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Business diversification and ESG engagement: Riding tandem to risk reduction and value creation?

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ABSTRACT

We examine the overlap between business diversification and environmental, social, and governance (ESG) engagement as two corporate risk management strategies, and theorise the underlying mechanisms of their interaction effect on firm value. Drawing on agency and stakeholder theories, we test our hypotheses using a sample of U.S. firms (2009–2019). Our findings indicate that ESG engagement mitigates the diversification discount. Further, ESG engagement reduces systematic risk, while diversification reduces idiosyncratic risk. However, we find no evidence supporting for the mediating role of total risk in the relationship between these strategies' interaction and firm value. This suggests the need to explore alternative channels that may produce complementarities between these strategies.

1. Introduction

Corporate risk management is gaining prominence as a primary driving force of value creation in an increasingly competitive and turbulent world (Vanderford, 2025). We examine the intersection between two firm-level risk-reduction strategies that have fuelled substantial interest: business diversification (hereinafter, BD) and a firm's engagement in environmental, social, and governance (ESG) practices.[1] Striving to achieve both strategies for risk hedging purposes, coupled with their frequent coexistence, is paradoxically at odds with the scant research that has addressed them jointly (Barros et al., 2024; Kang, 2013; Su & Tsang, 2015; Xu and Liu, 2017). To our knowledge, only Su and Tsang (2015) have done so, offering interesting insights on how good relationships with secondary stakeholders can improve BD performance. However, their analysis is confined to the diversity of the non-profit organisations to which each firm donates. Hence, a wider perspective of ESG is still needed.

From the agency lenses, BD is sometimes considered to be driven by agency conflicts from managers' opportunism and their private interests, such as empire-building or managerial entrenchment (Denis et al., 1997; Hoechle et al., 2012). Consequently, another noticeable research gap stems from overfocusing the value analysis of BD on the manager-shareholder interest alignment and thus neglecting additional stakeholders who play a central role in firms today. We overcome this narrow view by articulating our arguments through a combination of the lenses of agency and stakeholder theories.

Additionally, a more in-depth examination of the role played by a firm's risk in the interrelationship between BD, ESG engagement, and firm value remains missing (Park et al., 2017).[2] This has prevented integrated and coherent theorisation about the value of corporate risk management. By examining these strategies together, we follow studies such as Koh et al. (2014), who advocate delving into the interrelationships between corporate social responsibility (CSR) and other risk management mechanisms to ascertain their substitutive or complementary nature and, subsequently, design optimal hedging strategies.

The hedging benefits of BD and ESG strategies come from different sources. By combining two or more negatively correlated (or weakly correlated) businesses, BD helps smoothen a firm's income (Lewellen,

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[1] Following recent surveys (e.g. Gillan et al., 2021), we approach the terms corporate social responsibility (CSR), corporate sustainability, and ESG strategies as interchangeable, and refer to them with the single umbrella term of ESG.

[2] Park et al. (2017) focus on the interrelationship between CSR, geographical diversification, and systematic risk, although their analysis is focused on the particular setting of the restaurant industry.

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1971). This reduces the likelihood of financial distress (Wang et al., 2003) and provides the flexibility to internally redeploy its organisational resources (Dickler & Folta, 2020; Dickler et al., 2022; Kuppuswamy & Villalonga, 2016). In contrast, ESG engagement sends a positive signal to stakeholders (Fombrun et al., 2000) and tempers their negative judgements (Godfrey et al., 2009; Klein & Dawar, 2004) by contributing to the accrual of moral capital and trust (Godfrey, 2005; Shiu & Yang, 2017). Stakeholders' willingness to support such trustworthy corporations shields them from negative shocks (Amiraslani et al., 2023; Broadstock et al., 2021; Flammer & Ioannou, 2021; Godfrey et al., 2009; Kim et al., 2021; Koh et al., 2014; Lins et al., 2017; Shiu & Yang, 2017). Although this literature consistently linked both BD and ESG to firm risk outcomes, the extent to which the risk channel explains the value advantages of combining these strategies remains underexplored and may not be as obvious as often assumed.

We aim to identify and test the channel through which the interplay between BD and ESG engagement can impact firm value both directly and indirectly via firm risk. In particular, we reveal whether the mix of these strategies may confer valuation advantages on companies. By doing so, we overcome one limitation of the extant literature that has analysed BD and ESG engagement as separate and independent choices and neglected potential overlaps and/or complementarities between them. Specifically, the following questions drive our research: Do these strategies result in different value outcomes jointly when compared to considering them individually? How does the interplay between BD and ESG shape a firm's risk? Are they substitutes or complements in mitigating risk? How does the risk channel affect their impact on a firm's value?

Further, we examine how BD and ESG strategies are conceptualised through the frameworks of agency and stakeholder theories to rationalise the interaction effect of these strategies on a firm's value and risk. By integrating the agency and stakeholder perspectives, we hypothesise that ESG engagement (a non-market strategy) can enhance the performance of BD (a market strategy). On the one hand, a firm's embeddedness in ESG practices can make it easier to deal with the wider scope of stakeholders and favourably shape the more diverse stakeholder environment in which multi-business firms operate (Bach & Allen, 2010). This can improve BD value outcomes. On the other hand, BD allows those scale-free capabilities that emerge from ESG practices, such as moral capital and reputation, to be exploited through multiple business segments (Mammen et al., 2021).

