Are women greener? corporate gender diversity and environmental violations. *Journal of Corporate Finance*, 52:118–142.
- Liu, C. (2021). Why do firms fail to engage diversity? a behavioral strategy perspective. *Organization Science*.
- Lyons, S. and Kuron, L. (2014). Generational differences in the workplace: A review of the evidence and directions for future research. *Journal of Organizational Behavior*, 35(S1):S139–S157.
- Mannheim, K. (1952). *Diagnose unserer Zeit: Gedanken eines Soziologen*. Duncker & Humblot.
- Ng, E. S. and Sears, G. J. (2020). Walking the talk on diversity: Ceo beliefs, moral values, and the implementation of workplace diversity practices. *Journal of Business Ethics*, 164(3):437–450.
- Obermann, J., Velte, P., Gerwanski, J., and Kordsachia, O. (2020). Mutualistic symbiosis? combining theories of agency and stewardship through behavioral characteristics. *Management Research Review*.
- Pan, Y., Siegel, S., and Wang, T. Y. (2017). Corporate risk culture. *Journal of Financial and Quantitative Analysis*, 52(6):2327–2367.
- Parry, E. and Urwin, P. (2021). Generational categories: A broken basis for human resource management research and practice. *Human Resource Management Journal*.
- Rixom, J. M., Jackson, M., and Rixom, B. A. (2022). Mandating diversity on the board of directors: Do investors feel that gender quotas result in tokenism or added value for firms? *Journal of Business Ethics*, pages 1–19.
- Rudolph, C. W., Rauvola, R. S., Costanza, D. P., and Zacher, H. (2020). Generations and generational differences: Debunking myths in organizational science and practice and paving new paths forward. *Journal of business and psychology*, pages 1–23.
- Shi, W. and DesJardine, M. R. (2021). Under attack! ceo implicit motives and firm competitive responses following short seller activism. *Organization Science*.
- Shi, W. and Veenstra, K. (2020). The moderating effect of cultural values on the relationship between corporate social performance and firm performance. *Journal of Business Ethics*, pages 1–19.
- Tzouvanas, P., Kizys, R., Chatziantoniou, I., and Sagitova, R. (2020). Environmental disclosure and idiosyncratic risk in the european manufacturing sector. *Energy Economics*, 87:104715.
- Underwood, C. (2020). The bedrock of board effectiveness: A generational gearbox. *Board Leadership*, 2020(168):4–6.

- Vincent, J. A. (2005). Understanding generations: political economy and culture in an ageing society. *The British journal of sociology*, 56(4):579–599.
- Weck, M. K., Veltrop, D. B., Oehmichen, J. D., and Rink, F. (2021). Why and when female directors are less engaged in their board duties: An interface perspective. *Long Range Planning*, page 102123.

Table A1: Variable definitions

Notes: This table describes the variables we use in our empirical analysis. The first column (“Variables”) labels the variable. The second column “Definitions” describes the variable and explains how it is defined/computed/measured. The third column “Source” acknowledges the source of information.

Variables	Abbreviation	Definitions	Equation	Source
Panel A: Generational variables				
<i>Date of Birth</i>	DOB	Sum for dates of birth of board members/board size, where i is the board member and N the board size.	$\frac{\sum_{i=1}^N DOB_i}{N}$	BoardEX
<i>Age</i>	AGE	Sum for age of board members/ board size.	$\frac{\sum_{i=1}^N AGE_i}{N}$	BoardEX
<i>Traditionals' representation (%)</i>	TRAD	Number of Traditionals in the board/board size	$\frac{\sum_{i=1}^N TRAD_i}{N}$	BoardEX
<i>Baby Boomers' representation (%)</i>	BABY	Number of Baby Boomers in the board/board size	$\frac{\sum_{i=1}^N BABY_i}{N}$	BoardEX
<i>Generation's X representation (%)</i>	GENX	Number of Generation X in the board/board size	$\frac{\sum_{i=1}^N GENX_i}{N}$	BoardEX
<i>Generational Diversity</i>	GENDIV	Generational diversity calculated with the Blau formula (Blau, 1977). Generational diversity is measured by means of three categories based on generations Blau's Index (Blau, 1977), where k is a particular generation and P_k is the representation of a particular generation within the board.	$1 - \sum_{k=1}^3 P_k^2$	BoardEX
Panel B: CSR variables				
<i>Environmental performance</i>	E	Environmental performance is the weighted average of resource use, emissions and innovation scores		REFINITIV
<i>Social performance</i>	S	Social performance is the weighted average of workforce, human rights, community and product responsibility scores		REFINITIV
<i>Governance performance</i>	G	Governance performance is the weighted average of management, shareholders and the company's CSR scores.		REFINITIV
<i>ESG controversies</i>	ESGC	ESG controversies are negative news stories related to ESG issues, e.g. events related to tax frauds, human rights or environment		REFINITIV
<i>ESG performance</i>	ESG	The overall firm ESG score discounted for significant ESG controversies impacting the corporation.		REFINITIV
Panel C: Control variables				
<i>Return on assets</i>	ROA	Net income over total assets	$\frac{Net\ income}{Total\ assets}$	Datastream
<i>Sales growth (%)</i>	SALESG	Percentage change of sales from the previous year ($t-1$) to current one (t). It shows the growth opportunities of the firm.	$\frac{SALES_{t-1} - SALES_t}{SALES_{t-1}}$	Datastream
<i>Total assets</i>	SIZE	The size of the firm is proxied by the natural logarithm of firm's total assets.	$Ln(Total\ Assets)$	Datastream
<i>Intangible assets</i>	INTA	The natural logarithm of firm's intangible assets. It is a proxy to control for R&D.	$Ln(Intangible\ Assets)$	Datastream
<i>Leverage</i>	LEV	Leverage is the total debt to total equity the firm. It is a proxy for firm risk.	$\frac{Total\ debt}{Total\ Equity}$	Datastream
<i>Female representation (%)</i>	GENDER	Sum of female board members/ board size.	$\frac{\sum_{i=1}^N GENDER}{N}$	BoardEX
<i>Cultural diversity</i>	CULTURE	The standard deviation of an overall cultural index from the six components of the Hofstede database. A principal components analysis is used on the six subindices to derive a single index of cultural diversity. It is calculated as the standard deviation of the cultural index from the mean value (m) of the culture of the board of directors, attached to the board directors of each firm, according to the culture score of the country of nationality of each director.	$\sqrt{\frac{\sum_{i=1}^N (d_i - m)^2}{N}}$	BoardEX and Hofstede
<i>Education (%)</i>	EDUC	Sum of board members with either PHD or MBA / board size.	$\frac{\sum_{i=1}^N EDUC_i}{N}$	BoardEX
<i>Board size</i>	BSIZE	Number of directors sit in firm's board for any year given.		BoardEX
Panel D: Other variables				

