Irresponsible practices, CEO turnover, and firm value

– a mediation model

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Abstract

This paper examines the relationship between controversies and CEO turnover. We look at the relationship between irresponsibility and firm value. Moreover, we examine if engaging in irresponsible activities increases CEO turnover. We employ a causal mediation model approach on an international sample covering the years 2011-2021 and test multiple regressions at the same time to assess the direct and indirect effects of irresponsible practices on CEO turnover and the role of a firm value. Our findings indicate that irresponsible activities hurt firm value. We also document a positive effect of a firm's engagement in irresponsible practices on CEO turnover due to a decrease in firm value. The results are robust to different measures of a firm's engagement in irresponsible activities, thereby indicating that CEOs are held responsible for corporate misbehavior **only if firm value decreases**.

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1. Introduction

Environmental, Social, and Governance (ESG) aspects have recently become one of the most trending topics in corporate governance. ESG has arguably transcended not only researchers but also executives, investors, and a large stream of people throughout society. The main reason behind the growing importance of ESG is its utility as both a risk management tool and a long-term value creation strategy (Godfrey, Merrill, and Hansen, 2009; Edmans, 2023). However, earlier research has mainly focused on "good ESG", that is, corporate social responsibility (CSR). The "dark side of the moon" (i.e., corporate social irresponsibility) remains largely unexamined (Lange & Washburn, 2012). Little is known about the consequences of corporate social irresponsibility on a firm's value and how it may affect the CEO, who is commonly seen as the public face and voice of the company. Hence, the purpose of this paper is to examine how irresponsible practices affect firm value, and whether this effect induces companies to change their CEO. Moreover, we use directed acyclic graphs (Pearl, 2009) to illustrate the model and examine different paths through which these effects may arise.

Irresponsible practices are defined as corporate decisions that harm reasonably involved company stakeholders (Strike, Gao, & Bansal, 2006). Reputational capital is fundamental to companies, and they can destroy firm value by displaying irresponsible behavior. Thus, they may even increase their ESG engagement as a counteraction or remedy to mitigate the harmful reputational effect on the firm. Furthermore, firms are often inclined to attribute such irresponsible behavior to their CEO (Mui & Hill, 2023). Therefore, firms may deem CEO turnover as another potential mechanism for recovering from value losses in the face of irresponsible activities arising and taking the spotlight around the firm. Additionally, a CEO can also be replaced due to the aim of improving the firm's public image following irresponsible activities.

Traditional methods of mediation analysis have produced limited results and distorted estimates of mediation effects (Pearl, 2012; Aguinis, Edwards & Bradley, 2017). To overcome these limitations we employ semiparametric causal mediation models within the potential-outcomes framework, and test a combination of matching, linear, and probit models applied to longitudinal data to provide counterfactual-based interpretations of the direct and indirect effects of irresponsible firm practices on CEO turnover, and the potential role of the firm value in this context (see e.g., Imbens, 2004; Imai, Keele & Tingley, 2010; VanderWeele & Tchetgen Tchetgen, 2017). Our sample consists of publicly traded firms from the United States and 16 European countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Spain, and the United Kingdom). The sample covers CEO turnovers throughout 2,434 firm-year observations during the years 2011-2021.

Our findings indicate a negative and significant effect of irresponsibility on Tobin's Q, thereby suggesting corporate misbehavior hurts firm value. We further document that firm irresponsibility has a positive and significant effect on CEO turnover. Specifically, we find a positive effect of a firm's engagement in irresponsible practices on CEO turnover due to a decrease in firm value. The results are robust to different measures of a firm's engagement in irresponsible activities. Overall, our findings suggest that in many countries, CEOs are held accountable and replaced for ESG-related corporate misbehavior only when it poses harm to the company's market value.

We contribute to the thriving area of studies focusing on the consequences of firm irresponsibility on firm value and CEO turnover. We also extend the potential-outcomes framework and causal directed acyclic graphs (DAG) methodologies of causal inference to research in ESG and corporate finance. This methodology has great potential for

Finance and other research fields in Business Economics since the causal inference approach has been recently one of the major advancements in methods of mediation analysis (Nguyen, Schmid & Stuart, 2021). Moreover, we also contribute to the literature examining disciplinary actions towards managers following less than optimal performance or even misconduct (see e.g., Karpoff, Lee, & Martin, 2008). To extend In a recent paper, Colak, Korkeamäki, and Meyer (2024) report that reputational concerns increase the likelihood of CEO turnover. We contribute to academic knowledge by showing that their finding is potentially caused by changes in firm value due to misbehavior, rather than by the corporate misbehavior itself. Our findings also suggest there might be a non-linear effect of irresponsible practices on firm value (i.e., different levels of irresponsible practices do not impact firm value uniformly). We argue that, in addition to being academically interesting, our findings are also relevant to investors, regulators, and policymakers.

The rest of the paper is organized as follows: Section 2 presents the theoretical framework that our study is based on. Section 3 introduces the empirical design of the paper, including the sample, employed variables, the empirical models, and the methodology. Section 4 presents the descriptive statistics, our main findings, as well as robustness checks. Finally, section 5 provides concluding remarks.

2. Theoretical framework

2.1. Firm value and irresponsibility

Although irresponsible behavior has not been explicitly discussed in the CSR literature (Lange & Washburn, 2012), we cannot consider it just as the counterpart of ESG but rather as a complete, conceptual, and empirically distinct construct (Mattingly & Berman, 2006; Strike, Gao, and Bansal, 2006). Previous literature defines corporate

social irresponsibility (CSiR) as a firm's engagement in corporate actions that negatively affect others (e.g., Frooman, 1997; Godfrey et al., 2009; Lin-Hi & Müller, 2013; Fu, Tang & Chen, 2020; Markoczy, Kolev & Qian, 2023). Strike et al. (2006) posit irresponsibility as a source of value destruction due to harming stakeholders' welfare. Furthermore, irresponsible behavior may be seen as detrimental to stakeholders other than firm management, and it can entail a more significant impact than the potential positive effects of good ESG engagement (O'Sullivan, Zolotoy & Fan, 2021).

One potential mechanism causing a decrease in firm value due to irresponsibility is the attraction of attention (Lange & Washburn, 2012). Irresponsible behavior gathers attention from mass media and society, especially in the case of controversial industries and large corporations (Jo & Na, 2012; Tang et al., 2015). The irresponsible behavior can act as a negative signal to the market: irresponsibility puts firms in a negative spotlight which, in fact, may dilute the attractiveness of a particular stock, thereby decreasing its market value and potentially even causing divestment from the company (Barnett & Salomon, 2006). Negative media coverage related to ESG issues is also documented to harm a firm's business reputation (Baloria and Heese, 2018). Consequently, firms are very sensitive to how the media reports and comments upon their decisions and actions.

The negative media attention also increases the company's financial risk directly (Kölbel, Busch & Jancso, 2017; Hawn, 2021). For example, Price and Sun (2017) depict how irresponsible behavior can increase a firm's idiosyncratic risk, thereby consequently influencing the stock's market price and volatility. Becchetti et al. (2023) report that ESG misconduct increases the cost of equity for a firm by the increase of its reputational risk, while Chava (2014) finds environmental externalities to increase the cost of capital and debt of unsustainable companies. Consequently, to summarize, irresponsibility can decrease a firm market value via declines in stock prices due to an increase in firm risk,

consumer retaliation, and divestment from investors. For example, a negative product social performance decreases firm performance (Jayachandran, Kalaignanam & Eilert, 2013), while it reduces the consumers' willingness to pay and purchase intentions (Ferreira & Ribeiro, 2016). In the same vein, Antonetti & Maklan (2016a) find that market reactions to a loss of reputation stemming from irresponsible behavior can be magnified depending on consumers and stakeholders' level of anger, especially when stakeholders identify themselves with those stakeholders affected by the firm irresponsibility (Antonetti & Maklan, 2016b).