Moreover, both BD and ESG are widely recognised strategies for corporate risk management. However, because of the dissimilar source of insurance from these strategies, each may curb different types of risks. We contend that ESG may primarily hedge a firm against risk factors that impact the whole market (systematic risk) because of its legitimising power. Meanwhile, BD may mainly reduce a firm's specific risk by compensating losses and profits from its multiple industries and reallocating its business activity across them (idiosyncratic risk). Accordingly, we hypothesise that both strategies may be complementary and may reduce a firm's total risk, which could be a mediating channel to drive an indirect effect of the interplay of BD and ESG on a firm's value.

We test our hypotheses using a panel of U.S. publicly traded companies from 2009 to 2019. Earlier research, such as Jackson et al. (2019), emphasises the importance of accounting for macro-contextual factors that may partly explain why the same individual behaviour by firms might have a different impact on firm performance across differing contexts. To avoid such confounding effects, we focus on a single country. Moreover, the U.S. is widely considered to offer the strongest legal protection for shareholders (La Porta et al., 1998), where corporate managers are less likely to opportunistically use BD and ESG strategies to extract shareholder wealth. This setting allows us to minimise agency-driven motivations and, therefore, isolate the risk-reducing driving factors involved in adopting these two strategies. Additionally, our choice of the U.S. can bring interesting insights to our research goal of integrating the agency and stakeholder perspectives in terms of providing a more comprehensive view of how BD and ESG strategies impact a firm's value and its risk. Amiraslani et al. (2023) refer to ESG engagement as 'earned trust' that is generated internally to distinguish it from 'endowed trust'. U.S. data allow us to analyse such 'earned trust' benefits from ESG practices. Furthermore, given prior evidence that social engagement increases idiosyncratic risk in countries with a stronger shareholder orientation (Benlemlih & Girerd-Potin, 2017), the U.S. is particularly pertinent to our objective of examining the diversification-ESG interplay in relation to a firm's risk mitigation.

We show that stronger ESG engagement improves BD's effect on a firm's value by alleviating the diversification discount. Moreover, BD and ESG engagement mitigate different firm risk components: stronger ESG engagement decreases the systematic risk, while greater BD reduces the idiosyncratic risk. Contrary to our expectations, we find no mediating role of firm risk in the relationship between these strategies' interaction and a firm's value. Further, the interaction does not reduce a firm's total risk. Thus, while risk reduction is part of the story, it is not the mechanism through which the interplay of BS and ESG increases a firm's value.[3] Consequently, we perform additional robustness analyses that explore alternative mechanisms through which ESG can enhance the value of BD. Overall, we offer novel insights into the complementarities of BD and ESG for advancing firm value. Thus, we advance both theory and empirical works on each individual strategy and highlight the potential benefits that emerge from combining market and non-market strategies within corporations.

The rest of the article proceeds as follows. Section 2 undertakes the literature review and develops the hypotheses. Section 3 describes the data sources, sample, and empirical design. Section 4 explains the main empirical findings. Section 5 offers robustness analyses. Section 6 concludes and discusses the practical and future research implications.

2. Conceptual framework and hypotheses

BD is a well-known strategy for corporate risk management (Wang et al., 2003). Its insurance advantage stems from two main sources: the coinsurance effect, which arises from the combination of less than perfectly correlated cash flows of multiple segments (Wang et al., 2003); and strategic flexibility from resource redeployment, which allows firms to internally reallocate resources across businesses to cope with uncertainty (Dickler & Folta, 2020; Dickler et al., 2022).

Yet, debate continues on BD's impact on a firm's value with two opposite streams of empirical evidence: On the one hand, we have the diversification discount (Berger & Ofek, 1995; Hoechle et al., 2012; Kuppuswamy & Villalonga, 2016; Servaes, 1996), which portrays a value-destroying picture of BD for companies due to managerial overinvestment behaviour and the greater cost of diversifying at the corporate level compared to investors in their own portfolios. On the other hand, we have the diversification premium (Campa & Kedia, 2002; Villalonga, 2004a), which suggests that this strategy has a net positive effect on a firm's value that can emerge once the endogeneity of the diversification decision is appropriately controlled for. To reconcile this conflicting evidence, recent studies advocate a contingency approach by shifting the focus from the average BD-value relationship to identifying factors which can shape it differently across the universe of companies (Andrés et al., 2017a; Mackey et al., 2017; Su & Tsang, 2015).

Meanwhile, a firm's ESG engagement may moderate the BD-value association. Many studies document that ESG engagement endows firms with a buffer against adverse shocks (Amiraslani et al., 2023; Broadstock et al., 2021; Flammer & Ioannou, 2021; Godfrey et al., 2009; Kim et al., 2021; Koh et al., 2014; Lins et al., 2017; Shiu & Yang, 2017).

[3] We thank one of the reviewers for encouraging us to highlight the value of these non-significant results. A latest research stream encourages paying greater attention to non-significant results which may be highly informative (Abadie, 2020) and curb biased estimates in published research (Andrews & Kasy, 2019).

