

Propagation of ESG-Linked Compensation through Boardroom Connections

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Abstract

ESG-linked compensation policies propagate through common directors, impacting firm-level environmental innovation performance. Using a sample of U.S. listed firms during 2002-2020, we show that a firm is 2.7% more likely to implement ESG-pay policy if its board-connected peers have adopted it. This result is robust to alternative model specifications and an IV approach that uses ESG contracting of the peers of peers as an instrument. We show that these peer effects are more pronounced when common directors act as CEO in the focal firms, independent in the interlocked firms and are members of the compensation committees. In addition, the peer effects are more pronounced when the common directors have more power and when the focal firms with better board quality, more care about ESG issues, under higher level of information asymmetry and face more competition pressure.

Keywords: Peer effects; Board connections; ESG-linked pay; Executive compensation

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1. Introduction

The integration of environmental, social, and governance (ESG) criteria into executive compensation is transforming corporate governance worldwide. ESG-linked compensation schemes, which align executive rewards with sustainability performance indicators, have seen remarkable adoption, climbing from 3% of firms in 2010 to over 30% by 2021 (Cohen et al., 2022). This dramatic increase prompts a critical analysis of the motivations behind the adoption—whether driven by autonomous strategic decisions or by the influence of peers, a factor that has significant precedents in corporate behaviors such as option backdating, earnings management, and tax avoidance (Bizjak et al., 2009; Chiu et al., 2013; Cai et al., 2014; Brown and Drake, 2014).

Although research into peer effects is extensive, the granular impact of board interlocks on the diffusion of ESG compensation practices remains unclear. This study aims to explain how interlocking directors contribute to the spread of ESG-linked remuneration.

Peer effects suggest that the average behavior of a group influences the behavior of individual group members (Manski, 1993). The research into peer effects has focused on how industry and product market affiliations shape corporate decision-making. In this paper, we examine one widespread and potentially important channel through which ESG-linked pay policy propagation can occur, namely, interlocking boards of directors.² The board interlock is defined as a situation in which an individual serves concurrently on the boards of two or more companies, as illustrated in Figure. A.1. We propose a regression model in which the dependent variable, the focal firm's ESG-pay adoption, is regressed against the independent variable capturing the mean level of ESG-pay engagement among its networked peers. The model posits that the likelihood of a firm implementing ESG-linked compensation is influenced not solely by its intrinsic attributes but also by the prevalence of such practices among the firms connected through shared board membership. The paper finds that network effects on firms' adoption of ESG-linked pay exist in board interlock networks.

² The use of board interlocks is the primary conduit for the transfer of organizational practices such as earnings management (Chiu et al., 2013), stock option backdating (Bizjak et al., 2009), quarterly disclosure guidance (Cai et al., 2014), corporate governance practices (Bouwman, 2011), aggressive corporate tax reporting and tax avoidance strategies (Brown, 2011; Brown and Drake, 2014).

Our main interest in this study is whether firm's adoption of ESG-linked pay practices transmits through board networks. We collect ESG-linked compensation data from LSEG (formerly known as Refinitiv), boardroom connections based on Individual Profile Employment from BoardEx, other firm-level financial data from COMPUSTAT North America, analyst data from I/B/E/S. Using a sample of 14,219 firm-year observations and 2,139 unique firms between 2002 and 2020, we estimate linear-in-means models using lagged characteristics of the peers of peers as instrumental variables. We document positive and significant network effects on firms' adoption of ESG-linked pay. Specifically, the probability that a firm adopts ESG criteria in executive compensation design increases by about 2.7% if at least one of its board-connected peers has adopted these pay criteria.

Recognizing a pivotal challenge in our research, we must address the identification issue within the peer-effect model, known as the 'reflection problem' highlighted by Manski (1993). This issue is a longstanding and central concern in the study of network effects. The endogenous nature of network models complicates the task of discerning endogenous effects, or the influence of peers' behaviors, from contextual network effects, shaped by peers' exogenous characteristics, and from correlated effects that stem from peers' shared environments or intrinsic similarities.

Determining causality presents a notable challenge in network effect research. This paper addresses the intricacies of identifying such causal relationships in the context of adopting ESG-linked compensation. We outline a theoretical approach that utilizes exogenous variations—namely, the characteristics of second-degree peers—as instrumental variables. Our method is consistent with the framework proposed by Aghamolla and Thakor (2022).

We propose lagged value of the same policy proxy (ESG-linked pay) of the peers of peers, as excluded instrument for peers' adoption of ESG-linked pay. The excluded instrument should be strongly correlated with the average adoption of ESG-linked compensation policy of network firms but must be orthogonal to the focal firm's ESG-pay policy. We restrict that the peers of peers should not a direct peer of the focal firm.

Board interlock networks offer distinct dimensions—focal firms, connected firms, and interlocking directors—setting them apart from industry networks like those in Leary and

Roberts (2014). We harness the board interlock network's dynamics to pinpoint strategic herding, specifically assessing the influence of firms' unique characteristics and the distinct roles of interlocking directors on network effects.

First, we examine whether the role of common board members in connected firms affects firm herding. We posit that firms likely place greater value on insights from network firms when shared board members are inside directors, due to their active engagement and potential access to valuable information through day-to-day operations. We use *CommonDirector_Role* which including nine indicator variables to represent the number of the common board directors fulfil one of the following roles: (1) CEO, (2) Chairman/Chairwoman, (3) independent director of (a) either the focal firm only, (b) the interlocking peer firm only, or (c) on both boards. And the pairwise combination of criteria (1)-(3) with criteria (a)-(c) creates nine indicator variables. We find the diffusion of ESG-linked pay practices across boards primarily involves directors who are executives on one board and provide advisory services, highlighting their key role in advancing ESG-pay policies within focal firms. In contrast, directors serving exclusively as independent directors, and thereby in a monitoring role, do not exhibit a similar influence on the policy's adoption.

Furthermore, we examine how the characteristics of shared directors within focal firms affect the influence of board peers on the dissemination of ESG-pay practices. We use *CommonDirector_Char* as proxies for common directors' characteristics, which including *Tenure*, *Board Seats*, *Network Size* and *Female Director*. We find that female interlocking directors, along with directors who have longer tenures, hold multiple board appointments, and possess extensive networks, are more likely to facilitate the adoption of ESG-linked pay in the focal firm.

We also explore two special cases when the shared board members are compensation- or ESG-related expertise. We categorize common directors according to their expertise in compensation or ESG matters, determined by their membership on either the compensation committees or the CSR/sustainability committees, respectively. We divided our sample into two groups according to whether the common director is compensation or CSR/sustainability committee only in focal/peer firm or in both firms. Our findings indicate that interlocked directors serving on the compensation committees of one or both interconnected firms advocate for the adoption of ESG-linked compensation policies. However, directors with CSR expertise

do not appear to be as influential in encouraging the adoption of ESG-linked pay compared to their counterparts without such expertise. This finding aligns with Bursztyn et al. (2014), who found that individuals with less sophistication are more influenced by the decisions of others, while those with greater sophistication exert more influence on their peers.

Subsequently, we perform cross-sectional analyses on the effects of board interlocks, focusing on firm's characteristics. We examine whether firms with superior governance and ESG performance more effectively learn ESG-linked pay practices from their peers. We find firms with small board size, have the CEO and chairman duality, have CSR committee, and have worse previous year's ESG performance tend to adopt ESG-pay policies in line with those of their board-interlocked peers.

We also explore a potential variation in our results depending on the quality of the information environment and the competitive position in which focal firms operate. We expect board connections to be a more valuable and effective information transmission mechanism across firms if they operate in high information asymmetry environment, and hence can use board connections as a low-cost mechanism of information acquisition and exchange. Using several proxies for information asymmetry environment, which including bid-ask spread (*Bid-Ask Spread*), number of analysts following the focal firm (*Number of Analysts*), the dispersion of EBITDA (*Std EBITDA*) and the intangible assets (*Intangible Assets*), we repeat our main regressions on the subsamples of firms operating in high and low information asymmetry environments. Our main results are significantly more pronounced in the high information asymmetry and hence, are consistent with the idea that board interlocks are especially effective instrument of information and practices transmission for firms operating in low quality and costly informational environments.

Next, we test how network effects are influenced by a firm's competition intensity. We use Herfindahl-Hirschman Index (*HHI index*), *Marketshare*, *CR4*, *CR6* and *CR8* as the proxies for the degree of firm's competition pressure. And we repeat our main regressions on the subsamples of firms operating within high and low competition pressure. We find firms with the higher level of competition pressure are more likely to mimic the ESG-pay policy from their board-connected peers.

Our results are robust to using alternative measurement for the board-connected peer firms' ESG-linked pay and alternative regression models. Besides, we test the validity of our proposed instrumental variables (peers of peers) and the robustness of the results. Consistent with our main results, we find that the proposed IV is valid and the results remain robust.

To rule out the potential alternative explanations under the board-connected network effects on the adoption of ESG-linked pay. We control for the industry contagion effects by excluding the board-connected firm-pairs when the focal firm and the board-connected peers are in the same industry (based on 3-digit SIC industry code). We then control for potential network effects from common ownership and common compensation consultants by including indicators for whether board-connected peers share ownership or compensation consultants with focal firms. The results still hold after including these indicators.

Importantly, we examine the question of whether the transmission of ESG contracting via board links serves as an effective governance mechanism and, hence, translates into real ESG performance improvements or whether it is a mere mimicking behavior to provide a window-dressing signal of ESG intentions, without producing tangible ESG benefits. Using the detailed ESG scores as proxies for firms' different content of ESG performance, we show support for the former conjecture. Specifically, focal firms that implement ESG-pay practices following their adoption by their board-interlocked peers significantly improve their environmental innovation score, thus confirming that ESG contacting can serve as an effective governance tool in executive compensation design.

This paper makes the following contributions to the literature. First, our paper contributes to the strand of literature on the determinants of ESG-linked pay practices. To our best knowledge, this is the first study that provide evidence on the network effects on firms' ESG-linked pay adoption exist in board-interlock networks. We control peer firms in the same industry, metropolitan statistical area (MSA), share common ownership or common compensation consultant as the focal firm, to ensure that board-connected members are the channel of the causal link. We solve the endogeneity problem in the boardroom network effects model by adopting the characteristics of the peers of peers as a novel identification strategy.

Second, our analysis of dynamic board interlocking networks reveals evidence of corporate strategic herding, highlighting the crucial role that information quality and processing by

linking directors play in this behavior. Prior literature shows that board interlocks serve as an informational channel and a mechanism to propagate firms' policies and practices, such as governance practices (Bouwman, 2011; Field et al., 2013; Larcker et al., 2013), option backdating (Bizjak et al., 2009), earnings management (Chiu et al., 2013) and tax avoidance (Brown and Drake, 2014). While Bouwman (2011) provide some evidence that CEO total compensation is similar across firms with overlapping boards, they do not examine a transfer of specific elements in the design of overall executive compensation and the information procession across firms within the same board network. This paper is among the first studies to examine the interplay between strategic herding behavior and information quality within network effects.

Third, our paper contributes to the literature on real consequences of the implementation of ESG-linked pay practices. We contribute to the debate on the real outcomes of the ESG contracting by showing that the adoption of ESG-pay practices following peers' example leads to significant improvements in ESG investment.

The rest of the paper is structured as follows. Section 2 presents the related literature and develops our main hypothesis. Section 3 explains the data and variable construction. Section 4 presents the empirical models and discusses the results. Section 5 reports cross-sectional tests. Section 6 addresses the endogeneity concerns. Section 7 discusses robustness tests and Section 8 presents results of tests examining ESG performance consequences. Section 9 concludes the paper.

2. Board-Network-Peer Effects and ESG-Linked Compensation

2.1 Literature on ESG-linked Compensation

A key issue in corporate governance is how to incentive CEOs and other top executives to create value for shareholder efficiently (Bebchuk and Tallarita, 2022). For U.S. public firms, whose ownership is dispersed, and shareholders do not have enough incentives to monitor and discipline managerial behaviour. CEOs can exert substantial influence over the board of directors and can extract significant value from the company through excessive compensation packages (Bebchuk and Fried, 2004). The high level of CEO compensation attracts much attention from the public and academic researchers (Edmans et al., 2017).