2.2. Irresponsibility and CEO turnover

Earlier studies widely document an increased likelihood of CEO turnover following poor firm performance (e.g., Coughlan and Schmidt, 1985; Warner et al., 1988; Weisbach, 1988; Parrino, 1997). Reportedly, stakeholders often attribute a firm's irresponsible behavior to the CEO (Den Hond et al., 2014; Mui & Hill, 2023). As Chiu and Sharfman (2018) posit, firms' crisis of legitimacy due to CSiR reflects failures in their strategic leadership. For example, Pearce and Manz (2011) find that leadership style and selection are most likely to play a role in CSiR.

Furthermore, earlier studies widely suggest that poor firm performance contributes to CEO turnover decisions and that a forced CEO turnover generally leads to improved financial performance of the company (see e.g., Eisfeldt & Rampini, 2008; Evans, Nagarajan, and Schloetzer, 2010). Earlier research indicates that corporate boards follow firm performance closely and, in case of an actual deviation from the expected performance, the likelihood of CEO turnover is higher (Farrell & Whidbee, 2003).

In addition to potential direct financial consequences caused by irresponsible firm behavior, corporate boards can also discipline their CEOs due to ESG-related incidents that hurt primarily the stakeholders. Colak, Korkeamäki, and Meyer (2024) examine the

relationship between CEO turnover and the media coverage of ESG-related problems in a company and document that the likelihood of CEO turnover increases significantly when the media coverage of the ESG incidents reaches extreme levels. Interestingly, the CEO turnover occurs also in cases where the stock price does not decline. Consequently, reputational concerns are an important determinant of CEO turnover decisions around the world.

Interestingly, earlier findings further indicate that CEOs are often blamed for poor firm performance even when their decisions are similar to the decisions made by the CEOs of comparable firms (e.g., Khanna and Poulsen, 1995; Farrell and Whidbee, 2002). Instead of looking at voluntary vs. forced CEO turnovers, Jenter and Lewellen (2021) focus on performance-induced CEO turnovers, that is, turnovers that would not have taken place had the firm performance been 'good'. They estimate that 38%–55% of CEO turnovers are performance-induced, which is a much larger share of turnovers than the commonly documented portion of forced turnovers.

Assuming the magnitude of the irresponsible practices is enough to put the firm into a negative spotlight that may lead to a decreased firm value, affected companies have more incentives to announce a CEO turnover as a signal to the market to alleviate the potential harmful effect of CSiR on its firm risk and market value. Thus, CEO turnover is seen as one of the main corporate governance mechanisms that can be employed to change the course and turn the corporate performance fortune around. Figure 1 represents a directed acyclic graph (DAG) with the expected relationships between firm value, irresponsible practices, and CEO turnover. Hence, we hypothesize:

Hypothesis 1: Corporate social irresponsibility has a negative effect on firm value, thereby increasing the likelihood of a CEO turnover.

INSERT FIGURE 1 HERE

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3. Empirical design

3.1. Sample criteria

Our sample consists of US and European publicly traded companies from 2011 to 2021. We gather financial data from Worldscope and data on irresponsible practices from Refinitiv Eikon. Other governance data comes from NRG metrics database.

We apply some sample selection criteria to build our sample: after excluding countries with poor coverage of ESG data, we eliminate firms from the finance, insurance, and real estate industries (SIC codes 6,000-6,799). We transform both the ESG and ESG controversies scores provided by Eikon from a 100-point scale to a 10-point scale to avoid heteroscedasticity problems (Cheng, Ioannou, & Serafeim, 2014; Fuente, Ortiz, & Velasco, 2022). Finally, we look for outlying observations within our data and winsorize financial variables at the 1st and 99th percentiles. We do not winsorize the governance and ESG variables, since those do not display extreme outlier observations. Observations with missing data on our key variables are omitted.

Table 1 depicts the sample distribution by country and year. Our final sample includes CEO turnovers from 2,434 firm-year observations within the 2011-2021 period. It comprises firms from the United States and 16 European countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Spain, and the United Kingdom. The number of observations has increased in the most recent years due to the higher availability of data on ESG and irresponsible practices. The United Kingdom represents 30.73% of our sample, followed by Germany (17.71%) and France (10.07%).

INSERT TABLE 1 HERE

3.2. Variables

3.2.1. CEO turnover

Our analyses are based on identifying the firms with CEO change during the sample period. We therefore encode the names of the CEOs within our sample, generating a specific ID for each CEO. We then compare the year-to-year observations to identify CEO turnovers for each firm. Whenever the CEO ID differs from the previous firm-year observation, we label the observation as a CEO turnover (*CEOturnover*=1).

3.2.2. Irresponsible practices and firm value:

As for the treatment, we build a binary measure of irresponsible practices: *Controversies*. First, we look at all the controversies variables provided by Refinitiv. Whenever a firm has engaged in a controversy of any kind, we define that firm as irresponsible for that specific year. Thus, *Controversies* is a dummy variable equal to one if the firm has engaged in irresponsible practices within the year, zero otherwise. Furthermore, we define a firm with no irresponsible practices (*Controversies*=0) whenever it has a score of 0 in the *ESGControversiesScore* provided by Refinitiv. This is an inverted 10-point scale where firms with no irresponsible practices present a score of 10 out of 10. We revert this scale to present our analyses more intuitively. Therefore, a score of 0 out 10 means no irresponsible practices, while the more irresponsible practices engaged by the firm, the higher the ESG controversies score. Additionally, we use this *ESGControversiesScore* as an alternative (continuous treatment) measure of a firm's engagement in irresponsible practices.

Besides the explanatory variables, we use firm value as a mediator between a firm's engagement in irresponsible practices and CEO turnover. We measure firm value by Tobin's Q, the ratio of a firm's market value to its book value of assets (*TobinQ*). Tobin's Q is calculated as (market value of equity + book value of debt + book value of the preferred stock) divided by the book value of total assets. We select Tobin's Q as the measure of firm value instead of, e.g., stock prices, since it is a long-term measure that indicates the firm's ability to enhance performance over time (Caton, Goh, & Donaldson, 2001). Moreover, Tobin's Q also takes the risk-return relationship into account (Jose et al. 1996).

3.2.3. Control variables

Following previous literature (see e.g., Eisfeldt & Rampini, 2008; Evans et al., 2010; Colak et al., 2024), we control for several firm characteristics which potentially may have an impact on CEO turnover. We control for *ROA* (firm performance as return on assets), *SIZE* (a firm's size as the natural logarithm of the book value of total assets), *INVEST* (investment opportunities as the ratio of CAPEX to the book value of assets), and *CASH* (cash reserves as the ratio of cash to the book value of assets). We also control for ESG_{t-1} (past ESG performance as the ESG score in the previous year), as well as other governance variables such as *CEOduality* (a dummy variable equal to one if the CEO is also the board chair, zero otherwise), *CEOtenure* (experience as the number of years of the CEO on the firm) and *CEOgender* (a dummy variable equal to one if the CEO is a female, zero otherwise).