This insurance advantage stems from the resulting accrual of moral capital and trust (Amiraslani et al., 2023; Godfrey et al., 2009; Lins et al., 2017; Shiu & Yang, 2017), which trigger reciprocal stakeholder support and reduce negative stakeholder assessments. A firm's ESG engagement not only offers its stakeholders a safeguard for their explicit contractual claims to be satisfied but also their implicit ones (e.g. job security and timely delivery) (Cornell & Shapiro, 1987). Consequently, the mix of BD and ESG within a firm may be a non-replicable tandem driving risk management towards value creation. We discuss several features involved in the interrelationship between BD, ESG, and a firm's risk.

2.1. The moderating role of ESG engagement in the diversification-value relationship

The separation between ownership and control can lead managers to act opportunistically and satisfy their own best interests at the expense of maximising value for shareholders (Jensen & Meckling, 1976). From this agency-based view, many studies have shown corporate diversification to be a value-destroying strategy resulting from agency conflicts. These mainly stem from top managers' eagerness to pursue private benefits (e.g. managerial entrenchment, and stronger power or greater prestige) (Denis et al., 1997; Hoechle et al., 2012; Fuente & Velasco, 2020). These private benefits may encourage managers to opportunistically opt for diversification, which can be more efficiently replicated by shareholders in their own portfolios, resulting in a diversification discount.

Similarly, managers may use ESG practices for their own benefit at the expense of shareholder value (Cheng et al., 2023). Managers may be interested in divesting corporate resources from other corporate needs to reallocate them to build better stakeholder relationships and back up their managerial decisions to increase their own visibility, reputation, and entrenchment. Petrenko et al. (2016) suggest that ESG practices may result from managerial desire to attract attention and praise through corporate resource allocations. Such allocations can destroy shareholder value if they fail to yield higher financial returns for shareholders. The latter can individually decide to use those resources for alternative social and environmental issues they are more interested in (Atkinson & Galaskiewicz, 1988). According to agency theory, the threat of such managerial opportunistic behaviours (BD and ESG) requires implementing incentives and monitoring mechanisms (Jensen & Meckling, 1976).

Stakeholder theory challenges the manager-versus-shareholder perspective suggested by the agency theory. Specifically, the stakeholder perspective underscores the relevance of amplifying the scope of the principal-agent approach to account for additional stakeholders' interests (Gamache et al., 2020; Zolotoy et al., 2021).

According to stakeholder theory, both BD and ESG can contribute to value creation. While shareholders can easily diversify their portfolio of equity investments in capital markets, stakeholders cannot do so with their firm-specific investments (Wang et al., 2003). Hence, stakeholder investments are particularly sensitive to a firm's risk (Lim & Wang, 2007). Moreover, firm risk deters stakeholders from undertaking firm-specific investments (e.g. investments to enhance employee knowledge of a firm's technology and customer purchase of products with high switching costs), which are a key source of long-term competitive advantage (Wang et al., 2003). Consequently, risk management becomes a primary driver of value creation in companies in terms of stimulating stakeholder firm-specific investments (Wang et al., 2003).

Additionally, a major challenge facing diversified firms is their greater number and diversity of stakeholders (Kang, 2013). This requires them to deal with a broader range of stakeholder demands (Xu and Liu, 2017). ESG engagement can be a powerful signal of a firm's concern for its stakeholders and can harmonise their interests (Fombrun et al., 2000). Consistent with this idea, Kang (2013) and Xu and Liu, 2017 find that a higher degree of BD requires extra effort in ESG.

Some works highlight the importance of stakeholder management related to BD. Kang (2013) claims that the BD discount can be partly attributed to the extra burden on diversified firms to deal with the broader set of stakeholders. Su and Tsang (2015) provide evidence on the particular case of non-profit organisations as secondary stakeholders, which can help diversified firms mitigate external constraints from the socio-political environment. They find that firms who enjoy better relationships with these secondary stakeholders have improved BD performance. This effect is greater for unrelated diversifiers, since they have more diverse stakeholder voices. This nascent evidence suggests the potential value advantages from combining BD and ESG strategies, although a broader theorisation of underlying mechanisms is still lacking.

We hypothesise that a firm's ESG engagement may play a moderating role in the relationship between BD and a firm's value, making this strategy more value-enhancing for two reasons. First, a firm's engagement in ESG forges stronger bonds with its stakeholders (Amiraslani et al., 2023; Fombrun et al., 2000; Lins et al., 2017) and endows it with the legitimacy and trustworthiness that prompt reciprocal support from the stakeholders (Amiraslani et al., 2023; Henderson & Van Den Steen, 2015; Lins et al., 2017; Su & Tsang, 2015). For example, some works attribute CSR's strategic role in increasing employee identification with and employee commitment to the firm (Henderson & Van Den Steen, 2015; Shen et al., 2020). The number and diversity of stakeholders within a firm are positively associated with the number of businesses (Kang, 2013; Liang et al., 2016). However, operating in different industries increases the likelihood of potential conflicts. Consequently, the aforementioned stakeholder management advantages from ESG may enhance the impact of BD on a firm's value simply because more ESG-engaged diversified firms are expected to be better able to cope with a more complex array of stakeholder demands (Kang, 2013; Su & Tsang, 2015). Additionally, better stakeholder alignment may drive a more favourable stakeholder perception of the risk they are bearing within the company. This can encourage them to make further firm-specific investments, thereby improving BD performance.