<i>Experience</i>	EXP	Sum for years of experience sitting in the board of board members/ board size	BoardEX
<i>Tenure</i>	TENURE	Sum for years of experience in the same role (i.e., CEO, CFO) of board members/ board size	BoardEX
<i>Network</i>	NETWORK	Sum for number of outside board(s) members sit in /board size	BoardEX

Table A2: Sample composition

Notes” This table visualizes the breakdown of the sample by country, year and industry. The first column (“Country”, ”Year” and ”Industry”) lists the information included in our information set. The second column (“N. of observations”) indicates the number of observations for each case. The third column (“Sample Percentage”) indicates the weight of data in our sample. The fourth column (“N. of firms”) indicates the number of firms added in our analysis for each different case.

Panel A: Country composition			
<i>Country</i>	<i>N. of observations</i>	<i>Sample percentage</i>	<i>N. of firms</i>
Australia	880	3.636	162
Canada	3,042	12.569	381
New Zealand	51	0.211	13
United Kingdom	3,007	12.425	397
United States	17,222	71.159	3,364
Total	24,202	100	4,364
Panel B: Year composition			
<i>Year</i>	<i>N. of observations</i>	<i>Sample percentage</i>	<i>N. of firms added</i>
2005	150	0.620	150
2006	1,856	7.669	1,710
2007	1,924	7.950	124
2008	1,882	7.776	248
2009	1,130	4.669	187
2010	1,169	4.830	84
2011	1,195	4.938	75
2012	1,316	5.438	59
2013	1,402	5.793	67
2014	1,434	5.925	71
2015	1,748	7.223	374
2016	2,042	8.437	409
2017	2,107	8.706	217
2018	2,210	9.131	211
2019	2,637	10.896	378
Total	24,202	100	4,364
Panel C: Industry composition			
<i>Industry name</i>	<i>N. of observations</i>	<i>Sample percentage</i>	<i>N. of firms</i>
Aerospace & Defence	275	1.1363	37
Automobiles & Parts	342	1.4131	49
Banks	1,409	5.8218	331
Beverages	175	0.7231	22
Blank Check / Shell Companies	4	0.0165	4
Business Services	851	3.5162	168
Chemicals	580	2.3965	94
Clothing & Personal Products	319	1.3181	55
Construction & Building Materials	653	2.6981	105
Consumer Services	134	0.5537	31
Containers & Packaging	215	0.8884	29
Diversified Industrials	133	0.5495	24
Education	70	0.2892	16
Electricity	304	1.2561	41
Electronic & Electrical Equipment	1,296	5.3549	220
Engineering & Machinery	920	3.8013	148
Food & Drug Retailers	223	0.9214	31
Food Producers & Processors	566	2.3386	96
Forestry & Paper	209	0.8636	32
General Retailers	911	3.7642	139
Health	809	3.3427	197
Household Products	288	1.1900	47
Information Technology Hardware	426	1.7602	76
Insurance	804	3.3220	110
Investment Companies	175	0.7231	54
Leisure & Hotels	924	3.8179	159
Leisure Goods	109	0.4504	22
Life Assurance	139	0.5743	18
Media & Entertainment	592	2.4461	91
Mining	1,119	4.6236	165
Oil & Gas	1,644	6.7928	251
Pharmaceuticals and Biotechnology	1,331	5.4995	398
Private Equity	52	0.2149	8
Publishing	170	0.7024	24
Real Estate	1,438	5.9417	267
Renewable Energy	152	0.6280	32
Software & Computer Services	1,208	4.9913	262
Speciality & Other Finance	1,082	4.4707	177

Steel & Other Metals	247	1.0206	49
Telecommunication Services	477	1.9709	85
Tobacco	88	0.3636	12
Transport	644	2.6609	95
Utilities - Other	695	2.8717	93
Total	24,202	100	4,364