3.3. Empirical models and estimation methodology

We use semiparametric models within the potential-outcome means framework to estimate the causal mediation effects (Imbens, 2004; Cunningham, 2021). Our models combine matching with regression (probit and linear) estimators clustered at firm level.

The matching is conducted using a method of moments (MM) matrix of covariates for the companies in our sample: individuals with similar matrixes of covariates are grouped together to be used as treated and control observations when estimating the effect of irresponsible practices on CEO turnover. This approach allows to combine "some of the desirable variance properties of regression with the consistency of matching" (Imbens, 2004, p. 11).

Potential-outcomes means estimate the average outcomes for the population (Cunningham, 2021). Since every unit within that population has one potential outcome for each value level of the treatment (Imbens, 2020), using the binary treatment of *Controversies* leads to 2 different outcomes for every observation in our sample (i.e., treated vs not treated). Likewise, applying the continuous treatment *ESGControversiesScore* would yield a potential outcome for each level of the score:

$$POM_{t,t'} \equiv \mathrm{E}\left[Y_i\left(t, M_i(t')\right)\right]$$

$$\hat{POM}_{t,t'} \equiv \frac{1}{N}\sum_{i=1}^{N} Y_i\left(t, M_i(t')\right) | X_i = x$$

To estimate the average potential outcomes of our sample, $\hat{POM}_{t,t'}$, we apply a combination of parametric outcome and mediator models to the general form of causal mediation (Nguyen et al., 2022). Thus, we run probit and linear models to estimate the mediator and the direct and indirect effects of treatment on the potential outcomes:

$$\Phi\left(\eta_i^Y\right) = \beta_0 + \beta_1 T_i + \beta_2 M_i + \beta_3 T_i M_i + W_i\gamma$$

$$\eta_i^M = \alpha_0 + \alpha_1 T_i + Z_i\zeta$$

Where W_i and Z_i are potentially overlapping sets of covariates. T_i and M_i are the treatment and mediator variables, respectively. η_i^M represents a linear model for the continuous mediator, while $\Phi\left(\eta_i^Y\right)$ corresponds to the cumulative normal distribution

function of a probit model used to estimate the effect of the treatment, mediator and their interactions on the binary potential outcome CEO turnover. General form and assumptions of the causal mediation models are included in Appendix 1.

The causal effect from a treatment in mediation models comes from the comparison of counterfactuals within the potential-outcomes framework (Pearl, 2012; Imbens, 2020). Consequently, the total effect of a causal mediation model estimates the average difference between the expected potential outcomes of all the individuals under the treatment condition against the counterfactual of not receiving such treatment[3]:

$$TE \equiv \mathrm{E}\big[Y_i\big(1, M(1)\big)\big] - \mathrm{E}\big[Y_i\big(0, M(0)\big)\big]$$

Furthermore, causal mediation models allow for disentangling the effect through direct and indirect paths. This two-fold decomposition can be represented in terms of average total effects (ATE) decomposition 1 or ATE decomposition 2[4]. Following Nguyen et al. (2021), we make no prior assumptions regarding how the total effect can be decomposed, thus reporting and analyzing both decompositions in our models.

On the one hand, ATE decomposition 1 assumes the existence of a natural direct effect (NDE), and aims to determine whether a natural indirect effect (NIE) exists through the mediator (Nguyen et al., 2021):

$$NDE \equiv \mathrm{E}\big[Y_i\big(1, M(0)\big)\big] - \mathrm{E}\big[Y_i\big(0, M(0)\big)\big]$$

$$NIE \equiv \mathrm{E}\big[Y_i\big(1, M(1)\big)\big] - \mathrm{E}\big[Y_i\big(1, M(0)\big)\big]$$

Where the natural direct effect assesses the effect of the treatment without the presence of any mediation. The natural indirect effect estimates the effect of the mediator under the treatment condition. On the other hand, ATE decomposition 2 studies the pure

[3] This formulation can be extended straightforwardly to multivalued and continuous treatments (see e.g., (VanderWeele & Tchetgen Tchetgen, 2017; Nguyen et al., 2022).

[4] We take terminology from various papers from the causal mediation literature (see, e.g., Robins and Greenland, 1992; VanderWeele 2015; Pearl and MacKenzie; 2018). We introduce the formulas for binary treatments throughout the paper for the sake of simplicity.

natural indirect effect (PNIE) of the mediator under the untreated condition and differentiates it from the total natural direct effect (TNDE) of the treatment when the mediator is held at its value under the treated condition:

$$PNIE \equiv \mathrm{E}\big[Y_i\big(0, M(1)\big)\big] - \mathrm{E}\big[Y_i\big(0, M(0)\big)\big]$$
$$TNDE \equiv \mathrm{E}\big[Y_i\big(1, M(1)\big)\big] - \mathrm{E}\big[Y_i\big(0, M(1)\big)\big]$$

4. Results

4.1. Descriptive statistics

Table 2 summarizes the descriptive statistics. Our sample displays an average *ESGControversiesScore* of 0.84 out of 10 within the period, and a past ESG performance of 5.25 out of 10. This can indicate that a relatively low performance based on the ESG scores does not necessarily involve engagement in an irresponsible practice. More than 75% of the sample CEOs are males, and the average tenure within the sample is almost 10 years, thus explaining the low portion of turnovers during the sample period 2011-2021.

Table 3 presents the Spearman's pairwise correlation matrix for all variables. As expected, our measures of a firm's engagement in irresponsible practices (*ESGControversiesScore* and *Controversies*) are highly positively correlated since both of these alternative variables measure irresponsibility within the firm. We do not find any high statistically significant correlation within the variables included in the models, thus alleviating the potential multicollinearity concerns.

INSERT TABLES 2 AND 3 HERE

4.2. Effect estimation

Table 4 (panel A) presents the results of our causal mediation model. Column (1) presents the mediation linear model and column (2) the outcome probit model. The mediation model shows a significant negative effect of irresponsible practices on firm value (α_1= –0.4212; p-value<0.01). The treatment-mediator interaction is significantly negative (β_3= –0.2315; p-value<0.01) which indicates that one may offset the other due to having opposite signs yielding to a small or insignificant total effect (Imai et al., 2010; Aguinis et al., 2017). The outcome model results in a significant positive effect of irresponsible practices on CEO turnover (β_1= 0.3925; p-value<0.05) while the mediator is no longer statistically significant (β_2= 0.0189; p-value>0.1).

INSERT TABLE 4 HERE

Panel B displays the potential outcome means and total effect decomposition. From the potential outcomes under the irresponsible practices, we find an increase of the likelihood of a CEO turnover compared to the potential outcomes of no irresponsible practices, while having the expected mediator value with and without the treatment condition (Y1M1–Y0M0). We find some remarkably different nuances in the results of the total effect decomposition. Firstly, there is only a significant positive natural indirect effect of irresponsible practices on CEO turnover (Y1M1–Y1M0= 0.0150; p-value<0.05). The lack of statistical significance in both the NDE and TE suggests that the potential outcome of changes in firm value due to irresponsible practices offset other effects of these irresponsible practices on CEO turnover. Similarly, we find no total natural direct effect when the mediator is held at the value under the treatment condition (Y1M1-Y0M1). No statistically significant value is found when analyzing counterfactual

potential outcomes under the non-treatment condition (Y0M1-Y0M0). The lack of a pure natural indirect effect corroborates the role of irresponsible practices, decreasing firm value as the cause of an increase in the likelihood of CEO turnover.