Second, recent literature suggests that external collaboration can curb inefficiencies within the boundaries of internal markets and thus, improve resource allocation in diversified firms. Indeed, Cabral et al. (2020) find that diversified firms are more likely to form alliances to externally access resources. Insofar as ESG engagement fosters cooperation within a wider range of stakeholders (both internal and external), it may improve BD performance. Related empirical evidence, such as Dickler and Folta (2020) and Dickler et al. (2022),[4] reveals that the resource redeployment flexibility advantage of diversified firms decreases switching costs. ESG engagement is likely to lessen such costs due to its proven ability to generate an option-like value, which endows firms with flexibility in decision-making (Husted, 2005; Fuente et al., 2022). Moreover, diversified firms may be able to leverage ESG benefits due to the scale-free nature of intangible assets arising from ESG actions, which can be spread among multiple businesses without opportunity costs (Levinthal & Wu, 2010). A diversified firm can do so by fostering stakeholder collaboration across business segments (Shen et al., 2020) or transferring legitimacy across businesses in the form of stronger reputational economies of scope (Nayyar, 1990; Wernerfelt, 1988). Klein and Dawar (2004) attribute the spillover or 'halo effects' to ESG endeavours in one business/product that favour stakeholders' (e.g. customers) judgements of new products. Based on these arguments, we hypothesise:

H1: *A firm's ESG engagement positively moderates BD's effect on its value.*

[4] Notably, Dickler et al. (2022) explore further business portfolio characteristics such as business relatedness and sales growth correlation, although these issues lie outside the scope of our study.

2.2. The effect of BD and ESG engagement on a firm's risk components

Studies have largely separately analysed BD and ESG as corporate risk management strategies. However, few explore whether their interplay may be substitutive or complementary in alleviating a firm's risk. In particular, examining this issue by decomposing a firm's risk into its different components can be helpful. Indeed, a point of convergence between the agency and stakeholder theories lies in their assumption of risk averse agents in making decisions (Zolotoy et al., 2021).

According to the Capital Asset Pricing Model (CAPM) (Sharpe, 1964), a business's total risk can be decomposed into systematic (also called market risk) and idiosyncratic risks (specific or diversifiable risk). Idiosyncratic risk refers to the uncertainty of a business's returns stemming from its unique weaknesses, threats, and perils. This risk can be cancelled out in a portfolio by compensating the losses from this business with the unrelated profits from another. Systematic risk captures the volatility of a business's returns linked to the variability in the economic cycle. This latter risk cannot be removed from a diversified portfolio.

According to agency theory, managers should only be concerned about systematic risk, which shareholders cannot remove from their individual diversified portfolios and for which they must be rewarded (market risk premium). Conversely, according to stakeholder theory, managers should primarily concern themselves with idiosyncratic risk (Bettis, 1983), since this must be borne in full by key non-financial stakeholders in their undiversified total wealth portfolios. Together, these contrasting ideas point to the importance of accounting for the different types of risk which have a dissimilar influence across stakeholder groups. Depending on its nature, each risk may require a different strategy to manage it.

By sharing business activity amongst multiple industries, BD can primarily alleviate firm idiosyncratic risk. BD produces a coinsurance effect due to the combination of businesses with imperfectly correlated outcomes (Lewellen, 1971), reducing the volatility of revenues from the business portfolio (Hann et al., 2013). Additionally, BD can further lessen idiosyncratic risk through the flexibility granted by internal resource redeployment (Dickler & Folta, 2020; Dickler et al., 2022; Kuppuswamy & Villalonga, 2016). This is consistent with the prediction made by modern portfolio theory (Markowitz, 1952): When unrelated businesses are combined within the same firm, the losses from some specific businesses are compensated by the profits from others, such that each business's idiosyncratic risk is cancelled out within the portfolio as a whole. Accordingly, we hypothesise:

H2a: *BD reduces a firm's idiosyncratic risk.*

ESG is primarily seen as a buffer against systematic risk (Albuquerque et al., 2019; Park et al., 2017). ESG insurance ability from stakeholder legitimacy and earned trust may give the firm an advantage over other market participants to mitigate market shocks. The moral capital accrued from this strategy can temper negative reactions when unfavourable events occur. Stakeholders generally see ESG-engaged firms to be more trustworthy and grant them the 'benefit of the doubt' (Godfrey et al., 2009; Klein & Dawar, 2004; Luo et al., 2018). Albuquerque et al. (2019) provide an additional explanation for ESG's ability to mitigate systematic risk: ESG actions foster product differentiation, which leads the firm to exhibit less price-elastic demand and lower elasticity of profits to aggregate shocks. Many studies show that the risk-mitigating role of ESG becomes more prominent in general market crises, such as the financial crisis (Flammer & Ioannou, 2021; Lins et al., 2017) and COVID-19 pandemic (Broadstock et al., 2021; Ding et al., 2021). Hence, we posit:

H2b: *ESG engagement reduces a firm's systematic risk.*

Since each strategy mainly focuses on reducing different components of a firm's risk, their individual risk-mitigating effects should not overlap. Rather, the joint impact of BD and ESG engagement on reducing total risk may be stronger than when they are implemented separately. This is because each of these strategies can produce increasing effects on the different types of risk (BD on systematic risk and ESG on idiosyncratic risk), which may be partly mitigated when combining both strategies.