ESG-linked executive compensation policy is an emerging corporate governance mechanism. Due to the information asymmetries between the “principal” (shareholders, represented by the board of directors) and the “agent” (senior managers), aligning a company’s ESG performance with executive compensation is an incentive package to guide and motivate management and can be used as a novel aspect of the corporate response to the low-carbon transition and ESG-driven pressure from institutional investors (Ritz, 2020).

The managerial incentives used as the tool for shareholders to help align the manager’s interests with those of shareholders. The increasing incorporation of sustainability metrics into executive pay evaluative criteria stems from the growing recognition that sustainability strategies can drive growth, as well as enhance profitability and shareholder value. To date, several studies have investigated the effects of ESG-linked executive compensation on firm’s performance.

Keddie and Magnan (2023) find firms with ESG incentives will have a 32% reduction in excess annual cash bonuses when they have the powerful top management team. However, firms will have excess bonuses if they are from environmentally sensitive industries, have a corporate social responsibility (CSR) committee or have long-term view institutional shareholders. Cohen et al. (2023) find firms adopting ESG metrics in executive compensation is related to engagement, voting, and trading by institutional investors and can be able to align their management’s objectives with the preferences of certain shareholder groups. In addition, firms with ESG Pay can improve key ESG outcomes. However, ESG Pay cannot lead to improved financial performance.

There is a conflict view on whether ESG pay facilitates rent extraction. Bebchuk and Tallarita (2022) suggest that ESG Pay facilitates rent extraction. However, Cohen et al. (2023) show ESG Pay is unrelated to abnormal CEO compensation. Flammer et al. (2019) conclude that integrating CSR variables into executive compensation tends to improve firms’ financial performance. However, Cohen et al. (2023) analysis of the rationales for the adoption of ESG Pay is relevant with that an increasing number of shareholders favor environmental and social criteria, even if they come at the expense of lower financial returns (Hartzmark and Sussman, 2019).

Prior literature indicates the importance of considering broader non-financial stakeholder criteria in executive compensation (Berrone and Gomez-Mejia, 2009) and there is an argument that the sustainable bonuses have emerged because of the regular bonuses have become controversial after the financial crisis (Kolk and Perego, 2014). Another potential reason for taking the sustainability-related bonus is it can seek inclusion and legitimacy from relevant stakeholders (Kolk and Perego, 2014).

The traditional agency theory posits that corporate owners care only about firms' financial performance, and not broader societal measures such as those reflected in ESG variables. However, ESG outcomes are recognized as leading indicators of future financial performance currently. The rationale for ESG pay then is similar to that for the inclusion of non-financial variables, such as customer satisfaction, employee satisfaction or product quality, in managerial incentive contracts (Dikolli, 2001; Dutta and Reichelstein, 2003; Ittner et al., 1997; Sliwka, 2002). ESG metrics may be viewed as indicators of firms' future risk exposures, such as the risk of stranded assets because of climate change. This is consistent with the evidence on the risks related to several ESG dimensions such as climate risk or social unrest. In addition, a significant number of institutional investors believe climate risks have financial implications for their portfolio companies (Gibson Brandon et al., 2022).

The existing agency models provide an efficient contracting rationale for ESG Pay as ESG metrics are viewed as important indicators of future financial performance and potential risks. Consistent with the notion of efficient incentive contracting, Cohen et al. (2023) finds that the adoption of ESG Pay correlates with variables that plausibly capture the costs and benefits of ESG variables for shareholders. To be specific, ESG pay is more common in industries with a higher environmental footprint and in countries with heavier ESG regulations and greater social sensitivity toward sustainability. And ESG pay is more common among larger firms and firms with relatively high levels of emissions, which is consistent with heavier emitters bearing a higher cost for carbon emissions and larger firms being subject to more public scrutiny on ESG performance.

Also, ESG Pay adopters exhibit a higher percentage of institutional ownership and a positive association with engagement, voting, and trading activities by these institutional investors (Cohen et al., 2023), which support the argue that adopt ESG pay can align managerial objectives with the interests of select stakeholder groups, including the firm's shareholders.

In addition, firms can signal their commitment to focus on ESG-related variables by taking ESG Pay. Large institutional investors and the main retail shareholders' association opposed the introduction of sustainable bonuses as they argue firms do not need to set a separate dimension of sustainability to be separately addressed (Kolk and Perego, 2014). In addition, they argued that a series of indicators would disperse efforts and was opaque because some targets could be easily met. There are needs for demonstrating how sustainability can deliver long-term value through a better alignment of traditional incentive programmes.

2.2 Literature on Peer Effects in Corporate Policies

Peer effects suggest that the average behavior of a group influences the behavior of individual group members (Manski, 1993). It is a subject of increasing attention in many areas of economics and finance. Peer effects have been studied, theoretically and empirically, across the fields of economics and finance. To investigate the peer effects, prior research defines peer groups in various ways, including common industrial classifications (Grennan, 2019; Leary and Roberts, 2014), product markets (Hoberg et al., 2014), compensation contract disclosures (Bizjak et al., 2009), analyst coverage (Kaustia and Rantala, 2015), executives' business school experience (Shue, 2013), or boardroom connections (Song and Wang, 2021).

Prior literature show the peer effects in corporate policies such as corporate capital structures and financial policies (Leary and Roberts, 2014), precautionary cash holdings (Hoberg et al., 2014), and corporate investment decisions (Foucault and Fresard, 2014). Specifically, peer firms which are in the same industry play an important role in determining corporate capital structures and financial policies (Leary and Roberts, 2014). Similarly, Adhikari and Agrawal (2018) show robust evidence that firms' payout policy such as dividends and share repurchases, are significantly influenced by the policies of their industry peers. Grennan (2019) also shows firms' decisions to change their dividend policies have peer effects. To be specific, firms increase payments by 16% in response to peer firms' changes by using 3-digit SIC to define peer groups based on industry. Seo (2021) finds management forecasts disclosure made by industry peers induce firm disclosure. Moreover, firms' investment decision is related to peer firms' stock prices that peers of a given firm are defined as firms in its Text-based Network Industry Classification (TNIC) industry which developed by Hoberg and Phillips (2016). And peer firms' one standard deviation increase in valuation is associated with a 5.9% increase in

corporate investment (Foucault and Fresard, 2014). Also, recent study use TNIC as a proxy for peer firms and find the role of peer effects in the employee welfare policies (Rind et al., 2021a). Kaustia and Rantala (2015) find firms are more likely to split their stock if their peer firms have recently done so. Also, they find firms have no clear benefit in following successful peer splitters.

Gomes et al. (2017) use the analyst network peers to show the significant effects on corporate capital structure such as leverage and equity issuance decisions. Existing studies also show the peer effects on the household level and find peer distress leads to a decline in individual leverage and debt on average (Kalda, 2019). In addition, social interaction contributes to some traders' disposition effect (Heimer, 2016). Maturana and Nickerson (2019) find workplace peers have an important role in household financial decision that the mortgage refinancing choice.

Studies also suggests that the behavior of peer firms matter for executive compensation through companies' compensation peers. To be specific, Denis et al. (2020) document firms will reduce CEO compensation following their compensation peers experience weak say on pay votes.

2.3 Hypothesis Development

In this section, we motivate the hypothesis that the adoption of ESG contracting generate peer effects for firms connected to adopting firms through shared board directors. We place our emphasis on shared directors for several compelling reasons. Firstly, as board members have access to information and insights within their networks that often surpass what is directly accessible to company executives, directors serve as primary sources of decision-making and monitoring insights for a majority of firms. Therefore, shared directors represent a critical and direct conduit for inter-firm information exchange (Mizruchi, 1996).

The board of directors is essential in guiding corporate strategy and managerial oversight (Bizjak et al., 2009). Due to the limited pool of qualified candidates, it is common for a board member to sit on the board of more than one firm. On one hand, as board members can bring their valuable corporate experience acquired at other firms to their new firms, board interlocks can facilitate an efficient information exchange and knowledge transfer and provide real benefits to interlocked firms. On the other hand, firms linked by joint board members may

compromise board independence and thus, exacerbate agency problems and hinder effective fulfilment of board's monitoring and advising functions.

The board interlock is one type of the social networks, by reviewing the prior literature, there are several mainstream theories behind social network analysis which including structural capital (Borgatti and Foster, 2003), resource access (Hillman et al., 2009), contagion (Chiu et al., 2013), and other theories such as organizational learning (Huber, 1991) and herding (Seo, 2021). To be specific, the focus of structural (social) capital implies that these benefits derive from actors' positions within the network regardless of their specific immediate connections (Borgatti and Foster, 2003). The contagion paradigm explains how behaviors spread via immediate connections and influence actors. And the use of board interlocks is the primary conduit for the transfer of organizational practices such as earnings management (Chiu et al., 2013), stock option backdating (Bizjak et al., 2009), quarterly disclosure guidance (Cai et al., 2014), corporate governance practices (Bouwman, 2011), aggressive corporate tax reporting and tax avoidance strategies (Brown, 2011; Brown and Drake, 2014).

Our study based on resource access which is the integration of social capital theory and resource dependency theory. To be specific, the social capital theory posits that the central actors in a network have privileged access to information and resources (Adler and Kwon, 2002). For example, prior studies show an association between firm performance and the network centrality of boards (Larcker et al., 2013) or CEOs (El-Khatib et al., 2015). So combining the resource dependency theory with social capital theory means firms will be affected and constrained by the environment in which they are embedded and, as a result, attempt to manage resource dependencies (Hillman et al., 2009).

Prior studies show the board interlocks demonstrate both positive and negative effects in the dissemination of business practices. To be specifically, this perspective suggests that interlocks reduce information acquisition costs and increase access to new information that can directly affect firms' strategies and performance (Caiazza et al., 2019). To be specific, the negative effects mostly come from contagion among boards of practices such as backdating stock options (Bizjak et al., 2009), aggressive tax reporting (Brown, 2011), and earnings management (Chiu et al., 2013). The findings about the positive effects of board networks including the improvements in firm performance (Larcker et al., 2013), financial reporting quality (Intintoli et al., 2018), and managerial guidance (Schabus, 2022).

There are conflicting views regarding the influence of board interlock on companies. On the one hand, there are two agency conflicts of board overlap may have a detrimental impact. First, serving on the boards of multiple companies diminishes the dedication of interlocked directors, potentially undermining the efficacy of board oversight (Fich and Shivdasani, 2007; Field et al., 2013). Second, there are concerns about the ability of interlocked directors to consistently maintain an unswerving fiduciary duty of loyalty, positing that conflicts of interest may emerge in cases where interlocked companies share business interests (Talley, 1998). On the other hand, the presence of overlapping boards can lead to improved access and mobilization of information and resources, which may improve coordination among firms and enable firms get better corporate strategy and firm oversight, or even potentially adopting a collusive stance to bolster firms' market influence (Azar et al., 2018).

Prior evidence supports the view that board interlocks are an important channel for information and practices transfer across firms, albeit serving as a medium for transfer of both valuable and harmful practices. For example, Bouwman (2011) finds that firms with greater director overlap exhibit greater similarity of board characteristics and governance practices (both positive and questionable), such as board size, the presence of CEO duality, total CEO and director pay. Recent studies show that firms with common directors have other similar (likewise, valuable and questionable) corporate practices, such as option backdating (Bizjak et al., 2009), earnings management (Chiu et al., 2013), and tax avoidance (Brown and Drake, 2014). Cai et al. (2012) investigate M&A transactions between firms with current board connections and find that acquirers obtain higher announcement returns in transactions with a first-degree connections where the acquirer and the target share a common director. While Amin et al. (2020) find a well-connected board can improve firms' CSR performance, Fich and Shivdasani (2007) find that a firm is more likely to face a financial lawsuit if it shares a board member with another firm that has previously been sued for fraud.