Overall, these findings suggest irresponsible practices increase the likelihood of a CEO turnover by 2% only when there is a decrease in firm value. The actual effect is lower than the results from the outcome model, as expected from the negative interaction between irresponsible practices and firm value.

4.3. Effect identification (endogeneity concerns)

Causal mediation models rely on several untestable assumptions such as conditional independence or unconfoundedness, overlap and stable unit treatment-value assumptions (see Appendix 1 for the notation of these assumptions following prior studies on causal inference). When violated, these assumptions can deter the estimations and thus make the causal mediation effects unidentifiable.

The conditional independence assumption requires the models to have no intermediate variables (i.e., unobserved characteristics) affecting the mediator-outcome model for the causal effects to be consistent. Since the mediator is not likely to be exogenous nor based on a random assignment, we use instrumental variables to estimate the mediator to alleviate potential concerns about confounding variables in the mediation models (Imbens, 2004; Shaver, 2005).

The overlap assumption can be somewhat assessed by the characteristics of the data. Our *Controversies* variable displays a mean of 0.1753, which implies that the number of observations with irresponsible practices is positive albeit lower than 20% of the sample. Similarly, the *ESGControversiesScore* displays a mean of 0.8426 out of 10.

While both means are low, it is reasonable to assume that the probability of having a unit under the treatment condition (irresponsible practices) is strictly between 0 and 1.

As for the stable unit treatment-value assumption, the potential outcomes of a unit must reflect only the treatment assigned to that unit. We argue that the irresponsible practices are not likely to have an impact on the CEO turnover of another company. The same reasoning applies to firm value. While some CEOs may be subject to pressures regarding market situations against other competitors, we assume that an increase in the value of company *A* will not influence the probability of a CEO being fired from company *B*. Thus, assuming the potential outcomes on CEO turnover within each firm reflects only the treatment and mediator values for that unit seems plausible given the nature of our data and the phenomenon of study.

Besides these common assumptions for causal mediation effects, reverse causality may arise withing our research design. If irresponsible practices affect CEO turnover, consequently, this effect will intuitively have an impact in other covariates like *CEOgender* or *CEOduality*. Additionally, under the scenario of a CEO turnover the *CEOtenure* will change, thus compromising the consistency of our estimated effects. A similar problem stems from the relationship between the mediator, *TobinQ*, and its potential effects on irresponsible practices. Furthermore, CEO turnover may imply changes in the management style (Pearce & Manz, 2011), therefore our potential outcomes of *CEOturnover* could have an impact on the treatment *Controversies*. We forward the dependent variable and lag the treatment for 1 period to alleviate these reverse causality concerns. Moreover, we lag all the covariates for 2 periods since "it is important that these variables are not affected by the treatment" (Imbens, 2004, p.5). This also allows us to control for any problems regarding subsequent temporal ordering of our variables (VanderWeele & Tchetgen Tchetgen, 2017). Figure 2 represents the DAG with

the causal mediation model validated for reverse causality and unconfoundedness concerns.

INSERT FIGURE 2 HERE

INSERT TABLE 5 HERE

Table 5 presents the results for the causal mediation model after addressing the concerns over effect identification. Column (1) presents the mediation linear model and column (2) the outcome probit model using instrumental variables. The mediator ivTobinQ is an estimation of the first stage regression from a 2SLS model using the mean Tobin's Q of each industry and country as instruments for firm value. Cragg-Donald F-statistics and Sargan overidentification test support the relevance of validity of our instrumental variables. These instruments are likely to be correlated with firm value while having no effect on the potential outcome of a CEO being fired. Our results regarding effect estimation and decomposition are confirmed when using the causal mediation model validated for effect identification under a binary treatment condition.

4.4. Robustness tests (sensitivity analyses)

Table 6 reports the results for our models using the *ESGControversiesScore* as a continuous treatment. All our results are robust to introducing this alternative measure of irresponsible practices using the baseline causal model and the validated through an IV approach.[5] Panel A displays the effect estimation. Irresponsible practices have a negative

[5] Here we present the results using *ESGControversiesScore* in the IV model and report only one decomposition for the sake of brevity. Results are robust to all the previous effects estimation and decomposition under the binary treatment condition.

and significant effect on firm value (α_1= –0.1041; p-value<0.01) in the linear mediation model, as well as a positive and significant effect on CEO turnover in the probit outcome model (β_1= 0.0767; p-value<0.01). The treatment-mediator interaction remains negative and statistically significant (β_3= –0.0377; p-value<0.05)

INSERT TABLE 6 HERE

Panel B of Table 6 reports the effect decomposition under a continuous treatment. Units are grouped depending on their *ESGControversiesScore*, using those observations with a score of 0 out of 10 as a control group (i.e., no irresponsible practices). We find an increasingly positive natural indirect effect of irresponsible practices on CEO turnover via firm value. However, this effect is only statistically relevant for the groups with a score of 8 or above out of 10. For companies with a score between 7 and 8, the likelihood of a CEO turnover increases by 3.7%, whereas CEOs in companies with a score between 8 and 9 can experience almost a 5% increase. Meanwhile, those companies with the worst scores of a 9 to 10 out of 10 will increase by 6.6% the likelihood of a CEO turnover. In addition to confirming our main results, these findings further suggest that the effect of irresponsible practices on firm value might be non-linear. Likewise, the level of irresponsible practices that triggers disciplinary actions such as CEO turnover because of corporate misbehavior may vary across companies depending on the severity of such irresponsible practices, conditional to an actual deterioration of the company's market value.

This effect decomposition is robust to different criteria regarding group classifications from 2 to 10 different groups[6]. In additional analyses we control for the

[6] Nontabulated sensitivity analyses and robustness tests are available upon request.

presence of UK and US firms in the sample. Companies from the UK and the US may differ from other European firms due to different cultural environments while being representative as half of our sample belongs to those countries. Our findings are robust to controlling for these companies, as well as to excluding observations from UK and US when conducting the effect estimation and decomposition.

Further robustness analyses were performed controlling for extreme (minimum and maximum) values of firm value and analyzing the subsample of only irresponsible companies. Although we are considering subsequent time effects in our validated model, we introduce the baseline values of the mediator as a covariate in the mediation model since such baseline values may have an impact (i.e., act as an unobserved characteristic) of the subsequent values of exposure and mediator on the outcome (VanderWeele & Tchetgen Tchetgen, 2017). Moreover, while fixed effects are not particularly relevant to our models due to the matching of units conducted before the regressions, we run additional analyses introducing industry, country, and year fixed effects as covariates in the outcome model. We also exclude years 2020 and 2021 from the sample in order to alleviate concerns about the potential impact of COVID-19 on our findings. The effect estimation and natural indirect effect of irresponsible practices remain significant during all the robustness analyses.

5. Conclusion

We examine the relationship between controversies and CEO turnover. Estimating potential outcome means, our findings suggest that in many countries, CEOs are replaced for ESG-related corporate misbehavior. However, disentangling this effect and, more precisely, the lack of a natural direct effect suggests that companies take action against corporate misbehavior only when it poses a threat to their market value. We,

therefore, document that firm irresponsibility has a negative and significant effect on firm value, which further results in a positive natural indirect effect on CEO turnover. The results are robust to different alternative measures of a firm's engagement in irresponsible activities and sensitivity analyses.