First, while BD may curb a firm's idiosyncratic risk through the coinsurance effect from operating in imperfectly correlated businesses, recent findings suggest that it may expose firms to greater systematic risk. Onali and Mascia (2022) argue that BD introduces operational and stakeholder complexity that can create firm-specific vulnerabilities, particularly in firms with lower financial flexibility. They find empirical evidence that diversified firms are more vulnerable to negative market shocks, such as the COVID-19 crisis, due to higher internal subsidisation risk, weaker cash holdings, and greater financial fragility linked to a lower Tobin's Q. This increase in systematic risk from BD can be partially offset by ESG engagement. Barros et al. (2024) argue that ESG may act as a 'friendly channel' that mitigates the potential penalisation of diversification strategies by improving transparency and stakeholder perceptions. Consequently, ESG engagement allows diversified firms to enhance their stakeholder support to buffer external shocks and thus, mitigate their additional systematic risk from BD.

Second, ESG engagement may aggravate a firm's idiosyncratic risk by limiting its flexibility to respond to firm-specific disruptions. Becchetti et al. (2015) show that ESG reduces stakeholder conflict but simultaneously increases earnings volatility by constraining the management's ability to adjust stakeholder related costs during negative productivity shocks. This higher idiosyncratic risk from the specific rigidity associated with ESG engagement may be partially absorbed by the coinsurance effects of BD. Moreover, BD enhances a firm's strategic flexibility by enabling resource redeployment across business units over time, thereby mitigating corporate exposure to idiosyncratic shocks (Dickler & Folta, 2020; Dickler et al., 2022).

Given these side effects, combining BD and ESG engagement can create a super-additive value, where one strategy's risk-mitigating strengths may offset the vulnerabilities introduced by the other. Accordingly, we can expect highly diversified corporations with high systematic risk to differentiate themselves by increasing commitment to ESG issues. Similarly, firms renowned for their strong commitment to ESG issues may embark on diversification to reduce their idiosyncratic risk. Studies, such as Kang (2013) and Barros et al. (2024), provide further empirical support for these predictions, showing that ESG engagement tends to be stronger in more diversified firms.

Accordingly, we hypothesise that BD and ESG serve as complementary strategies to manage risk within firms and that their interaction further reduces total firm risk. Hence, we hypothesise:

H2c: *The interplay between BD and ESG engagement decreases a firm's total risk.*

2.3. The mediating influence of a firm's risk in the relationship between the diversification-ESG interplay and firm value

Studies (Cao & Han, 2016; Fu, 2009) reveal that both idiosyncratic and systematic risks are positively related to expected stock returns. This is consistent with Bettis' (1983) arguments regarding the risk which managers should focus on, although it challenges the core premises of modern portfolio theory. A simple rationale is that investors cannot

reduce total risk as efficiently as firms can (Merton, 1987). Consequently, under-diversified investors would require a premium for total risk (from either systematic or idiosyncratic sources). They would be willing to pay a higher price for firms that are able to reduce total risk in a way which they themselves cannot.

If the interplay between BD and ESG engagement negatively affects a firm's total risk, such a risk reduction may then yield an additional source of value. Andrés et al. (2017a) support the idea of the non-replicable nature of certain patterns of BD, which explains their superior potential to create value, as they can neither be achieved by investors nor at a lower cost. The interplay of BD and ESG may be one such value-driver risk reduction source that shareholders cannot replicate in their own portfolios. Investors can replicate a firm's portfolio of businesses by investing in a similar bundle of unisegment firm stocks with comparable ESG engagement. However, the spillover effects will not emerge within such stocks' portfolio, since no single ESG strategy exists whose reciprocal benefits can spread among its multiple interconnected stakeholders. Accordingly, we propose that the interplay of BD and ESG positively affects a firm's value that is indirectly channelled by a non-replicable reduction in total risk. Therefore, we hypothesise:

H3: *A firm's total risk mediates the positive effect of the interplay of BD and ESG engagement on a firm's value.*

3. Methodology

3.1. Data sources and sample construction

Our sample covers an unbalanced panel of U.S. publicly traded firms from 2009 to 2019 and includes both active and non-active companies to curb potential survivorship bias (Andrés et al., 2017a, 2017b). Our data come from several sources, accessed through the LSEG Data & Analytics Workspace (formerly Refinitiv Eikon database). Firm annual financial and segment data are retrieved from Worldscope, while stock price data are from DataStream.

LSEG's ESG scores are estimated from a wide range of annual reports, such as corporate annual reports, sustainability reports, stock exchange filings, and news sources (Amiraslani et al., 2023). LSEG transforms qualitative data into quantitative scores at yearly frequency and categorises them into three pillars: environmental, social, and governance. LSEG's ESG ratings provide relevant, auditable, and systematic ESG information, which has been used extensively in prior research (Amiraslani et al., 2023; Cheng et al., 2014; Fuente et al., 2022; Kim et al., 2021).

We then apply Berger and Ofek's (1995) sample selection procedure to ensure the comparability of our findings with prior research (Andrés et al., 2017a, 2017b; Campa & Kedia, 2002; Santaló & Becerra, 2008; Hoechle et al., 2012; Kuppuswamy & Villalonga, 2016). First, we require segmental data available on industry Standard Industry Classification (SIC) and segment-level sales. We delete observations which report at least one business segment in the financial industry (SIC codes 6000–6999). Second, we eliminate firm-year observations with sales below the $20 million threshold and those whose sum of segment sales deviates by more than 1 % from the firm's reported total sales. Finally, we remove observations that display non-positive sales and/or missing data on total capital (measured as the market value of common equity plus the book value of debt). We drop firm-year observations with negative common equity and those with missing data in regression variables. This process yields a sample of 15,927 firm-year observations (2,774 firms), with unisegment and diversified firms accounting for 65 % and 35 % of total observations, respectively. This distribution is consistent with prior literature (Andrés et al., 2017a; Dickler et al., 2022; Villalonga, 2004b).