Based on prior literature, and without first taking a stance on the benefits or costs of board network effects, we postulate that board interlocks contribute to the transmission of ESG contracting practices. Our central hypothesis is thus as follows:

H1: The adoption of ESG contracting in focal firms is associated with the adoption of this practice in firms with which they share common directors.

3. Data and Variable Construction

3.1 Sample Construction

We use several sources to construct our sample of U.S. publicly listed firms. We collect information on directors' employment history to construct board connections from BoardEx North America database. We use Refinitiv to collect ESG-linked compensation data (available from 2002). Financial data come from Compustat. Analyst data are from I/B/E/S database. Common ownership data from Thomson Reuters S34. Compensation consultant data from ISS Incentive Lab.

Our initial sample is a cross-section of firms available in BoardEx and those that have ESG-linked pay data in Refinitiv. After merging these data with Compustat, we drop observations with missing data on the key analysis variables. Our final sample includes 14,219 firm-year observations for 2,139 unique firms during 2002 and 2020.

3.2 Construction of Board-Connected firms

We use BoardEx as the main data source for identifying board-connected firms. BoardEx started collecting data on top managers and directors holding positions in public firms in 1999. The data contain a unique identification number for each director, allowing us to identify interlocking directors who sit on the boards of different firms. The data also contain the start date and end date of each board position. This allows us to build a panel in which each observation is a firm-director-position-year that enable us to identifying the common directors between two firms in a given year. We exclude director observations at the start and at the end of their tenure that correspond to less than a full year of service. As a result of this filter, we also automatically exclude board connections that last less than a year, that is when a common director served for less than a year on the board of one of the interlocking companies.

About 9% of remaining board interlocking observations are with firms from the same industry, identified based on a 3-digit SIC code. This number is comparable to the one reported in prior studies (Song and Wang, 2020) and is in line with the evidence that the majority of board connections are formed between firms in different industries as sharing directors with industry peers can lead to security and privacy concerns.

By construction, our final sample includes only firm-year observation that correspond to firms sharing at least one director with another board-linked peer firm in a given year. About 95% of our final sample observations represent firms with at least one board connection, which is similar with Foroughi et al. (2021) that 90% of firms in their sample share at least one director with another firms. In addition, the average number of a focal firm's board connections is 4.

3.3 ESG-Linked Compensation Proxies

Our dependent variable, *ESG_Pay_Focal*, is an indicator variable equal to one if a firm's executive compensation is linked to ESG goals in a given year, and zero otherwise.³

Our independent variable, *ESG_Pay_Peer*, measures the presence of the ESG-linked compensation policy in the board-connected peers of focal firms. *ESG_Pay_Peer* is a dummy variable that equals one if at least one of the board-connected peers has ESG-linked compensation policy in a given year, and zero otherwise.

3.4 Control Variables

Following prior research (e.g., Flammer et al., 2019), we control for several firm-level determinants of executive compensation and ESG policies, such as firm size (*Size*), profitability (*ROA*), leverage (*Leverage*) and cash holdings (*Cash*). We define *Size* as the natural logarithm of total assets deflated to 2009 by the CPI value. *ROA* is the ratio of net income to total book value of assets. *Leverage* is the ratio of long- and short-term debt to the total book value of assets. *Cash* is the ratio of cash and short-term investments to the total book value of assets. We include these controls based on focal firms' characteristics as well as include their average values for their board connected peers in a given year. We winsorize all continuous variables at the top and bottom one percentile. Table A.1 in the Appendix provides detailed definitions of all analysis variables.

³ The data item in Refinitiv used to construct *ESG_Pay_Focal* is "Policy Executive Compensation ESG performance", which is defined as equal to one if the firm's pay policy includes remuneration for CEO, executive directors, non-board executives, and other management bodies based on ESG or sustainability factors.

4. Empirical Results

4.1 Descriptive Statistics

Panel A of Table 1 reports descriptive statistics. The mean value the focal firms' ESG-linked compensation (*ESG_Pay_Focal*) is 0.289, suggesting that 28.9% of the sample firm-year observations represent firms with ESG-linked compensation policy. This ratio is consistent with a similar variable reported in Flammer et al. (2019).⁴ Similarly to the previous studies on peer effects (Adhikari and Agrawal, 2018), the average values of all control variables for the board-connected peers in our sample are similar to the respective average values for the focal firm, with most standard deviations of these variables lower for the portfolios of board connected peers, rather than for the focal firm.

Panel B of Table 1 presents the sample distribution over time. Column 1 shows that the number of sample firms gradually increases from 207 in 2002 to 1,897 in 2020, consistent with the expansion of coverage in Refinitiv.⁵ Column 3 reveals that the number of focal firms that have ESG-linked pay also increases almost tenfold over the sample period, with only 48 firms with this policy in 2002 and 570 firms in 2020. While this increase is partially due to a better coverage of firms in Refinitiv, it can also be attributed to more frequent adoption of this policy by firms generally. The overall percentage of focal firms that have ESG-linked pay in our sample is 28.95% (Column 4).

<Insert Table 1 about here>

4.2 Peer Effects of ESG-linked Pay

We use the following model to test our central hypothesis that the adoption of ESG-linked pay policy by board-connected peers increase the probability of the focal firm's use of this policy:⁶

⁴ Flammer et al. (2019) report that approximately 24% of the S&P 500 companies in their sample use CSR criteria in executive compensations. Their sample period is 2004-2013.

⁵ Refinitiv began reporting ESG ratings for companies in the Standard & Poor's 500 and NASDAQ 100 indexes in 2002. In 2016, Refinitiv expanded its data coverage to Russell 2000 and Russell 3000 indexes. Therefore, the number of firms covered in the sample has increased substantially since 2016.

⁶ This paper uses the OLS model as the main specification because it allows to include fixed effects that can estimate effects controlling for time-invariant firm heterogeneity. Prior research (Greene, 2004) indicate that the coefficient estimates of nonlinear models (e.g., probit and logit) with fixed effects are biased and inconsistent, so the estimation results are difficult to interpret. However, this paper also runs the probit and logit models for the main tests and reports the results in the robustness test section.

$$ESG_Pay_Focal_{i,t} = \beta_0 + \beta_1 ESG_Pay_Peer_{i,t} + \gamma X_{i,t} + \lambda Y_{i,t} + \mu_j + \varphi_t + \varepsilon_{i,t}, \quad (1)$$

where the indices i , j , and t refer to the firm, three-digit SIC classification, and year, respectively. ESG_Pay_Focal is a proxy for the presence of ESG pay criteria in the executives' compensation policy of the focal firm; ESG_Pay_Peer measuring the presence of ESG pay policy in the board-connected peers; X is a vector the focal firm's characteristics; Y is a vector of peer firms' average characteristics; μ_j controls for industry fixed effects; φ_t is the year fixed effects.⁷ $\varepsilon_{i,t}$ is the firm-specific error term that is clustered at the firm level. Our main hypothesis predicts a positive and statistically significant on ESG_Pay_Peer variable ($\beta_1 > 0$).

Table 2 reports the main results, which show strong and consistent support of our central hypothesis that board-interlocked peer firms' adoption of ESG-linked compensation policy positively affects the focal firms' propensity to have the same policy. The coefficient estimates on the proxies of peers' ESG-linked pay in columns 1 through 4 are all positive and statistically significant at better than 5% level. The results are also economically meaningful. For example, a coefficient of 0.027 in Column 4 suggests that, all else equal, if at least one peer firm has the ESG-linked compensation policy (ESG_Pay_Peer), then there is a 2.7% higher probability that the focal firm also implements this policy.

The coefficients on control variables are generally consistent with expectations. We find that focal firms are more likely to have ESG-pay policy if they are in larger size.

<Insert Table 2 about here>

4.3 The Impact of Common Directors' Roles on ESG-Pay Policy

We next postulate that the effect of board peers on the propagation of ESG-pay practices may depend on the specific roles occupies by the shared directors on the boards of the focal and peer firms. For example, Amin et al. (2020) show that independent directors with a higher network connectedness can foster firms' CSR performance. Based on the agency theory, as

⁷ We use the contemporaneous proxies for ESG_Pay_Peer to limit the time for firms to respond to one another (Leary and Roberts, 2014). We check that our main conclusions remain unchanged when we use a one-year lag of proxies for ESG-linked pay of board connected peers.

monitoring role is the key responsibility of independent directors, they will work to collect information and resources from networks and to facilitate information transmission. At the same time, it is the executive directors that act as advisors on firms' policies and hence, occupying an executive role on one of the connected firms' boards (focal or its peer), may be essential to transmit the ESG-pay practices across networks.

To test whether the peer effects of ESG-linked pay are more pronounced in firms with interlocking directors occupying specific positions, we perform the following OLS regression model:

$$\begin{aligned}
 ESG_Pay_Focal_{i,t} & \\
 &= \beta_0 + \beta_1 ESG_Pay_Peer_{i,t} \times CommonDirector_Role_{i,t} \\
 &+ \beta_2 ESG_Pay_Peer_{i,t} + \beta_3 CommonDirector_Role_{i,t} + \gamma X_{i,t} + \lambda Y_{i,t} + \mu_j \\
 &+ \varphi_t + \varepsilon_{i,t}
 \end{aligned}
 \tag{2}$$

where $CommonDirector_Role_{i,t}$ represents one of nine indicator variables, each equal to the number of the interlocking directors fulfil one of the following roles: (1) CEO, (2) Chairman/Chairwoman, (3) independent director of (a) either the focal firm only, (b) the interlocking peer firm only, or (c) on both boards. The pairwise combination of criteria (1)-(3) with criteria (a)-(c) creates nine indicator variables. We expect a positive and significant coefficient on all interaction terms in model (2) ($\beta_1 > 0$).

The result in column 1 of Table 3 shows positive and significant coefficients on the interaction terms in regressions, where the common director is CEO in the focal firm only. The coefficient of 0.025 on the interaction term in column 1 suggests that the likelihood of a focal firm adopting an ESG-pay policy increases by 2.5% when it shares a director with another firm, who acts as a CEO on the focal firm.

The result in column 8 of Table 3 shows positive and significant coefficients on the interaction terms, where the interlock director is independent director in the interlocked peer firm only, and hence is an executive in the focal firm. To be specific, the coefficient of 0.025 on the interaction term in column 8 suggests that the likelihood of a focal firm adopting an ESG-pay policy increases by 2.5% when it shares a director with another firm, who acts as an

independent director on the interlocked peer firm's board and as an executive on the focal firm's board.

However, the coefficients on the interaction terms in column 4 to 6 of Table 3 are consistently positive but not significant. This result suggests that a shared director who acts as chairman or chairwoman on either or both focal and peer firms' boards does not promote the adoption of ESG-linked pay policies in the focal firm.

Overall, these results can be interpreted as evidence that a director who fulfils an advising role (i.e., serves as an executive) only on focal firms' boards plays an important role in propagating ESG-pay policies in the focal firm. However, a director who fulfils a monitoring role only on focal boards (i.e., serves as independent director) does not play the same important role in the transmission of these policies.

<insert table 3 about here>

4.4 The Impact of Common Directors' Characteristics on ESG-Pay Policy

In this section, we examine whether the effect of board peers on the propagation of ESG-pay practices may depend on the different characteristics occupies by the shared directors on the boards of the focal firms. We use *Tenure*, *Board Seats*, *Network Size* and *Female Director* as proxies for common directors' characteristics.

We perform the similar OLS regression as in model (3) and replace *CommonDirector_Role* with *CommonDirector_Char* which represents *Tenure*, *Board Seats*, *Network Size* and *Female Director* and the results show in column 1 to 4 separately.

The coefficients on the interaction terms in column 1 to 3 of Table 4 are consistently positive and significant at 1% level. The results show the interlocking directors with longer tenure, more board seats and larger network size play an important role in propagating ESG-pay policies in the focal firm. The coefficient on the interaction terms in column 4 of Table 4 is positive and significant at 10% level, which indicates the female directors are more likely to propagating the ESG-linked pay in the focal firm.