Examining these research questions will contribute to both theory and practice. In particular, we contribute to the scarce area of studies focusing on the consequences of firm irresponsibility on firm value and CEO turnover. We also contribute to the literature examining disciplinary actions towards managers following less-than-optimal performance or even misconduct (see e.g., Karpoff, Lee, & Martin, 2008).

In comparison to the recent findings by Colak, Korkeamäki, and Meyer (2024), we focus on examining irresponsible firm practices while they examine the ESG risk. We are interested in changes in firm value while Colak et al. (2024) also examine 'non-pecuniary' concerns that are ESG-related issues that have little impact on shareholder wealth. Thus, we contribute to academic knowledge by extending the approach of causal inference, potential-outcomes and mediation to the context of ESG and corporate finance while studying the non-linear mediation effect of irresponsible practices in CEO turnover via firm value.

Future research could focus on the antecedents of irresponsible practices rather than on firm characteristics. Some exploratory analyses suggest differences between countries (especially in the UK and the US in relation to the EU members). Research on cultural and other intrinsic factors of each country could help elucidate the effects of different institutional contexts. Moreover, given the validity conditions are met, future research could analyze time, culture and other external shock effects using a causal inference diff-in-diff approach (e.g., attention paid to controversies by society).

Even though more research and periodic reviews need to be conducted to address these dynamic phenomena in the real world, our analyses suggest firm value may be the main mechanism by which irresponsible practices have an impact on CEO turnover nowadays. Delving into governance characteristics such as board composition and individual behavioral components should be of utter interest for understanding these dynamics within complex business organizations. Additionally, studying and introducing personal characteristics such as moderating variables or determinants of CEO turnover could contribute to understanding the causal effects between managers personal traits and corporate disciplinary actions. For example, we found significance of CEO gender as a covariate which is an interesting result. This could imply that female CEOs are evaluated and punished differently than their male counterparts. Future research can delve into these personal traits and their interactions with corporate decisions at firm level.

In addition to being academically interesting, we argue that our findings are also relevant, for example, to investors, regulators, and policymakers, as this paper provides practical insights on the importance of managing the effects of corporate misbehavior on stakeholder relationships. Although our study points out that continuous engagement in irresponsible practices might suppose for manager and increase of up to 6% of the likelihood of being fired, the lack of direct or total effect of irresponsible practices on CEO turnover, which suggest this effect is solely because decreases in market value. However, based on earlier studies, (see e.g., Price & Sun, 2017), incidents related to corporate misbehavior have longer enduring effects on the companies than CSR initiatives, thereby highlighting the importance of avoiding corporate misbehavior. Consequently, corporate boards and investors should adopt a long-term-oriented vision and consider irresponsible practices when assessing top managers' performance in their roles for the firm besides immediate changes in firm market value.

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Table 1
Sample distribution by year and country

Panel A: Distribution of firm-year observations by year		
Year	**No. of observations**	**of observations**
2011	81	3.33
2012	136	5.59
2013	137	5.63
2014	130	5.34
2015	138	5.67
2016	159	6.53
2017	189	7.76
2018	225	9.24
2019	367	15.08
2020	425	17.46
2021	447	18.36
Total	**2434**	**100.00**
Panel B: Distribution of firm-year observations by country		
Country	**No. of observations**	**of observations**
Austria	78	3.20
Belgium	55	2.26
Denmark	136	5.59
Finland	152	6.24
France	245	10.07
Germany	431	17.71
Greece	33	1.36
Ireland	64	2.63
Italy	46	1.89
Luxembourg	16	0.66
The Netherlands	37	1.52
Norway	55	2.26
Poland	19	0.78
Portugal	7	0.29
Spain	196	8.05
The UK	748	30.73
The United States	116	4.77
Total	**2434**	**100.00**

This table shows the distribution of firm-year observations by year (Panel A) and by country (Panel B). The sample comprises an unbalanced panel of listed companies from 16 European countries and the United States during the 2011-2021 period.

Table 2
Descriptive statistics

Variable	N	Mean	SD	p25	Median	p75
CEOturnover	2413	0.1123	0.3158	0	0	0
Independent variables						
ESGControversiesScore	2413	0.8426	2.1923	0	0	0
Controversies	2413	0.1753	0.3803	0	0	0
Mediation variables						
TobinQ	2413	2.0754	1.9933	1.1345	1.4394	2.2114
Control variables						
ROA	2413	0.0669	0.1160	0.0309	0.0658	0.1089
SIZE	2413	14.8619	1.5642	13.8211	14.7764	15.9292
INVEST	2413	0.0398	0.0350	0.0164	0.0315	0.0544
CASH	2413	0.1039	0.0946	0.0418	0.0791	0.1361
ESG_{t-1}	2413	5.2459	1.9164	3.8720	5.3346	6.7363
CEOduality	2413	0.2009	0.4008	0	0	0
CEOtenure	2413	9.7281	8.0923	3	7	14
CEOgender	2413	0.0513	0.2208	0	0	0

This table summarizes the main descriptive statistics of the final sample. *CEOturnover* is a dummy variable equal to one if the firm had a CEO turnover within the year, zero otherwise. Irresponsible practices are captured by *ESGControversiesScore* (a score from 0 to 10 which equals 0 if a firm has engaged in no irresponsible practices) and *Controversies* (a dummy variable equal to one if the firm engaged in irresponsible practices, zero otherwise). Firm value is measured with the Tobin Q for each firm-year observation. Control variables are *ROA* (a firm's financial performance as return on assets), *SIZE* (a firm's size as the natural logarithm of the book value of total assets), *INVEST* (investment opportunities as the ratio of CAPEX to the book value of assets), *CASH* (cash reserves as the ratio of cash to the book value of assets), *TANG* (asset tangibility as the ratio of property, plant and equipment to the book value of assets), ESG_{t-1} (past ESG performance as the ESG score in the previous year), *CEOduality* (a dummy variable equal to one if the CEO is also the board chair, zero otherwise), *CEOtenure* (experience as the number of years of the CEO on the firm) and *CEOgender* (a dummy variable equal to one if the CEO is a female, zero otherwise). All variables are winsorized at the 1st and 99th percentiles (except for ESG and governance variables, which do not display extreme outlier observations).

Table 3
Spearman's pairwise correlations

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1.CEOturnover	1											
2.ESGControversiesScore	0.0239	1										
3.Controversies	0.0259	0.834***	1									
4.TobinQ	0.0129	-0.0970***	-0.0804***	1								
5.ROA	0.0294	-0.0202	0.0193	0.352***	1							
6.SIZE	0.0204	0.420***	0.484***	-0.271***	0.0465*	1						
7.INVEST	-0.00884	0.0246	0.0251	0.0162	0.107***	0.0308	1					
8.CASH	-0.00786	-0.0672***	-0.0789***	0.288***	-0.0318	-0.266***	-0.0797***	1				
9.ESG_{t-1}	0.00164	0.267***	0.315***	-0.0939***	0.0622**	0.602***	0.00653	-0.137***	1			
10.CEOduality	-0.00481	0.00474	0.00810	-0.0233	-0.0114	0.0884***	-0.00576	0.0547**	0.0276	1		
11.CEOtenure	-0.237***	-0.0278	-0.0511*	0.0274	-0.0135	-0.000391	-0.0124	0.0281	0.0409*	-0.0459*	1	
12.CEOgender	0.0539**	-0.0318	-0.0431*	-0.000875	-0.0224	-0.0281	0.0310	0.0279	-0.0324	-0.00901	-0.0430*	1

This table shows the pairwise Spearman correlation coefficients for our study's variables. All of them are winsorized at the 1st and 99th percentiles (except for ESG and governance variables, which do not display extreme outlier observations). ***, ** and * indicate statistical significance at the 0.1, 1, and 5 level respectively.