3.2. Variables

3.2.1. Dependent variable

Our main dependent variable is a firm's excess value (*EXVAL*), which is a well-known measure to assess whether diversification leads to a gain or a loss of corporate value (Andrés et al., 2017a; Campa & Kedia, 2002; Kuppuswamy & Villalonga, 2016; Santaló & Becerra, 2008; Villalonga, 2004b). It is based on the comparison of a diversified firm's actual value with its estimated value under the assumption that its businesses operated as stand-alone companies. Following Berger and Ofek (1995), we calculate excess value as the natural logarithm of the ratio of a firm's market value to its imputed value. A firm's market value is the sum of the market value of equity, preferred stock, and total debt. A firm's imputed value is given by the sum of all its segment imputed values, each of which is the product of the firm's sales allocated in that business segment and the corresponding annual industry median of the multiple of enterprise value to sales. To reach meaningful industry valuation multiples, these are calculated based on the narrowest SIC grouping, which includes a minimum of five unisegment firms (beginning from four-digit SIC grouping and, if necessary, moving onto three- and two-digit SIC ones).

3.2.2. Explanatory variables

Our explanatory variables are a firm's degree of BD and its ESG engagement. For the former, we consider three alternative proxies: the number of segments (*NUMSEG*), Herfindahl index (*HERF*), and entropy index (*ENTROPY*). *NUMSEG* is a count variable which measures the number of a firm's businesses that have a unique four-digit SIC code. The Herfindahl index (*HERF*) by Hirschman (1964) is calculated as:

$$\mathrm{HERF} = 1 - \sum_{j=1}^{n} P_j{}^2 \tag{1}$$

where 'P_j' is the proportion of a firm's sales (the ratio of segment sales to firm total sales) allocated in business segment 'j', and 'n' is the number of a firm's segments at the four-digit SIC grouping. *HERF* ranges between zero and one. The higher the index, the greater the degree of diversification. Total entropy (*ENTROPY*) is based on Jacquemin and Berry's (1979) measure:

$$\mathrm{ENTROPY} = \sum_{j=1}^{n} P_j \bullet \ln\left(\frac{1}{P_j}\right) \tag{2}$$

with 'P_j' and 'n' denoting the proportion of a firm's sales in segment 'j' and total number of segments, respectively. This index is also a direct proxy for a firm's degree of diversification.

To capture a firm's engagement in ESG, we rely on LSEG's ESG scores, which range from 0 to 100; we do transform them to a 10-based scale to mitigate heteroscedasticity concerns (Cheng et al., 2014; Fuente et al., 2022). We compute the equally-weighted average of the scores of the environmental, social, and governance pillars, denoted by *ESGscore* (Cheng et al., 2014; Fuente et al., 2022; Kim et al., 2021).

3.2.3. Mediating variables

Our mediating variable is a firm's total risk, proxied by the standard deviation of daily returns over a year (*TOTALRISK*) (Bouslah et al., 2013; Cheung, 2016).[5] Additionally, we decompose a firm's total risk into systematic and idiosyncratic risks. Following Cheung (2016) and Albuquerque et al. (2019), systematic risk is computed from fitting the

[5] We require a minimum of 20 non-missing daily returns in a year to compute this measure.

CAPM.[6] Specifically, we run time-series regressions on the following one factor model:

$$r_{i,s} = \alpha_i + \beta_i \cdot r_{M,s} + \varepsilon_{i,s} \quad (3)$$

where $r_{i,s}$ is the daily return for stock i on day s, $r_{M,s}$ is the daily return for the market portfolio proxied by Standard & Poor's 500 Composite Price Index, α_i is the intercept for stock i, $\varepsilon_{i,s}$ is the residual term for stock i on day s, and β_i is the beta coefficient for stock i. For each stock i and day s, a daily beta is computed on a rolling basis from 252 prior daily returns up to day s.[7] Systematic risk (*SYSRISK*) for each stock i in year t is then obtained as the average daily betas over year t.

Following Ferreira and Laux (2007), idiosyncratic risk is obtained from the natural logarithm of the ratio of 1-R^2 to R^2, with R^2 being the coefficient of determination from regressing equation [3]. Idiosyncratic risk (*IDRISK*) for each stock i in year t is computed by taking the average of such daily natural logarithms as obtained from daily rolling regressions over year t.

3.2.4. Control variables

For models in which excess value (*EXVAL*) is the dependent variable, we consider several firm-level characteristics which can shape a firm's value (Andrés et al., 2017a; Berger & Ofek, 1995; Campa & Kedia, 2002; Santaló & Becerra, 2008): a firm's size (*SIZE*), measured by the natural logarithm of total assets; financial leverage (*LEVERAGE*), calculated as the ratio of total debt to total assets; profitability (*PROFITAB*), measured as the ratio of earnings before interest and taxes to total sales; investment activity (*INVEST*), calculated as the ratio of capital expenditures to total sales; cash holdings (*CASH*), computed as the ratio of total cash to total assets; and asset tangibility (*TANG*), proxied by the ratio of fixed assets to total assets. We add year and industry fixed effects. The industry classification scheme is based on Fama-French's 12-industries.