<insert table 4 about here>

4.5 The Impact of Expertise of Interlocking Directors on ESG-Pay Policy

In this section, we examine whether the shared board members are compensation- or ESG-related expertise can be instrumental in implementing ESG-pay practices. We treat the common directors as compensation or ESG-related expertise by identifying whether they seat on the compensation committees and CSR/sustainability committees separately. Given that the members of the compensation committee are in charge of setting executive compensation and can use their external experience to provide recommendations on the compensation design and guide the board in setting this policy (Zhang, 2021). Further, directors that have seats on CSR or sustainability committees in either the focal or board-connected peer firms are likely to pay greater attention to providing incentives to executives to invest in ESG.

We divided the sample into two groups according to whether the common director is compensation or CSR/sustainability committee only in focal/peer firm or in both firms. Table 5 shows the regression results for model (1) when the shared director is a compensation committee member on either focal firm's board, peer firm's board, or on both boards. The coefficients on *ESG_Pay_Peer* in all odd groups are positive and statistically significant, suggesting that interlocked directors who are members of compensation committee on either or on both interlocked firms' boards promote ESG-linked compensation policies in the focal firms.

Panel B of Table 5 shows the results for examining the role in the propagation of the ESG-pay practices of interlocking directors who are members of CSR or sustainability committee on either or on both board-connected firms. The coefficient estimates on *ESG_Pay_Peer* in all even groups are positive and statistically significant, which suggesting that if the focal firm shares at least one director with a peer that has ESG-pay policy and that director is not on the CSR/sustainability committee of either or both firms, then the probability that a focal firm adopts ESG-linked pay increases by 2.6% to 3.3%. In other words, common directors who have the CSR-related knowledge are not likely to promote adoption of ESG-linked pay when compared with those who are not CSR-expertise. The potential explanation for this result is the ESG expertise may has more concerns about the ESG-pay and do not think link the incentive with ESG issues can improve the problem. The finding is consistent with the notion raised by

Bursztyn et al. (2014) who identify the heterogeneous learning effects and the unsophisticated individuals react more strongly to others' decisions and sophisticated individuals' decisions have a greater impact on others.

Overall, these results show that shared directors who are compensation committee members on the either or both focal and board-linked firms are instrumental in transmitting ESG-related pay policies.

<insert Table 5 about here>

5. Cross-Sectional Tests

In this section, we explore possible heterogeneity in our results based on the firm's characteristics, the information environment, and the competition situation in which focal firms operate.

5.1 Heterogeneity of Peer Effects by Firm's Characteristics

In Table 6, we test whether our baseline results would be different depending on the specific firm characteristics. The intuition is that there is heterogeneity in the characteristics of different firms to promote ESG-pay. To be specific, prior literature show firms with good corporate governance are more likely to adopt ESG-linked pay (e.g., Hong et al., 2016). We show that firms with certain characteristics are associated with a more pronounced peer effects on the adoption of ESG-pay. To be specific, we find firms with small board size, have the CEO and chairman duality, have CSR committee, and have worse previous year's ESG performance are more likely to adopt the ESG-pay that learned from their board-interlocked peer firms.

<insert Table 6 about here>

5.2 Heterogeneity of Peer Effects by Firm's Information Asymmetry

According to the resource dependence theory board members can gain strategic resources from their outside engagements and, thus, provide valuable information to their firms (Amin et al., 2020). However, the effectiveness of their two primary roles, monitoring and advising, depends on the firm's information environment. If the cost of acquiring information is low, then outside directors are more effective in fulfilling their roles, whereas a high cost of information

acquisition inhibits effective fulfilment of directors' roles (Duchin et al., 2010). Board connections, however, present another mechanism for valuable information transmission and knowledge exchange between firms even if they are operating in high-asymmetry information environment (Aghamolla and Thakor, 2022). We, therefore, hypothesize that the impact of shared directors on transmission of ESG-linked policies from the interlocked peer to the focal firm will be more important for the focal firms operating in high asymmetry information environment.

To test this hypothesis, we construct four proxies for information asymmetry following prior literature (e.g., Drobetz et. al (2010) and Duchin et al. (2010)), namely the bid-ask spread (*Bid-Ask Spread*), number of analysts following the focal firm (*Number of Analysts*), the dispersion of EBITDA (*Std EBITDA*), and the intangible assets (*Intangible Assets*). Detailed definitions of these variables are available in Table A.1 in the Appendix.

We perform the main regression model (1) separately on the subsamples on firms operating in high and low information environments and present results in Table 7. The coefficient estimates on all proxies for peers' ESG-pay policy are positive and statistically significant at better than 10% level for the regressions on the subsample of firms operating in high information asymmetry environment (columns 1, 3, 5, and 7).

Overall, these results are consistent with our conjecture that board-connected peer effects are more pronounced in firms operating in high information asymmetry environments, which derive higher value from valuable board connections and are more likely to implement a new policy, for example, ESG-pay, under the influence of board peers. In contrast, firms operating in low information environment have other information channels available to them, and are less likely to implement new policy, such as ESG-pay, because their board-connected peers' adopted such policy.

<insert Table 7 about here>

5.3 Heterogeneity of Peer Effects by Firm's Competition Pressure

In this section, we explore the potential competition channels which is based on rivalry-based theories. The rivalry-based theories suggest firms with higher competition intensity in the product market will have strong motivation to mimic their peer firms (Lieberman and Asaba,

2006). Also, peer mimicking enables firms to maintain their relative position in the competition market (Rind et al., 2021b). In our case, firms adopt the ESG-linked executive compensation policy will bring firms several competitive advantages relative to their counterparts. Cao et al. (2019) indicate that a firm engage in CSR activities can raise firm' value by gaining the competitive advantage and document that a firm's CSR policy can be changed by its peers' practices. Second, firm takes the ESG metrics into the compensation package can attract the attention of institutional investors.

As discussed above, firms take the ESG-linked executive compensation policy have the competitive advantages. So, firms without the ESG-contract are at a relative disadvantage when a peer firm adopt the policy. In order to remain competitive, a firm will increase its propensity of adopting the policy when observing a peer firm undertake the ESG-contract. In other words, the marginal benefit of not taking the ESG-linked compensation policy decreases upon the policy adoption of a peer firm. Overall, the above arguments indicate that competitive pressure in the product market may result in peer effects in the adoption of ESG-linked compensation policy.

To test the results, this paper calculates a Herfindahl-Hirschman Index (*HHI index*) which is measured by firms' sales data and based on the 3-digit SIC industry classification level. The data are collected from Compustat database. The concentration index (*HHI index*) measures how concentrated the industry is in a given year and can proxy for firms' competition pressure. If a certain industry is dispersed among multiple firms, then this industry is less concentrated and thus more competitive. If firms in an industry that are concentrated in a small number of firms, then the industry is less competitive.

Also, we use the *Marketshare* as the second measures of the level of competition pressure that firms faced. The *Marketshare* is the ratio of firm's market share to the total value of the 3-digit SIC industry's market shares based on sales data. Firms with higher value of *Marketshare* represents they face less competition pressure. In contrast, firms with lower value of *Marketshare* means they are under higher level of competition pressure.

In addition, this study also uses *CR4*, *CR6* and *CR8* as the alternative measurements of industry's concentration ratio to proxy for the degree of competition pressure. To be specific, *CR4* is the four-firm concentration ratio which is measured as the total sales of the four largest

firms in 3-digit SIC industry to the total value of the industry. Similarly, *CR6* is the six-firm concentration ratio which uses the total sales of the six largest firms in 3-digit SIC industry to the total value of the industry and *CR8* is the eight-firm concentration ratio which uses the total sales of the eight largest firms in 3-digit SIC industry to the total value of the industry. The higher value of three different measures of concentration ratio represents lower competition pressure. In the same time, the lower value of concentration ratio means higher level of competition pressure that firms in the given industry faced.

Table 8 shows the results of the peer effects in ESG-linked compensation policy for firms facing high or low competition pressure separately. Column (1) and (2) of Table 8 is the results of the lower and higher competition group by using the *HHI index*. Lower competition pressure group (Lower Com) is defined as firms with *HHI index* higher than the sample median in a given year. Similarly, higher competition pressure group (Higher Com) is defined as firms with *HHI index* lower than the sample median in a given year. Column (3) and (4) show the results by using the *Market share* to proxy for the competition pressure. The sample is split by using the mean value of *Market shares* in a given year for the lower competition pressure group (firm's *Market share* value is bigger than the median value of *Market share* in a given 3-digit SIC industry) and higher competition pressure group (firm's *Market share* value is lower than the median value of *Market share* in a given 3-digit SIC industry). Column (5) to (10) uses the *CR4*, *CR6* and *CR8* as the measures of level of industry concentration separately. In the same idea, the lower competition pressure group (Lower Com) are firms with higher value of industry concentration (*CR4*, *CR6* and *CR8*) than the median value of industry concentration (*CR4*, *CR6* and *CR8*) for a given 3-digit SIC industry. The higher competition pressure group (Higher Com) are firms with lower value of *CR4*, *CR6* and *CR8* than the median value of industry concentration (*CR4*, *CR6* and *CR8*) for a given 3-digit SIC industry.

As discussed above, we predict the peer effects are more pronounced if the focal firm face higher degree of competition pressure. The results across five different measures of firms' competition level shows the consistent results that the coefficient for firms with the higher level of competition pressure are positive and statistically significant.

<insert Table 8 about here>

6. Instrumental Variables Specification

The main question we wish to consider is whether (and how) peer effects propagate ESG-linked compensation through a network of interlocking directors. We hypothesize that firms sharing directors with other firms that have experienced the adoption of ESG-linked criteria in compensation are more likely to adopt same practice. To address potential endogeneity concerns due to board interlocks being formed endogenously, we follow Aghamolla and Thakor (2022) and use peers of peers' ESG-pay policy in an instrumental variable (IV) approach.

In our study, each firm has a distinct board-connected peer group, that is peer groups do not perfectly overlap across firms. This setting allows us to use as an instrument for the peer's ESG-linked compensation policy the lagged value of the same policy proxy for the board-connected peer of the focal firm's peer firm which is not a direct peer of the focal firm.⁸

The above variable satisfies the relevance and exclusion conditions of a valid instrument for peer effects. For the relevance restriction to hold, the instrument should be correlated with the suspected endogenous independent variable (peer firms' adoption of ESG-linked compensation policy). As our main results show, a firm's ESG-pay policy is directly related to the presence of this policy in their board-connected peers. For the exclusion restriction to hold, the instrument should be related to the dependent variable (focal firms' adoption of ESG-linked compensation policy) only through the treatment variable (peer firms' adoption of ESG-linked compensation policy) after including controls.

We define our instruments consistent with variation of the dependent variable and use *Peer's Peer ESG_Pay* to instrument for *ESG_Pay_Peer*. We then transform our baseline model (1) into a two-stage least squares estimation (2SLS). In the first stage, we regress *ESG_Pay_Peer* on the respective *Peer's Peer ESG_Pay* instrument and then use the fitted value of *ESG_Pay_Peer* from the first stage to run our main model (1). We use the same control variables and fixed effects in both the first and second estimation stages as we used before.

⁸ For example, there are four firms: A, B, C, and D. Suppose that firms A and B are direct peers because they have one shared board director. Firm A does not share any directors with Firms C and D. Firm B, on the other hand, has two direct peers - firms C and D as it shares directors with these firms. In this example, firms C and D peer's of peers as they a peer of firm B, which is a peer of the focal firm A.

Column 1 and 3 of Table 9 report the results of the first-stage IV estimation. The coefficient estimates on all variations of *Peer's Peer ESG_Pay* are positive and statistically significant ($p < 0.000$) confirming that there is a higher probability of the focal firms' peer to have adopted the ESG-pay policy if its peers have this policy, which is consistent with our main result. The Cragg-Donald Wald F-statistic in main models is 274.527, indicating that *Peer's Peer ESG_Pay* is unlikely to be a weak instrument. Overall, the first-stage results suggest that integration of the ESG-linked compensation policy by the peers of peers is a strong predictor of peer firms' adoption of this policy.