Table 4
CEO turnover, firm value, and irresponsible practices

PANEL A: ***Effect estimation***

	Dependent variable: TobinQ	**Dependent variable: CEOturnover**
	(1)	**(2)**
Constant	2.1493***	-1.1629***
	(0.0912)	(0.3849)
Controversies	-0.4212***	0.3925**
	(0.1424)	(0.1609)
Mediation variables		
TobinQ		0.0189
		(0.0144)
TobinQ*Controversies		-0.2315***
		(0.0780)
Control variables		
ROA		0.7078**
		(0.3081)
SIZE		0.0309
		(0.0291)
INVEST		-0.7696
		(1.0057)
CASH		0.2044
		(0.3869)
ESG_{t-1}		-0.0100
		(0.0211)
CEOduality		-0.0691
		(0.0774)
CEOtenure		-0.0744***
		(0.0106)
CEOgender		0.2846*
		(0.1473)
No. of obs.	2413	2413

PANEL B: *Total effect decomposition* (binary treatment)				
Control group: 0 (no irresponsible practices)	**Coefficient**	**p-value**	**[95% conf. interval]**	
PO means				
Y0M0	0.1124*** (0.0072)	0.000	0.0983	0.1265
Y1M0	0.1103*** (0.0149)	0.000	0.0811	0.1394
Y0M1	0.1110*** (0.0073)	0.000	0.0967	0.1253
Y1M1	0.1252*** (0.0179)	0.000	0.0901	0.1604
NIE				
***Controversies* (1 vs 0)**	0.0150** (0.0066)	0.024	0.0020	0.0279
NDE				
***Controversies* (1 vs 0)**	-0.0021 (0.0170)	0.901	-0.0354	0.0312
PNIE				
***Controversies* (1 vs 0)**	-0.0014 (0.0012)	0.247	-0.0037	0.0010
TNDE				
***Controversies* (1 vs 0)**	0.0142 (0.0197)	0.471	-0.0244	0.0529
TE				
***Controversies* (1 vs 0)**	0.0128 (0.0198)	0.516	-0.0259	0.0516

This table summarizes the causal mediation estimation results and effect decompositions. Panel A comprises the estimation results. Column (1) displays the estimation results for the mediation model while column (2) shows the results for the outcome model. The dependent variable in column (2) is a change of the CEO, which is measured by *CEOturnover* (a dummy variable equal to one if the firm had a CEO turnover within the year, zero otherwise). Irresponsible practices are captured by *Controversies* (a dummy variable equal to one if the firm engaged in irresponsible practices, zero otherwise). Firm value is measured with the Tobin Q for each firm-year observation and acts as dependent variable in column (1), as well as a mediator in column (2). *TobinQ*Controversies* captures the interactions between the independent variable and the mediator. Control variables are: *ROA* (a firm's financial performance as return on assets), *SIZE* (a firm's size as the natural logarithm of the book value of total assets), *INVEST* (investment opportunities as the ratio of CAPEX to the book value of assets), *CASH* (cash reserves as the ratio of cash to the book value of assets), *TANG* (asset tangibility as the ratio of property, plant and equipment to the book value of assets), ESG_{t-1} (past ESG performance as the ESG score in the previous year), *CEOduality* (a dummy variable equal to one if the CEO is also the board chair, zero otherwise), *CEOtenure* (experience as the number of years of the CEO on the firm) and *CEOgender* (a dummy variable equal to one if the CEO is a female, zero otherwise). Standard errors are shown in parentheses under coefficients. ***, ** and * indicate statistical significance at the 1, 5, and 10 level, respectively.
Panel B presents the potential outcome means and both decompositions of the effects of the causal mediation model: natural indirect effect (NIE), natural direct effect (NDE), pure natural indirect effect (PNIE), total natural direct effect (TNDE) and total effect (TE). These effects are contrasted against the control group (*Controversies*=0). Standard errors are shown in parentheses under coefficients. ***, ** and * indicate statistical significance at the 1, 5, and 10 level, respectively.

Table 5
Causal mediation model validated

PANEL A: ***IV Effect estimation***		
	Dependent variable: ivTobinQ	**Dependent variable: $CEOturnover_{t+1}$**
	(1)	**(2)**
Constant	2.1342***	-1.2813**
	(0.0704)	(0.6134)
$Controversies_{t-1}$	-0.5313***	0.6583***
	(0.1325)	(0.2022)
Mediation variables		
ivTobinQ		0.0978*
		(0.0580)
ivTobinQ*$Controversies_{t-1}$		-0.2776***
		(0.0963)
Control variables		
ROA_{t-2}		0.7307
		(0.5093)
$SIZE_{t-2}$		-0.0016
		(0.0420)
$INVEST_{t-2}$		-0.3670
		(1.1978)
$CASH_{t-2}$		-0.4158
		(0.5501)
ESG_{t-2}		-0.0123
		(0.0288)
$CEOduality_{t-2}$		-0.0994
		(0.1172)
$CEOtenure_{t-2}$		-0.0095*
		(0.0056)
$CEOgender_{t-2}$		0.4429**
		(0.1786)
F-statistic	6.87***	
Weak identification test (Cragg-Donald statistic)	46.823	
Sargan overidentification test (p-value)	0.3597	
No. of obs.	1313	1313

PANEL B: *Total effect decomposition* (binary treatment)					
Control group: 0 (no irresponsible practices)		**Coefficient**	**p-value**	**[95% conf.**	**interval]**
PO means					
	Y0M0	0.1091*** (0.0095)	0.000	0.0903	0.1278
	Y1M0	0.1247*** (0.0218)	0.000	0.0820	0.1675
	Y0M1	0.0998*** (0.0100)	0.000	0.0802	0.1194
	Y1M1	0.1448*** (0.0247)	0.000	0.0964	0.1933
NIE					
	***Controversies*$_{t-1}$ (1 vs 0)**	0.0201** (0.0100)	0.0440	0.0005	0.0396
NDE					
	***Controversies*$_{t-1}$ (1 vs 0)**	0.0157 (0.0249)	0.5300	-0.0332	0.0646
PNIE					
	***Controversies*$_{t-1}$ (1 vs 0)**	-0.0092 (0.0061)	0.1300	-0.0212	0.0027
TNDE					
	***Controversies*$_{t-1}$ (1 vs 0)**	0.0450 (0.0274)	0.1010	-0.0088	0.0988
TE					
	***Controversies*$_{t-1}$ (1 vs 0)**	0.0358 (0.0277)	0.1960	-0.0185	0.0900