For regressions in which firm risk is the dependent variable, we consider three additional controls to make our results comparable to the literature (Abdoh & Varela, 2017; Chang & Thomas, 1989; Fink et al., 2010): firm age (*AGE*), obtained as the natural logarithm of the difference between each current year and the firm's founding year; geographical diversification (*GEODIV*), proxied by a binary variable which equals one if the firm reports two or more geographical segments, and zero otherwise; and the degree of rivalry of a firm's core industry (*RIVALRY*), proxied by the Herfindahl index based on the sales shares of firms belonging to each industry group (two-digit SIC code level).

Table A1. of the Appendix summarises the variable definitions. All continuous variables (except for ESG proxies) are winsorised at the upper and lower 1 % tails of their distribution. *EXVAL* is winsorised at the upper and lower limits of −1.386 and 1.386, respectively. Berger and Ofek (1995) identify extreme excess values as those which lie outside said the [-1.386, 1.386] range.

3.3. Empirical strategy

Fig. 1 illustrates the causal paths of our hypotheses. Hypothesis 1 corresponds to path *c* (the direct effect). The bottom part of Fig. 1 depicts the mediation model, wherein a firm's risk is the mediating variable that channels an indirect effect of the interplay between BD and ESG on excess value (path *c'*).

To assess the mediation effect, we follow Baron and Kenny's (1986) conditions, as do recent works (Park et al., 2021; Zhang & Zhou, 2022). The first condition to evaluate (path *a*) is that the changes in the independent variables (BD and ESG, in addition to the interplay of both) should be significantly related to the mediator (a firm's risk). The second condition (path *b*) establishes that such a mediator should significantly affect the dependent variable (excess value). Finally, the third condition requires that the significant effect of the interplay between BD and ESG on a firm's excess value (the direct path of causality: path *c*) no longer be significant or weaken its statistical significance when the mediator (a firm's risk) is accounted for in the regression, thereby supporting the existence of full and partial mediation, respectively.

We specify the following baseline model (equation [4]) to test Hypothesis 1 regarding the effect of the interplay between BD and ESG on a firm's excess value (direct effect of path *c*):

$$EXVAL_{i,t} = \beta_0 + \beta_1 \bullet BD_{i,t} + \beta_2 \bullet ESG_{i,t} + \beta_3 \bullet BD_{i,t} \bullet ESG_{i,t} + \beta_4 \bullet CONTROLS_{i,t} + \beta_5 \bullet INDUSTRY_j + \beta_6 \bullet YEAR_t + \varepsilon_{i,t} \quad (4)$$

where i, j and t denote firm, industry, and year, respectively. $EXVAL_{i,t}$, $BD_{i,t}$ and $ESG_{i,t}$ refer to a firm's excess value, BD, and ESG engagement, respectively. $CONTROLS_{i,t}$ comprises the vector of control variables. $INDUSTRY_j$ and $YEAR_t$ denote industry- and time-fixed effects, respectively. $\varepsilon_{i,t}$ represents the random disturbance.

The following regression is used to test Hypotheses 2a to 2c (path *a* of the first Baron and Kenny's (1986) condition):

$$RISK_{i,t} = \delta_0 + \delta_1 \bullet BD_{i,t} + \delta_2 \bullet ESG_{i,t} + \delta_3 \bullet BD_{i,t} \bullet ESG_{i,t} + \delta_4 \bullet CONTROLS'_{i,t} + \delta_5 \bullet INDUSTRY_j + \delta_6 \bullet YEAR_t + \varphi_{i,t} \quad (5)$$

where i, j and t denote firm, industry, and year, respectively. $RISK_{i,t}$ alternatively denotes a firm's total, idiosyncratic, and systematic risks. $CONTROLS'_{i,t}$ comprises the same set of control variables described previously, in addition to a firm's age, geographical diversification, and rivalry in the core industry. Industry- and time-fixed effects are added. $\varphi_{i,t}$ is the random disturbance.

Finally, the last two conditions of mediation help estimate the models of equations [6] (path *b*) and [7] (path *c'*). To test Hypothesis 3 regarding the mediating role of a firm's risk, we need to pay attention to how the statistical significance of BD, ESG, and their interaction changes compared with the baseline equation [4] once the mediator (*RISK*) is incorporated into the regression[8]:

$$EXVAL_{i,t} = \beta_0 + \beta_1 \bullet RISK_{i,t} + \beta_2 \bullet CONTROLS_{i,t} + \beta_3 \bullet INDUSTRY_j + \beta_4 \bullet YEAR_t + \varepsilon_{i,t} \quad (6)$$

$$EXVAL_{i,t} = \beta_0 + \beta_1 \bullet BD_{i,t} + \beta_2 \bullet ESG_{i,t} + \beta_3 \bullet BD_{i,t} \bullet ESG_{i,t} + \beta_4 \bullet RISK_{i,t} + \beta_5 \bullet CONTROLS_{i,t} + \beta_6 \bullet INDUSTRY_j + \beta_7 \bullet YEAR_t + \varepsilon_{i,t} \quad (7)$$

Following Petersen (2009), we initially estimate our models by using ordinary least squares (OLS) with standard errors clustered at firm level. This econometric procedure corrects potential residual dependence created by the firm effect and makes our results comparable to prior empirical studies (Lins et al., 2017; Fuente et al., 2022; Amiraslani et al., 2023).