Column 2 and 4 of Table 9 report the results of the second-stage IV estimation. The coefficient estimates on the instrumental variables are positive and highly significant ($p < 0.000$) in all regressions, suggesting that our main results continue to hold even after instrumenting for peer firms' integration of ESG-linked compensation policy. Overall, these results indicate that our main conclusions are not driven by endogeneity or reverse causality concerns.

<insert Table 9 about here>

7. Robustness

7.1 Alternative Measurements and Models

In this section, we conduct several tests to examine the robustness of the main results. First, we use *ESG_Pay_Peer_Num* as an alternative measurement for the board-connected peer firms' ESG-linked pay. To be specifically, *ESG_Pay_Peer_Num* is the natural logarithm of the number of peer firms that have the ESG-linked executive compensation policy plus one. Panel A of Table 10 show the regression results. Similar with the baseline results, all the coefficients are positive and statistically significant. The coefficient on *ESG_Pay_Peer_Num* of 0.030 suggests an additional board connection with ESG-linked pay policy (approximately equal to one standard deviation of *ESG_Pay_Peer_Num*) increases the probability of a focal firm's implementation of this policy by about 9.21%.⁹ Secondly, given that our dependent variable is a binary variable we use logit and probit models in alternative specifications. The results are shown in Panel B of Table 10, which is consistent with the baseline regression.

⁹ This number is computed as $(0.030/100\%)*3.071=0.0921$, where 3.071 represents a one standard deviation change from an unlogged value *ESG_Pay_Peer_Num* from its mean value ($\exp(1.404)-1=3.071$).

Thirdly, to control for the potential impact of industry and location networks, we exclude the connected peers in the same industry (based on 3-digit SIC industry code) and in the same MSA as focal firms from our sample. Panel C of Table 10 shows the results are still hold. Fourthly, we lagged the independent variables for one year period. Panel D of Table 10 shows the results are consistent with the main analyses.

<insert Table 10 about here>

7.2 Common Ownership

Prior studies suggest that institutional investors play an important role in corporate governance and they influence firms' adoption of ESG-linked pay (Cohen et al., 2023). Thus, common institutional investors among board-connected firms may have effect on firms' compensation policy choice. To deal with this potential explanation under the boardroom network effects, we additionally control for common ownership among focal and connected peer firms in the regressions. The results are shown in Panel A of Table 11. In columns (1) to (4), we use four measures of common ownership (*CommonOwner_Num*, *CommonOwner_Ratio*, *CommonOwner_Half* and *CommonOwner_One*), in the regression. The variable definitions are reported in Appendix Table A.1. The coefficient of peers' ESG-pay adoption still remains positive and statistically significant. So, our results are robust to ruling out the alternative explanations of the effects of common ownership by institutional investors among the board-interlocked networks.

7.3 Common Compensation Consultants

Another concern about the board-connected networks on firms' adoption of ESG-pay is the potential effect from the common compensation consultants as firms may seek the advice on setting compensation from the compensation consulting firms. Thus, we identify whether the focal and connected peer firms have common compensation consultants. We collect data of firms' compensation consultant from ISS Incentive Lab database. The results are shown in Panel B of Table 11. In columns (1) to (4), we use four measures of common compensation consultants (*CommonConsult_Num*, *CommonConsult_Ratio*, *CommonConsult_Half* and *CommonConsult_One*), in the regression. The variable are defined in Appendix Table A.1. The coefficient of peers' ESG-pay adoption remains positive and statistically significant. Thus, our

results are robust to ruling out the alternative explanations of the effects of common compensation consultant among the board-interlocked networks.

<insert Table 11 about here>

8. Window-Dressing Signal or ESG-Inducing Learning?

Our main result shows that ESG-linked pay practices transmit through board interlocks. However, an important and unanswered question remains whether the adoption of such practices induced by board-connected peers translates into actual improvements in ESG performance. Do focal firms learn these practices from their interlocked peers and adopt them to change executive's ESG behavior and enhance the real ESG outcomes? Or do focal firms merely mimic the ESG-pay practices of their interlocked peers as a low-cost window-dressing signal to investors that they have intentions to implement ESG policies, but fail to produce any actual improvements in ESG performance?

To differentiate between these two possible motives for the transmission of the ESG-pay practices, we perform the following OLS model:

$$\begin{aligned}
 ESG_Score_Focal_{i,t} &= \beta_0 + \beta_1 ESG_Pay_Peer_{i,t} \times ESG_Pay_Focal_{i,t} \times Post_Adopt_Peer_{i,t} \\
 &+ \beta_2 ESG_Pay_Peer_{i,t} + \beta_3 ESG_Pay_Focal_{i,t} \\
 &+ \beta_4 ESG_Pay_Peer_{i,t} \times ESG_Pay_Focal_{i,t} + \beta_5 Post_Adopt_Peer_{i,t} \\
 &+ \beta_6 ESG_Pay_Peer_{i,t} \times Post_Adopt_Peer_{i,t} \\
 &+ \beta_7 ESG_Pay_Focal_{i,t} \times Post_Adopt_Peer_{i,t} + \gamma X_{i,t-1} + \lambda Y_{i,t-1} + \theta Z_{t-1} \\
 &+ \varphi_i \\
 &+ \varepsilon_{i,t},
 \end{aligned} \tag{3}$$

where *ESG_Score_Focal* is the proxy for focal firms' detailed ESG performance by using the ESG overall score (*ESG Score, Combined, Controversies*), E, S and G Pillar overall score (*E Score, S Score, G Score*), detailed environmental pillar score (*Resource Use, Emission, Envir Innovation*), detailed social pillar score (*Workforce, Human Right, Community*) seperately. *Post_Adopt_Peer* is an indicator variable equal to one if the year of the focal firm's first adoption of the ESG-linked compensation policy is after any of its board-connected peers has adopted this policy, and all other variables are as defined in the main model (1).

ESG_Pay_Focal is an indicator variable equal to one if at least one peer firm has adopted ESG-pay policy, and zero otherwise.

Model (3) is the full model, where we include all three stand-alone effects (*ESG_Score_Focal*, *ESG_Pay_Focal*, *Post_Adopt_Peer*), and all the necessary interaction terms. However, some of the stand-alone and interacted effects are subsumed by the fixed effects and hence, get dropped from the model. Therefore, our final estimation model for the ESG performance is as follows:

$$\begin{aligned}
 ESG_Score_Focal_{i,t} &= \beta_0 + \beta_1 ESG_Pay_Peer_{i,t} \times ESG_Pay_Focal_{i,t} \times Post_Adopt_Peer_{i,t} \\
 &+ \beta_2 ESG_Pay_Peer_{i,t} + \beta_3 ESG_Pay_Focal_{i,t} \\
 &+ \beta_4 ESG_Pay_Peer_{i,t} \times ESG_Pay_Focal_{i,t} + \gamma X_{i,t-1} + \lambda Y_{i,t-1} + \theta Z_{t-1} \\
 &+ \varphi_i + \varepsilon_{i,t}, \tag{4}
 \end{aligned}$$

Our key coefficient of interest is on the triple interaction term, β_1 , capturing the effect on the ESG performance of the ESG-pay policy adoption by the focal firm after one of its board-linked peers has adopted it.

Table 11 presents the results of this test. Panel A of Table 11 show the results of the peer effects on firms' overall ESG score. All of the coefficients across Panel A to Panel E of Table 11 of the triple interaction are not significant, except the column 3 of Panel C. The results indicates that when the focal firm adopts the ESG-pay policy following such adoption by one of its board-linked peers, the ESG score does not change, even if we look into the E, S and G pillar score separately (as shown in Panel B of Table 11). However, Column 3 of Panel C shows the coefficients on the triple interaction are positive and significant at 5% level. Specifically, it indicates that when the focal firm adopts the ESG-pay policy following such adoption by one of its board-linked peers, the environmental innovation score increases by about 0.3 point.

Overall, the results of these tests suggest that focal firms' adoption of ESG-pay practices induced by such practices in their interlocked peers is not a mere window-dressing mimicking behavior. Rather, learning of these practices from peers translates into real enhancements of environment innovation performance, as measured by environment innovation rankings.

<insert Table 12 about here>

9. Conclusion

This study examines whether peer effects exist in firm's integration of ESG-linked pay and whether they are ESG-performance-enhancing. We collect detailed directors' employment information from BoardEx to identify the interlocked directors and construct peer groups for each focal firm. Using an unbalanced panel of 14,219 firm-year observations for 2,139 distinct U.S.-listed firms from 2002 to 2020, we find peer effects exist in adopting ESG contracting. Specifically, our main result shows that there is a 2.7% higher probability that a firm implements ESG-pay practices if at least one of its board-connected peers has adopted it. In addition, we show the impact that various roles occupied by the interlocked directors on the integration of the ESG contracting by the focal firm.

Our results are robust to alternative model specifications and instrumental variable approach. Importantly, we show that focal firms' integration of ESG contracting induced by its presence in their interlocked peers provides real benefits in the form of improvements in ESG performance. Overall, our findings suggest that resources and information exchanged via board connections play a dominant role in the design of executive compensation contracts and hence, contribute by showing a new evidence of the peer learning effects on the policies incentivizing ESG behavior.

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Table 1. Summary Statistics

The sample consists of all firms in the BoardEx, Refinitiv and Compustat merged database from 2002 to 2020 with nonmissing data for all analysis variables (see Table A.1 in Appendix). Panel A presents the summary statistics for key variables used in the main regression analyses. All continuous variables are winsorized at the 1st and 99th percentiles. Panel B reports the sample distribution by year.

Panel A: Full sample summary statistics								
	N	Mean	SD	Min	p25	Median	p75	Max
ESG Pay Focal	14,219	0.289	0.454	0	0	0	1	1
ESG Pay Peer	14,219	0.604	0.489	0	0	1	1	1
Focal size	14,219	13.943	1.816	9.584	12.805	13.931	15.151	18.631
Focal leverage	14,219	0.434	0.231	0.01	0.286	0.433	0.571	1.163
Focal cash	14,219	0.164	0.201	0.001	0.032	0.088	0.207	0.933
Focal ROA	14,219	0.021	0.133	-0.677	0.008	0.039	0.08	0.27
Peer size	14,219	14.188	1.505	10.148	13.293	14.333	15.254	17.354
Peer leverage	14,219	0.44	0.162	0.03	0.348	0.44	0.532	0.923
Peer cash	14,219	0.158	0.165	0.003	0.058	0.106	0.187	0.854
Peer ROA	14,219	0.023	0.107	-0.52	0.013	0.044	0.072	0.199

Table 1. Summary Statistics - Continues

Panel B: Sample distribution by year				
year	Firm-year observations	% of full sample annually	Num of firms using ESG-contracting	% of firms using ESG-contracting
	(1)	(2)	(3)	(4)
2002	207	1.46	48	23.19
2003	204	1.43	58	28.43
2004	267	1.88	51	19.10
2005	311	2.19	34	10.93
2006	314	2.21	45	14.33
2007	348	2.45	64	18.39
2008	454	3.19	108	23.79
2009	496	3.49	140	28.23
2010	516	3.63	181	35.08
2011	538	3.78	210	39.03
2012	535	3.76	213	39.81
2013	558	3.92	219	39.25
2014	578	4.06	210	36.33
2015	885	6.22	267	30.17
2016	1,216	8.55	330	27.14
2017	1,478	10.39	404	27.33
2018	1,627	11.44	453	27.84
2019	1,790	12.59	511	28.55
2020	1,897	13.34	570	30.05
Total	14,219	100	4,118	28.95