This table summarizes the causal mediation estimation results and effect decompositions after the validation of the model. Panel A comprises the estimation results using an instrumental variables approach. Column (1) displays the estimation results for the mediation model while column (2) shows the results for the outcome model. The dependent variable in column (2) is a change of the CEO forwarded one period, which is measured by *CEOturnover*$_{t+1}$ (a dummy variable equal to one if the firm had a CEO turnover within the year, zero otherwise). Past irresponsible practices are captured by *Controversies*$_{t-1}$ (a dummy variable equal to one if the firm engaged in irresponsible practices the year before, zero otherwise). Firm value acts as dependent variable in column (1), as well as a mediator in column (2). *ivTobinQ* is built from the first stage regression of a 2SLS model using the mean Tobin Q of the industry and country for each firm-year observation as instruments for Tobin Q. *ivTobinQ*Controversies*$_{t-1}$ captures the interactions between the independent variable and the mediator. All control variables have been lagged 2 periods: *ROA*$_{t-2}$ (a firm's financial performance as return on assets), *SIZE*$_{t-2}$ (a firm's size as the natural logarithm of the book value of total assets), *INVEST*$_{t-2}$ (investment opportunities as the ratio of CAPEX to the book value of assets), *CASH*$_{t-2}$ (cash reserves as the ratio of cash to the book value of assets), *TANG*$_{t-2}$ (asset tangibility as the ratio of property, plant and equipment to the book value of assets), *ESG*$_{t-2}$ (past ESG performance as the ESG score in the previous year), *CEOduality*$_{t-2}$ (a dummy variable equal to one if the CEO is also the board chair, zero otherwise), *CEOtenure*$_{t-2}$ (experience as the number of years of the CEO on the firm) and *CEOgender*$_{t-2}$ (a dummy variable equal to one if the CEO is a female, zero otherwise). F-statistic corresponds to the 2SLS model. The Cragg-Donald test evaluates instrument relevance. The Sargan test of overidentifying restrictions evaluates instrument validity. Standard errors are shown in parentheses under coefficients. ***, ** and * indicate statistical significance at the 1, 5, and 10 level, respectively.

Panel B presents the potential outcome means and both decompositions of the effects of the causal mediation model using lags and IV: natural indirect effect (NIE), natural direct effect (NDE), pure natural indirect effect (PNIE), total natural direct effect (TNDE) and total effect (TE). These effects are contrasted against control group (*Controversies*$_{t-1}$=0). Standard errors are shown in parentheses under coefficients. ***, ** and * indicate statistical significance at the 1, 5, and 10 level, respectively.

Table 6
Sensitivity analyses using *ESGControversiesScore*

PANEL A: *IV Effect estimation*

	Dependent variable: ivTobinQ	Dependent variable: $CEOturnover_{t+1}$
	(1)	(2)
Constant	2.1200***	-1.4206**
	(0.0688)	(0.6090)
$ESGControversiesScore_{t-1}$	-0.1041***	0.0767***
	(0.0153)	(0.0294)
Mediation variables		
ivTobinQ		0.0887
		(0.0564)
ivTobinQ*$ESGControversiesScore_{t-1}$		-0.0377**
		(0.0172)
Control variables		
ROA_{t-2}		0.5069
		(0.5264)
$SIZE_{t-2}$		0.0139
		(0.0415)
$INVEST_{t-2}$		-0.1226
		(1.1756)
$CASH_{t-2}$		-0.4367
		(0.5468)
ESG_{t-2}		-0.0161
		(0.0281)
$CEOduality_{t-2}$		-0.1198
		(0.1159)
$CEOtenure_{t-2}$		-0.0104*
		(0.0055)
$CEOgender_{t-2}$		0.4689***
		(0.1782)
F-statistic	6.87***	
Weak identification test (Cragg-Donald statistic)	46.823	
Sargan overidentification test (p-value)	0.3597	
Durbin-Wu-Hausman test (p-value)	0.8054	
No. of obs.	1324	1324

PANEL B: ***Total effect decomposition*** **(continuous treatment)**				
Control group: score=0 (no irresponsible practices)	**Coefficient**	**p-value**	**[95% conf. interval]**	
NIE				
***ESGControversiesScore*$_{t-1}$**				
(1 vs 0)	-0.0010 (0.0011)	0.374	-0.0032	0.0012
(2 vs 0)	-0.0005 (0.0023)	0.822	-0.0051	0.0040
(3 vs 0)	0.0014 (0.0038)	0.704	-0.0060	0.0089
(4 vs 0)	0.0049 (0.0058)	0.392	-0.0064	0.0163
(5 vs 0)	0.0101 (0.0084)	0.230	-0.0064	0.0265
(6 vs 0)	0.0169 (0.0117)	0.149	-0.0061	0.0399
(7 vs 0)	0.0257 (0.0160)	0.108	-0.0056	0.0571
(8 vs 0)	0.0366* (0.0213)	0.086	-0.0052	0.0785
(9 vs 0)	0.0499* (0.0279)	0.073	-0.0047	0.1046
(10 vs 0)	0.0658* (0.0358)	0.066	-0.0043	0.1360
NDE				
***ESGControversiesScore*$_{t-1}$**				
(1 vs 0)	-0.0013 (0.0046)	0.7700	-0.0103	0.0076
(2 vs 0)	-0.0023 (0.0089)	0.7960	-0.0197	0.0151
(3 vs 0)	-0.0029 (0.0130)	0.8250	-0.0283	0.0226
(4 vs 0)	-0.0030 (0.0168)	0.8560	-0.0360	0.0299
(5 vs 0)	-0.0028 (0.0205)	0.8900	-0.0430	0.0373
(6 vs 0)	-0.0023 (0.0240)	0.9250	-0.0494	0.0448
(7 vs 0)	-0.0013 (0.0274)	0.9610	-0.0551	0.0524
(8 vs 0)	-0.0000 (0.0307)	0.9990	-0.0603	0.0602
(9 vs 0)	0.0016 (0.0340)	0.9630	-0.0650	0.0681
(10 vs 0)	0.0035 (0.0372)	0.9250	-0.0693	0.0764

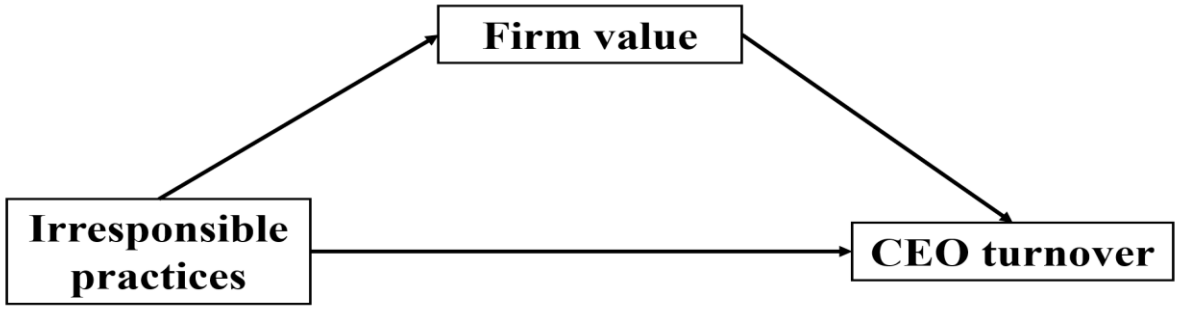
TE				
ESGControversiesScore$_{t-1}$				
(1 vs 0)	-0.0023 (0.0047)	0.6150	-0.0115	0.0068
(2 vs 0)	-0.0028 (0.0087)	0.7460	-0.0198	0.0142
(3 vs 0)	-0.0014 (0.0123)	0.9080	-0.0256	0.0227
(4 vs 0)	0.0019 (0.0158)	0.9050	-0.0291	0.0329
(5 vs 0)	0.0072 (0.0195)	0.7110	-0.0309	0.0454
(6 vs 0)	0.0146 (0.0236)	0.5340	-0.0315	0.0608
(7 vs 0)	0.0244 (0.0284)	0.3910	-0.0313	0.0801
(8 vs 0)	0.0366 (0.0343)	0.2860	-0.0307	0.1039
(9 vs 0)	0.0515 (0.0415)	0.2150	-0.0299	0.1329
(10 vs 0)	0.0694 (0.0502)	0.1670	-0.0290	0.1677