Table 2. Peer Effects on ESG-linked Compensation

This table presents the baseline regression results by using OLS model specification. The dependent variable is *ESG_Pay_Focal*. The independent variables is *ESG_Pay_Peer*. Standard errors shown in parentheses are clustered at the firm level. Year and industry fixed effects (based on 3-digit SIC code) are included in the regression, as indicated. All variables are defined in Table A.1 in Appendix. Standard errors shown in parentheses are clustered at the firm level. All control variables are winsorized at 1st and 99th percentiles. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
ESG_Pay_Peer	0.153*** (0.014)	0.088*** (0.013)	0.102*** (0.013)	0.027** (0.012)
Focal_size			0.042*** (0.006)	0.053*** (0.007)
Focal_leverage			0.083** (0.036)	0.037 (0.037)
Focal_cash			-0.144*** (0.049)	-0.061 (0.049)
Focal_ROA			-0.073 (0.055)	0.039 (0.054)
Peer_size			-0.001 (0.006)	0.006 (0.006)
Peer_leverage			-0.013 (0.042)	0.023 (0.038)
Peer_cash			-0.071 (0.058)	-0.054 (0.058)
Peer_ROA			-0.156** (0.064)	0.074 (0.059)
Constant	0.197*** (0.010)	0.236*** (0.010)	-0.334*** (0.108)	-0.557*** (0.108)
Year FE	No	Yes	No	Yes
Industry FE	No	Yes	No	Yes
Observations	14,219	14,219	14,219	14,219
Adjusted R-squared	0.027	0.223	0.063	0.255

Table 3. Cross-sectional Tests on Interlocking Directors' Role

This table shows the cross-sectional results of the peer effects on ESG-linked pay by identifying the different role of the interlocking directors. The table shows the results when the common director is CEO, Chairman (Chairwoman), or independent director in the focal firm (in Column 1, Column 4 or Column 7), peer firm (in Column 2, Column 5 or Column 8) or both firms (in Column 3, Column 6 or Column 9) separately. All variables are defined in Table A.1 in Appendix. Standard errors shown in parentheses are clustered at the firm level. Year and industry fixed effects are included in the regression. All control variables are winsorized at 1st and 99th percentiles. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	CEO			Chairman/Chairwoman			Independent Director		
	Focal Firm	Peer Firm	Both Firms	Focal Firm	Peer Firm	Both Firms	Focal Firm	Peer Firm	Both Firms
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ESG_Pay_Peer* CommonDirector_Role	0.025*	-0.018	-0.042	0.013	0.010	0.032	0.014	0.025***	0.003
	(0.014)	(0.017)	(0.052)	(0.009)	(0.012)	(0.021)	(0.009)	(0.009)	(0.003)
ESG_Pay_Peer	0.017	0.032**	0.028**	0.018	0.023*	0.023*	0.017	0.012	0.001
	(0.014)	(0.013)	(0.012)	(0.014)	(0.014)	(0.012)	(0.014)	(0.014)	(0.019)
CommonDirector_Role	-0.025**	0.015	-0.005	-0.003	-0.013	-0.024	-0.005	0.025***	0.003
	(0.010)	(0.016)	(0.047)	(0.006)	(0.011)	(0.015)	(0.008)	(0.009)	(0.003)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.555***	-0.561***	-0.555***	-0.553***	-0.560***	-0.553***	-0.546***	-0.556***	-0.483***
	(0.108)	(0.108)	(0.108)	(0.108)	(0.109)	(0.109)	(0.108)	(0.108)	(0.111)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,219	14,219	14,219	14,219	14,219	14,219	14,219	14,219	14,219
Adjusted R-squared	0.255	0.255	0.255	0.255	0.255	0.255	0.255	0.256	0.257

Table 4. Board-Linked Directors' Characteristics

This table shows the cross-sectional results of the peer effects on ESG-linked pay by identifying the interlocking directors' power which measured by the tenure in the focal firm (in Column 1), total number of board seats (in Column 2), network size (in Column 3) and whether they are female (in Column 4) separately. All variables are defined in Table A.1 in Appendix. Standard errors shown in parentheses are clustered at the firm level. Standard errors shown in parentheses are clustered at the firm level. All control variables are winsorized at 1st and 99th percentiles. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Tenure	Board Seats	Network Size	Female Director
	(1)	(2)	(3)	(4)
ESG_Pay_Peer* CommonDirector_Char	0.032*** (0.010)	0.033*** (0.011)	0.027*** (0.010)	0.031* (0.017)
ESG_Pay_Peer	-0.082** (0.034)	-0.069** (0.034)	-0.234** (0.094)	-0.002 (0.017)
CommonDirector_Char	-0.002 (0.008)	-0.007 (0.010)	0.008 (0.008)	0.019 (0.015)
Controls	Yes	Yes	Yes	Yes
Constant	-0.486*** (0.109)	-0.493*** (0.109)	-0.454*** (0.116)	-0.466*** (0.110)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Observations	14,219	14,219	14,219	14,219
Adjusted R-squared	0.256	0.256	0.257	0.257

Table 5. Expertise of Interlocking Directors

This table shows the cross-sectional results of the peer effects on ESG-linked pay by identifying whether the common directors are expertise in the ESG-linked pay related area. We identify whether there is at least one interlocking director served at compensation committee (in Panel A) or CSR-related committee (in Panel B) in the focal firm (in Column 1 and 2), peer firm (in Column 3 and 4), or in both firms (in Column 5 and 6), separately. All variables are defined in Table A.1 in Appendix. Standard errors shown in parentheses are clustered at the firm level. Year and industry fixed effects are included in the regression. All control variables are measured at fiscal year and winsorized at 1st and 99th percentiles. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Compensation Committee Member

	Focal Firm		Peer Firm		Both Firms	
	Yes is member (1)	No Not member (2)	Yes is member (3)	No Not member (4)	Yes is member (5)	No Not member (6)
ESG_Pay_Peer	0.030** (0.015)	0.020 (0.015)	0.031** (0.014)	0.021 (0.016)	0.039* (0.020)	0.020 (0.013)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.538***	-0.496***	-0.665***	-0.396***	-0.434**	-0.588***
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,788	6,413	8,625	5,575	3,296	10,904
Adjusted R-squared	0.250	0.276	0.260	0.261	0.269	0.258

Table 5. Expertise of Interlocking Directors - Continues

Panel B: CSR/Sustainability Committee Member

	Focal Firm		Peer Firm		Both Firms	
	Yes is member	No Not member	Yes is member	No Not member	Yes is member	No Not member
	(1)	(2)	(3)	(4)	(5)	(6)
ESG_Pay_Peer	-0.026 (0.040)	0.033*** (0.013)	-0.010 (0.030)	0.026** (0.013)	-0.158 (0.110)	0.028** (0.012)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-1.468***	-0.457***	-0.648**	-0.495***	-2.632***	-0.542***
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,306	12,897	2,100	12,096	155	14,040
Adjusted R-squared	0.397	0.240	0.320	0.241	0.510	0.249

Table 6. Cross-sectional Tests on Firm's Characteristics

This table shows the sub-group regression results by using OLS model specification to exam whether per effects differ based on the focal firm's different characteristics. The dependent variable is ESG_Pay_Focal, which is a dummy variable that equals to one if the company takes the ESG-linked compensation policy, and zero otherwise. In column 1 (column 7) and column 2 (column 8), we divided the sample into Small (Good) group and Big (Bad) group based on whether the focal firm was above- or below- median of board size (previous ESG performance). The Same Person (With) group in column 3 (column 5) and Different Person group (Without) in column 4 (column 6) are split based on whether the focal firm has or not has CEO and Chairman duality (CSR committee). All variables are defined in Table A.1 in Appendix. Standard errors shown in parentheses are clustered at the firm level. Year and industry fixed effects are included in the regression. All variables are defined in Table A.1 in the Appendix. Standard errors shown in parentheses are clustered at the firm level. All control variables are winsorized at 1st and 99th percentiles. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Board Size		CEO Chairman Duality		CSR Committee		ESG Performance	
	Small	Big	Same Person	Different Person	With	Without	Good	Bad
ESG_Pay_Peer	0.034**	0.014	0.020	0.042**	0.046*	0.012	0.015	0.030**
	(0.016)	(0.017)	(0.016)	(0.018)	(0.023)	(0.014)	(0.019)	(0.014)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.276**	-0.572***	-0.449***	-0.512***	-0.401*	-0.108	-0.466***	0.033
	(0.131)	(0.173)	(0.133)	(0.160)	(0.223)	(0.115)	(0.175)	(0.125)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,922	7,359	8,300	4,989	4,966	8,320	6,706	6,574
Adjusted R-squared	0.232	0.300	0.271	0.338	0.321	0.166	0.288	0.214

Table 7. Firm Information Asymmetry

This table presents the sub-group regression results by using OLS model specification to exam whether the peer effects differ based on the level of information asymmetry that a focal firm face. The dependent variable is *ESG_Pay_Focal*, which is a dummy variable that equals to one if the company takes the ESG-linked compensation policy, and zero otherwise. We use four measures of information asymmetry which including *Bid-Ask Spread*, *Number of Analyst*, *Std EBITDA* and *Intangible Assets*. See Table A.1 in Appendix for the detailed description for each variable. The high asymmetry (*High*) group in the odd columns and low asymmetry group (*Low*) in the even columns are split based on whether the focal was above- or below- median in terms of *Bid-Ask Spread*, *Industry Complexity*, *Std EBITDA* and *Intangible Assets* (opposite for the use of *Number of Analyst*). All variables are defined in Table A.1 in Appendix. Standard errors shown in parentheses are clustered at the firm level. All control variables are winsorized at 1st and 99th percentiles. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Bid-Ask Spread		Number of Analyst		Std EBITDA		Intangible Assets	
	High	Low	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ESG_Pay_Peer	0.028*	0.021	0.036**	0.027	0.023*	0.028	0.070***	0.014
	(0.015)	(0.019)	(0.017)	(0.017)	(0.014)	(0.021)	(0.023)	(0.014)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.599***	-0.491***	-0.135	-0.768***	-0.599***	-0.338**	-0.260	-0.630***
	(0.118)	(0.165)	(0.147)	(0.211)	(0.133)	(0.170)	(0.212)	(0.122)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	8,649	5,461	6,467	7,015	11,023	3,169	2,931	11,271
Adjusted R-squared	0.272	0.266	0.254	0.301	0.263	0.239	0.418	0.238

Table 8. Firm Competition Pressure

This table presents the sub-group regression results by using OLS model specification to exam whether the peer effects differ based on the level of competition pressure that a focal firm face. The dependent variable is *ESG_Pay_Focal*, which is a dummy variable that equals to one if the company takes the ESG-linked compensation policy, and zero otherwise. We use five measures of firm competition pressure which including *HHI Index*, *Market Shares*, *CR4*, *CR6* and *CR8*. See Table A.1 in Appendix for the detailed description for each variable. The lower competition (*Lower Com*) group in the odd columns and higher competition group (*Higher Com*) in the even columns are split based on whether the focal was above- or below- median in terms of the four proxies. All variables are defined in Table A.1 in Appendix. Standard errors shown in parentheses are clustered at the firm level. All control variables are winsorized at 1st and 99th percentiles. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	HHI Index		Market Shares		CR4		CR6		CR8	
	Lower Com	Higher Com	Lower Com	Higher Com	Lower Com	Higher Com	Lower Com	Higher Com	Lower Com	Higher Com
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ESG_Pay_Peer	0.012 (0.017)	0.041** (0.017)	0.009 (0.017)	0.042*** (0.016)	0.013 (0.016)	0.038** (0.018)	0.020 (0.016)	0.035* (0.018)	0.016 (0.015)	0.036* (0.019)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.572*** (0.146)	-0.535*** (0.154)	-0.533*** (0.185)	-0.245* (0.134)	-0.586*** (0.141)	-0.524*** (0.154)	-0.581*** (0.143)	-0.515*** (0.156)	-0.628*** (0.141)	-0.447*** (0.152)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	7,228	6,987	7,110	7,089	7,461	6,754	7,870	6,345	8,170	6,045
Adjusted R-squared	0.284	0.222	0.320	0.193	0.279	0.227	0.280	0.224	0.277	0.239

Table 9. Instrumental Variables Approach (2SLS-IV)