This table summarizes the causal mediation estimation results and effect decompositions using an alternative measure of irresponsible practices as a sensitivity analysis. Column (1) displays the estimation results for the mediation model while column (2) shows the results for the outcome model. Panel A comprises the estimation results using an instrumental variables approach. The dependent variable in column (2) is a change of the CEO forwarded one period, which is measured by $CEOturnover_{t+1}$ (a dummy variable equal to one if the firm had a CEO turnover within the year, zero otherwise). Past irresponsible practices are captured by $ESGControversiesScore_{t-1}$ (a score from 0 to 10 which equals 0 if a firm has engaged in no irresponsible practices). Firm value acts as dependent variable in column (1), as well as a mediator in column (2). *ivTobinQ* is built from the first stage regression of a 2SLS model using the mean Tobin Q of the industry and country for each firm-year observation as instruments for Tobin Q. $ivTobinQ*Controversies_{t-1}$ captures the interactions between the independent variable and the mediator. All control variables have been lagged 2 periods: ROA_{t-2} (a firm's financial performance as return on assets), $SIZE_{t-2}$ (a firm's size as the natural logarithm of the book value of total assets), $INVEST_{t-2}$ (investment opportunities as the ratio of CAPEX to the book value of assets), $CASH_{t-2}$ (cash reserves as the ratio of cash to the book value of assets), $TANG_{t-2}$ (asset tangibility as the ratio of property, plant and equipment to the book value of assets), ESG_{t-2} (past ESG performance as the ESG score in the previous year), $CEOduality_{t-2}$ (a dummy variable equal to one if the CEO is also the board chair, zero otherwise), $CEOtenure_{t-2}$ (experience as the number of years of the CEO on the firm) and $CEOgender_{t-2}$ (a dummy variable equal to one if the CEO is a female, zero otherwise). The Cragg-Donald F-statistic evaluates instrument relevance. The Sargan test of overidentifying restrictions evaluates instrument validity. The Durbin-Wu-Hausman statistic tests for exogeneity of *TobinQ*. Standard errors are shown in parentheses under coefficients. ***, ** and * indicate statistical significance at the 1, 5, and 10 level, respectively.

Panel B presents the potential outcome means and both decompositions of the effects of the causal mediation model using lags and IV: natural indirect effect (NIE), natural direct effect (NDE), and total effect (TE). The observations are clustered in 10 different groups depending on their scores. Each of those groups is contrasted against the control group ($ESGControversiesScore_{t-1}$=0). Standard errors are shown in parentheses under coefficients. ***, ** and * indicate statistical significance at the 1, 5, and 10 level, respectively.

Figure 1

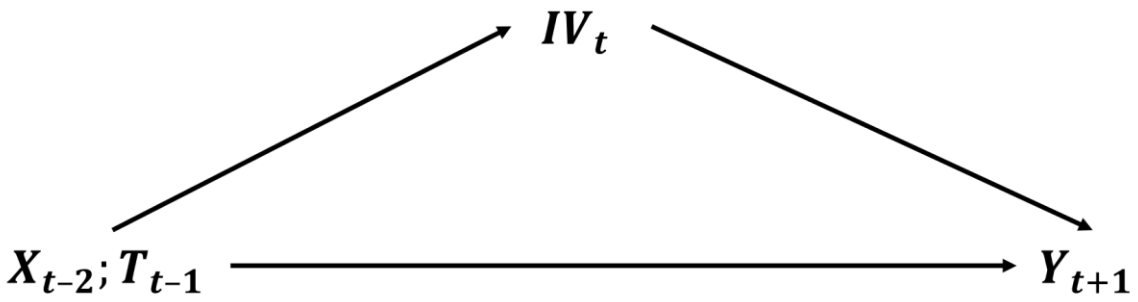
A model of firm value and irresponsible practices on CEO turnover



This DAG represents the causal mediation effect of a treatment *Irresponsible practices* on an outcome *CEO turnover* including its indirect effect through a mediator *firm value*.

Figure 2

Causal mediation model after validation



This DAG represents the causal mediation model on a forwarded potential outcome after using lags in the treatment and control variables, and applying an instrumental variables approach to introduce the mediation effect on the potential outcome.

Appendix 1. General form for causal mediation potential-outcome means and assumptions (Imbens, 2004; Imai, Keele & Tigley, 2010).

$$\mathrm{E}[Y_i(t, M_i(t')|X_i = x] = \int \mathrm{E}[Y_i|M_i = m, T_i = t, X_i = x]\, dF[m|T_i = t', X_i = x\,]$$

This general, nonparametric solution can be applied regardless of the outcome and mediator models. It can be extended to multivalued and continuous treatments under the same conditions. However, further assumptions such as sequential ignorability and stable unit treatment-value are required to identify the causal effects with observational data since the potential outcomes are not independent of the treatment assignation process (Imai et al., 2010). These assumptions are depicted as it follows:

The conditional independence assumption in causal inference requires that potential outcomes are independent of how the treatment has been assigned after conditioning (controlling) for a ser of observed covariates (control variables). Furthermore, mediation models require two different conditional assumptions since the selection process into the mediator is typically neither based on a random assignment (Imai et al, 2010).

$$\{Y_i[t, m], M_i(t')\} \perp T_i|X_i = x \qquad \text{(A.1)}$$

$$\{Y_i[t, m]\} \perp M_i(t')|T_i = t', X_i = x \qquad \text{(A.2)}$$

Where equation (A.1) represents the independence of the treatment assignment T to potential outcome Y and potential mediators M conditional on a set of observed covariates X. Equation (A.2) extends the conditional independence assumption to potential mediators being independent of the potential outcomes under the observed treatment and covariates.

While the existence of analogous treatment and control groups is required in order to identify the effect of a treatment (equation A.3), this overlap assumption common to causal inference (Imbens, 2004) needs to be extended for the mediation case (i.e., same principle applies to the mediator):

$$0 < \Pr\,(T_i = t|X_i = x) < 1, t \in \{0,1\} \qquad \text{(A.3)}$$

$$0 < \Pr\,(M_i(t) = m|T_i = t, X_i = x), t \in \{0,1\} \qquad \text{(A.4)}$$

Where equation (A.4) represents the overlap assumption for the mediation case. Finally, the definition of treatment and mediated effects requires a final assumption of stable unit treatment-value assumption. Therefore, the potential outcomes of an individual reflect the treatment assigned to that individual and are independent of treatment and mediator values of any other individuals. For further development and relaxations of these assumptions please see Imbens (2004).