This table shows results examining the propensity of the adoption of ESG-linked compensation policy based on whether peer firm have the policy, using an instrumental variable strategy. Column 1 and 3 of this table show the estimate of the first-stage regression relating the instrumental variable, *ESG_Pay_Peer's_Peer*, to interlocked peer firms' ESG-linked compensation policy. Column 2 and 4 of this table show the estimates of second-stage regressions relating to peer firms' ESG-linked compensation policy, instrumented in the first-stage regression, and focal firm's compensation policy. All variables are defined in Table A.1 in Appendix. Standard errors shown in parentheses are clustered at the firm level. All control variables are winsorized at 1st and 99th percentiles. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable:	ESG_Pay_Peer	ESG_Pay_Focal	ESG_Pay_Peer	ESG_Pay_Focal
	First Stage	Second Stage	First Stage	Second Stage
	(1)	(2)	(3)	(4)
$\widehat{ESG_Pay_Peer}$		1.335*** (0.049)		1.225*** (0.049)
Peer's Peer ESG_Pay	0.221*** (0.012)		0.120*** (0.012)	
Controls	Yes	Yes	Yes	Yes
Constant	0.459*** (0.011)	-0.522*** (0.026)	-1.514*** (0.086)	-0.867*** (0.100)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	13,897	13,897	13,897	13,897
Cragg-Donald Wald F statistic	128.068		274.527	
Adjusted R-squared	0.143	0.303	0.237	0.322

Table 10. Robustness Tests

This table shows the robustness tests results by using alternative variable measurement and models. The dependent variable is *ESG_Pay_Focal*, which is a dummy variable that equals to one if the company takes the ESG-linked compensation policy, and zero otherwise. Panel A use *ESG_Pay_Peer_Num* as alternative measure for peer firms' adoption of ESG-linked pay, which is the natural logarithm of the number of peer firms that have the ESG-linked executive compensation policy plus one. Panel B shows the regression results by using Logit and Probit Models, separately. Panel C shows the results by excluding the boardroom connected peers with same industry and location. Panel D reports the results by lagging the independent variables for one year. Year and Industry fixed effects are included in the regression. All variables are defined in Table A.1 in Appendix. Standard errors shown in parentheses are clustered at the firm level. All control variables are winsorized at 1st and 99th percentiles. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Alternative Measurement of the Main Independent Variable				
	(1)	(2)	(3)	(4)
ESG_Pay_Peer_Num	0.158***	0.098***	0.108***	0.030**
	(0.014)	(0.013)	(0.014)	(0.013)
Controls	Yes	Yes	Yes	Yes
Constant	0.194***	0.230***	-0.238**	-0.522***
	(0.010)	(0.010)	(0.108)	(0.110)
Year FE	No	Yes	No	Yes
Industry FE	No	Yes	No	Yes
Observations	14,219	14,219	14,219	14,219
Adjusted R-squared	0.038	0.228	0.067	0.255

Panel B: Nonlinear Models				
	Logit Model		Probit Model	
	(1)	(2)	(3)	(4)
ESG_Pay_Peer	0.547***	0.175**	0.319***	0.103**
	(0.073)	(0.083)	(0.043)	(0.047)
Controls	Yes	Yes	Yes	Yes
Constant	-4.145***	-7.670***	-2.451***	-4.397***
	(0.585)	(1.319)	(0.340)	(0.743)
Year FE	No	Yes	No	Yes
Industry FE	No	Yes	No	Yes
Observations	14,219	13,502	14,219	13,502
Pseudo R-squared	0.057	0.217	0.057	0.215

Table 10. Robustness Tests - Continues

Panel C: Excluding Intra-industry and Same SMA Connections				
	(1)	(2)	(3)	(4)
ESG_Pay_Peer	0.142*** (0.014)	0.080*** (0.013)	0.094*** (0.014)	0.022* (0.013)
Controls	Yes	Yes	Yes	Yes
Constant	0.213*** (0.011)	0.251*** (0.010)	-0.319*** (0.110)	-0.564*** (0.111)
Year FE	No	Yes	No	Yes
Industry FE	No	Yes	No	Yes
Observations	13,395	13,395	13,395	13,395
Adjusted R-squared	0.023	0.224	0.055	0.254
Panel D: Lagged the Independent Variables for One Year Period				
	(1)	(2)	(3)	(4)
ESG_Pay_Peer	0.150*** (0.015)	0.084*** (0.014)	0.101*** (0.015)	0.025* (0.014)
Controls	Yes	Yes	Yes	Yes
Constant	0.221*** (0.012)	0.261*** (0.011)	-0.289** (0.124)	-0.530*** (0.124)
Year FE	No	Yes	No	Yes
Industry FE	No	Yes	No	Yes
Observations	11,562	11,562	11,562	11,562
Adjusted R-squared	0.025	0.240	0.060	0.271

Table 11. Other Potential Effects

This table shows the robustness tests results by including controls for common ownership and common compensation consultant in the regression models. The dependent variable is *ESG_Pay_Focal*, which is a dummy variable that equals to one if the company takes the ESG-linked compensation policy, and zero otherwise. Panel A shows the results that control for common ownership by using four measures (*CommonOwner_Num*, *CommonOwner_Ratio*, *CommonOwner_Half* and *CommonOwner_One*). Panel B reports the regression results after controlling for common compensation consultants by using *CommonConsult_Num*, *CommonConsult_Ratio*, *CommonConsult_Half* and *CommonConsult_One*. The variables are defined in Appendix Table A.1. Year and Industry fixed effects are included in the regression. Standard errors shown in parentheses are clustered at the firm level. All control variables are winsorized at 1st and 99th percentiles. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Common Ownership				
	(1)	(2)	(3)	(4)
ESG_Pay_Peer	0.023*	0.026**	0.026**	0.026**
	(0.013)	(0.012)	(0.012)	(0.012)
CommonOwner_Num	0.014			
	(0.012)			
CommonOwner_Ratio		0.021		
		(0.017)		
CommonOwner_Half			0.024*	
			(0.015)	
CommonOwner_One				0.016
				(0.014)
Controls	Yes	Yes	Yes	Yes
Constant	-0.535***	-0.558***	-0.559***	-0.558***
	(0.113)	(0.108)	(0.108)	(0.108)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	14,219	14,219	14,219	14,219
Adjusted R-squared	0.255	0.255	0.255	0.255

Table 11. Other Potential Effects - Continues

Panel B: Common Compensation Consultant				
	(1)	(2)	(3)	(4)
ESG_Pay_Peer	0.031**	0.032**	0.032**	0.031**
	(0.014)	(0.014)	(0.014)	(0.014)
CommonOwner_Num	0.011			
	(0.030)			
CommonOwner_Ratio		0.002		
		(0.076)		
CommonOwner_Half			-0.024	
			(0.040)	
CommonOwner_One				0.011
				(0.030)
Controls	Yes	Yes	Yes	Yes
Constant	-0.508***	-0.502***	-0.501***	-0.510***
	(0.125)	(0.126)	(0.125)	(0.124)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	14,219	14,219	14,219	14,219
Adjusted R-squared	0.208	0.208	0.208	0.208

Table 12. ESG Performance Change

This table shows the regression results for whether the adoption of ESG-pay induced by board-connected peers translates into actual improvements in ESG performance. The dependent variables are ESG overall score (*ESG Score, Combined, Controversies*), E, S and G Pillar overall score (*E Score, S Score, G Score*), detailed environmental pillar score (*Resource Use, Emission, Envir Innovation*), detailed social pillar score (*Workforce, Human Right, Community*) seperately. Other variables are defined in Appendix Table A.1. Year and Industry fixed effects are included in the regression. Standard errors shown in parentheses are clustered at the firm level. All control variables are winsorized at 1st and 99th percentiles. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: ESG Overall Score			
Dependent Variable:	ESG Score (1)	Combined (2)	Controversies (3)
ESG_Pay_Peer*ESG_Pay_Focal*Post_Adopt_Peer	-0.004 (0.027)	-0.015 (0.027)	-0.048 (0.041)
ESG_Pay_Peer	0.094*** (0.017)	0.101*** (0.017)	0.016 (0.015)
ESG_Pay_Focal	0.130*** (0.029)	0.130*** (0.029)	0.002 (0.021)
ESG_Pay_Peer*ESG_Pay_Focal	0.067** (0.033)	0.057* (0.034)	-0.021 (0.039)
Controls	Yes	Yes	Yes
Constant	1.108*** (0.090)	1.545*** (0.101)	6.549*** (0.189)
Year and Industry FE	Yes	Yes	Yes
Observations	14,219	14,219	14,219

Adjusted R-squared	0.477	0.410	0.242
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Table 12. ESG Performance Change – Continues

Panel B: E, S and G Score			
Dependent Variable:	E Score	S Score	G Score
	(1)	(2)	(3)
ESG_Pay_Peer*ESG_Pay_Focal*Post_Adopt_Peer	-0.049 (0.057)	0.000 (0.031)	0.004 (0.035)
ESG_Pay_Peer	0.181*** (0.045)	0.070*** (0.019)	0.103*** (0.023)
ESG_Pay_Focal	0.044 (0.085)	0.055 (0.034)	0.211*** (0.035)
ESG_Pay_Peer*ESG_Pay_Focal	0.253*** (0.095)	0.083** (0.038)	-0.009 (0.044)
Controls	Yes	Yes	Yes
	Yes	Yes	Yes
Constant	-2.513*** (0.243)	0.796*** (0.105)	2.728*** (0.119)
Year and Industry FE	Yes	Yes	Yes
Observations	10,602	14,219	14,219
Adjusted R-squared	0.386	0.433	0.229

Table 12. ESG Performance Change - Continues

Panel C: Environmental Pillar Score			
Dependent Variable:	Resource Use	Emission	Envir Innovation
	(1)	(2)	(3)
ESG_Pay_Peer*ESG_Pay_Focal*Post_Adopt_Peer	-0.006 (0.100)	0.092 (0.099)	0.333** (0.132)
ESG_Pay_Peer	0.312*** (0.060)	0.327*** (0.058)	0.102* (0.057)
ESG_Pay_Focal	0.307*** (0.103)	0.321*** (0.107)	0.237** (0.111)
ESG_Pay_Peer*ESG_Pay_Focal	0.193 (0.124)	0.048 (0.128)	-0.019 (0.133)
Controls	Yes	Yes	Yes
Constant	Yes -7.434*** (0.322)	Yes -7.021*** (0.332)	Yes -5.072*** (0.388)
Year and Industry FE	Yes	Yes	Yes
Observations	14,219	14,219	14,213
Adjusted R-squared	0.518	0.509	0.451

Table 12. ESG Performance Change - Continues

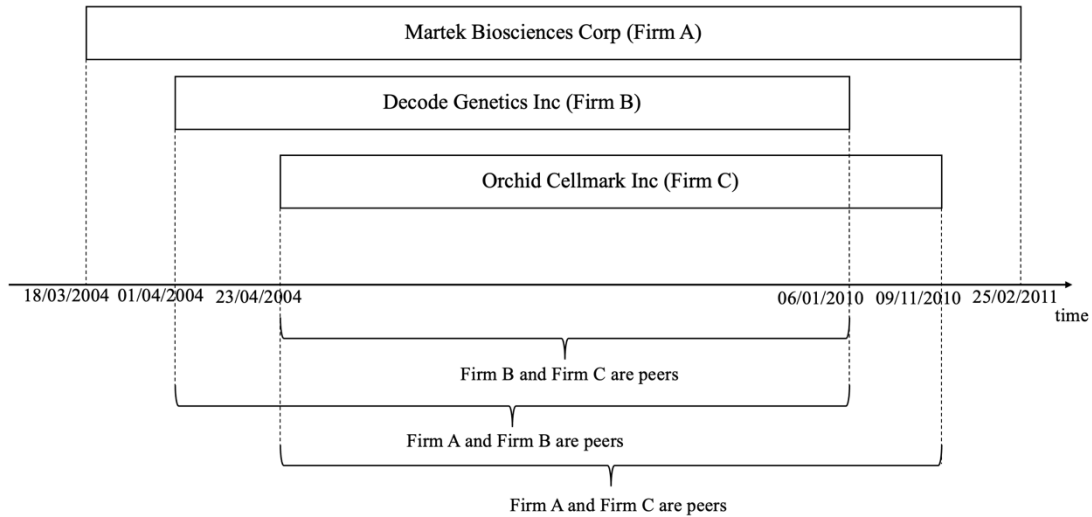
Panel D: Social Pillar Score				
Dependent Variable:	Workforce	Human Right	Community	Product
	(1)	(2)	(3)	(4)
ESG_Pay_Peer*ESG_Pay_Focal*Post_Adopt_Peer	-0.036 (0.040)	-0.022 (0.129)	0.037 (0.026)	-0.058 (0.080)
ESG_Pay_Peer	0.094*** (0.028)	0.117** (0.056)	0.074*** (0.019)	0.097** (0.048)
ESG_Pay_Focal	0.092* (0.049)	0.203* (0.105)	0.052 (0.036)	0.092 (0.081)
ESG_Pay_Peer*ESG_Pay_Focal	0.140** (0.055)	0.239* (0.134)	-0.011 (0.038)	0.162 (0.102)
Controls	Yes	Yes	Yes	-0.058 (0.080)
Constant	-0.222 (0.156)	-6.313*** (0.332)	2.004*** (0.102)	0.097** (0.048)
Year and Industry FE	Yes	Yes	Yes	Yes
Observations	14,219	14,219	14,219	14,219
Adjusted R-squared	0.353	0.467	0.275	0.332

Table 12. ESG Performance Change - Continues

Panel E: Governance Pillar Score			
Dependent Variable:	Management	Shareholder	CSR Strategy
	(1)	(2)	(3)
ESG_Pay_Peer*ESG_Pay_Focal*Post_Adopt_Peer	-0.006 (0.044)	0.009 (0.058)	0.069 (0.112)
ESG_Pay_Peer	0.144*** (0.030)	-0.014 (0.033)	0.321*** (0.057)
ESG_Pay_Focal	0.284*** (0.049)	0.026 (0.066)	0.256** (0.103)
ESG_Pay_Peer*ESG_Pay_Focal	-0.056 (0.060)	0.144* (0.079)	0.253** (0.125)
Controls	Yes	Yes	Yes
Constant	2.931*** (0.156)	3.391*** (0.205)	-8.076*** (0.336)
Year and Industry FE	Yes	Yes	Yes
Observations	14,219	14,219	14,219
Adjusted R-squared	0.158	0.141	0.508

Appendix

Figure A.1. Illustration of the board connection



Notes: This figure takes director Jim Beery's employment history from 18/03/2004 to 25/02/2011 in three firms as an example to illustrate board connection and the matching process for peer firms. He was an independent director in Firm A and Firm B. He had board seats as an independent director of Firm C from 23/04/2004 to 08/25/2009 and as an independent Chairman from 08/25/2009 to 09/11/2010.

Table A.1 Variables Definitions

Variable	Definition	Data Source
<i>Focal Firms' ESG-Pay</i>		
ESG_Pay_Focal	A dummy variable that equals to one if the company takes the ESG-linked compensation policy, and zero otherwise.	Refinitiv
<i>Peer Firms' ESG-Pay</i>		
ESG_Pay_Peer	A dummy variable that equals to one if at least one of peer firms have the ESG-linked compensation policy, and zero otherwise.	Calculation based on Refinitiv data.
ESG_Pay_Peer_Num	The natural logarithm of the number of peer firms that have the ESG-linked executive compensation policy plus one.	Calculation based on Refinitiv data.
<i>Firm-level Controls</i>		
Size	The natural logarithm of total assets deflated to year 2009 by the adjusted Consumer Price Index for all urban consumer. $\text{Log}(\text{at} * \text{adjusted_cpi_2009})$	Calculation based on Compustat data.
Leverage	The ratio of long- and short-term debt to total asset. $((\text{dltt} + \text{lct}) / \text{at})$	Calculation based on Compustat data.
Cash	The cash holding is the ratio of cash and short-term investments to the book value of total assets. che / at	Calculation based on Compustat data.
ROA	The ratio of net income to total assets. ni / at	Calculation based on Compustat data.
<i>Information Asymmetry Variables</i>		
Bid-Ask Spread	Firm's bid-ask spread in a given year.	Calculation based on CRSP data.

Number of analysts	The number of analysts who posted forecasts about the firm in a given year. Forecasts from the same analyst identifier and the same brokerage house are considered to be the same analyst.	IBES
Std EBITDA	The standard deviation of EBITDA divided by total asset. ebitda/at	Calculation based on Compustat data.
Intangible Assets	Firm's intangible assets divided by total asset. intan/at	Calculation based on Compustat data.
<i>Competition Level Variables</i>		
HHI Index	The Herfindahl-Hirschman Index is measured by firms' sales data and based on 3-digit SIC industry classification.	Calculation based on Compustat data.
Market Shares	The ratio of firm's market share to the total value of the 3-digit SIC industry's market share by using sales data.	Calculation based on Compustat data.
CR4	The four-firm concentration ratio is measures as the total sales of the four largest firms in 3-digit SIC industry to the total value of the industry.	Calculation based on Compustat data.
CR6	The six-firm concentration ratio is measures as the total sales of the six largest firms in 3-digit SIC industry to the total value of the industry.	Calculation based on Compustat data.
CR8	The eight-firm concentration ratio is measures as the total sales of the eight largest firms in 3-digit SIC industry to the total value of the industry.	Calculation based on Compustat data.
<i>Director' Role Variables</i>		
CEO	A dummy variable that equals to one if the director is the CEO for the firm in a given year, and zero otherwise.	BoardEx
Chairman/Chairwoman	A dummy variable that equals to one if the director is the Chairman or Chairwoman for the firm in a given year, and zero otherwise.	BoardEx

Independent Director	A dummy variable that equals to one if the director is the independent director for the firm in a given year, and zero otherwise.	BoardEx
<i>Director' Characteristic Variables</i>		
Tenure	The natural logarithm of the years plus one that the directors served in a given firm.	Calculation based on BoardEx data.
Board Seats	The natural logarithm of the number of board seats the director has.	Calculation based on BoardEx data.
Network Size	The natural logarithm of the size of director's network plus one.	Calculation based on BoardEx data.
Female Director	A dummy variable that equals to one if the director is female, and zero otherwise.	Calculation based on BoardEx data.
Compensation Committee Member	A dummy variable that equals to one if the director is in the compensation committee in a given firm, and zero otherwise.	Calculation based on BoardEx data.
CSR/sustainability Committee Member	A dummy variable that equals to one if the director is in the CSR or sustainability-related committee in a given firm, and zero otherwise.	Calculation based on BoardEx data.
<i>Firms' Characteristic Variables</i>		
Board Size	The natural logarithm of the boardroom size.	Refinitiv
CEO Chairman Duality	A dummy variable that equals to one if CEO and chairman(chairwoman) is the same person, and zero otherwise.	Refinitiv
CSR Committee	A dummy variable that equals to one if firm has CSR or sustainable committee, and zero otherwise.	Refinitiv
ESG Performance	The firm's ESG score of in year t-1.	Refinitiv
<i>Firm ESG Performance Variables</i>		
ESG Score	The overall ESG score used for measuring firms' ESG performance. It is an overall company score based on the self-reported information in the environmental, social and corporate governance pillars.	Refinitiv
Combined	ESG Combined Score is an overall company score based on the reported information in the environmental, social and corporate governance pillars (ESG Score) with an ESG Controversies overlay.	Refinitiv
Controversies	ESG controversies category score measures a company's exposure to environmental, social and governance	Refinitiv

	controversies and negative events reflected in global media.	
E Score	The environmental pillar measures a company's impact on living and non-living natural systems, including the air, land and water, as well as complete ecosystems. It reflects how well a company uses best management practices to avoid environmental risks and capitalize on environmental opportunities in order to generate long term shareholder value.	Refinitiv
S Score	The social pillar measures a company's capacity to generate trust and loyalty with its workforce, customers and society, through its use of best management practices. It is a reflection of the company's reputation and the health of its license to operate, which are key factors in determining its ability to generate long term shareholder value.	Refinitiv
G Score	The corporate governance pillar measures a company's systems and processes, which ensure that its board members and executives act in the best interests of its long term shareholders. It reflects a company's capacity, through its use of best management practices, to direct and control its rights and responsibilities through the creation of incentives, as well as checks and balances in order to generate long term shareholder value.	Refinitiv
Resource Use	Resource use category score reflects a company's performance and capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management.	Refinitiv
Emission	Emission category score measures a company's commitment and effectiveness towards reducing environmental emission in the production and operational processes.	Refinitiv
Envir Innovation	Environmental innovation category score reflects a company's capacity to reduce the environmental costs and burdens for its customers, and thereby creating new market opportunities through new environmental technologies and processes or eco-designed products.	Refinitiv

Workforce	Workforce category score measures a company's effectiveness towards job satisfaction, healthy and safe workplace, maintaining diversity and equal opportunities, and development opportunities for its workforce.	Refinitiv
Human Right	Human rights category score measures a company's effectiveness towards respecting the fundamental human rights conventions.	Refinitiv
Community	Community category score measures the company's commitment towards being a good citizen, protecting public health and respecting business ethics.	Refinitiv
Product	Product responsibility category score reflects a company's capacity to produce quality goods and services integrating the customer's health and safety, integrity and data privacy.	Refinitiv
Management	Management category score measures a company's commitment and effectiveness towards following best practice corporate governance principles.	Refinitiv
Shareholder	Shareholders category score measures a company's effectiveness towards equal treatment of shareholders and the use of anti-takeover devices.	Refinitiv
CSR Strategy	CSR strategy category score reflects a company's practices to communicate that it integrates the economic (financial), social and environmental dimensions into its day-to-day decision-making processes.	Refinitiv
<i>Other Variables</i>		
ESG_Pay_Focal	A dummy variable that equals to one if the focal firm has adopted ESG-linked compensation policy.	Authors construct based on the dataset
ESG_Pay_Peer	A dummy variable that equals to one if at least one of the peers has adopted ESG-linked compensation policy.	Authors construct based on the dataset
Post_Adopt_Peer	A dummy variable that equals to one if the year of the focal firm's first adoption of the ESG-linked compensation policy is after any of its peers have adopted it.	Authors construct based on the dataset
CommonOwner_Num	The number of board-linked peer firm who have ESG pay and share common ownership with the focal firm.	Authors construct based on Thomson Reuters

		Institutional (13f) database.
CommonOwner_Ratio	The number of board-linked peer firm who have ESG pay and share common ownership with the focal firm divided by the total number of board-linked peers.	Authors construct based on Thomson Reuters Institutional (13f) database.
CommonOwner_Half	A dummy variable that equals to one if the firm have more than half of the board-linked peer firm who have ESG pay and share common ownership with the focal firm, and zero otherwise.	Authors construct based on Thomson Reuters Institutional (13f) database.
CommonOwner_One	A dummy variable that equals one if the firm have at least one board-linked peer firm who have ESG pay and share common ownership with the focal firm, and zero otherwise.	Authors construct based on Thomson Reuters Institutional (13f) database.
CommonConsult_Num	The number of board-linked peer firm who have ESG pay and share common compensation consultant with the focal firm.	Authors construct based on ISS database.
CommonConsult_Ratio	The number of board-linked peer firm who have ESG pay and share common compensation consultant with the focal firm divided by the total number of board-linked peers.	Authors construct based on ISS database.
CommonConsult_Half	A dummy variable that equals one if the firm have more than half of the board-linked peer firm who have ESG pay and share common compensation consultant with the focal firm, and zero otherwise.	Authors construct based on ISS database.
CommonConsult_One	A dummy variable that equals one if the firm have at least one board-linked peer firm who have ESG pay and share common compensation consultant with the focal firm, and zero otherwise.	Authors construct based on ISS database.