Additionally, earlier research raises concerns about the presence of endogeneity in the diversification-value relationship (Andrés et al., 2017a, 2017b; Campa & Kedia, 2002; Hoechle et al., 2012; Villalonga, 2004b). Endogeneity is produced by simultaneous causality (Bascle, 2008): BD influences a firm's value, although the latter variable can also

[6] For robustness, systematic and idiosyncratic risks are also computed based on Fama and French's (1993) three factor model. Our results are not sensitive to these alternative proxies for risk components.

[7] We require at least 84 non-missing daily returns in a year to estimate each daily beta.

[8] If the statistical significance of the coefficient β_3 associated with the multiplicative term *BD×ESG* decreases but still remains statistically significant, partial mediation is at play. If β_3 has no statistical significance, this implies that the entire effect of BD and ESG engagement is channelled through a firm's risk (mediator), thereby supporting the full mediation conjecture.

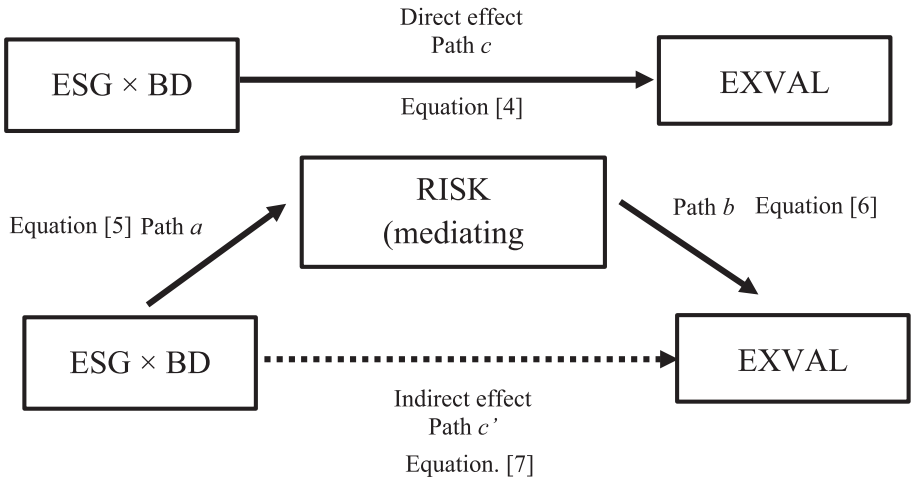

Fig. 1. Path diagrams of the direct and indirect effects.

impact the decision to diversify and refocus the portfolio of businesses. To alleviate endogeneity, we re-estimate the models involving BD by implementing an instrumental variable technique, such as two-stage least squares (2SLS) estimations (Bascle, 2008; Semadeni et al., 2014). We report the Durbin-Wu-Hausman statistic to test the null hypothesis that the regressors are exogenous. If this null hypothesis cannot be rejected, it rules out the presence of endogeneity. Then, OLS estimations would be unbiased and lead to more consistent estimations than 2SLS.

Any suitable instrument for diversification must fulfil two conditions: instrument relevance, referring to the extent to which the instrument corresponds with the endogenous variable (diversification); and instrument exogeneity, which requires the instrument to be uncorrelated with the random disturbance (Semadeni et al., 2014). We draw on two instrumental variables for BD: the number of analysts' forecasts of earnings per share for a one-year horizon (from the I/B/E/S database) and aggregate market share of diversified firms operating in a firm's core sector (based on Fama-French's 12 industries). Because of analyst forecasting specialisation in industries, coupled with the complexity of conglomerates, diversified firms usually have lower analyst coverage (Litov et al., 2012). Meanwhile, a greater portion of diversified firms in a certain industry can be a sign that a diversification strategy confers a competitive advantage, thereby encouraging firms to diversify their business portfolios (Santaló & Becerra, 2008). To evaluate instrument quality, the 2SLS estimations report the Cragg-Donald statistic (which tests for instrument relevance) and Sargan test (which assesses instrument exogeneity). If the p-values of both tests do not lead to their null hypotheses being rejected, this supports the validity of the chosen instruments.

4. Empirical results[9]

4.1. Descriptive statistics and univariate analysis

Table 1 contains the descriptive statistics. Our sample has an average diversification discount of −0.0650, as indicated by the mean *EXVAL*. This concurs with prior works (Andrés et al., 2017a; Campa & Kedia, 2002). Our sample firms display several segments ranging from one to seven, at most. On average, they have an overall ESG score of 3.83 out of 10. Greater variance in the idiosyncratic risk variables is observed than in the total risk and systematic risk ones. Approximately 59 % of firm-year observations are geographically diversified.

Table A2 of the Appendix displays pairwise correlations; multicollinearity is not a concern. *EXVAL* displays a negative and statistically significant correlation (at the 1 % level) with the three alternative BD measures, thus suggesting a diversification discount. The diversification measures exhibit correlations exceeding 0.88, supporting their suitability as alternative proxies for the same construct. Additionally, some differences exist in the correlations of the different types of risk with a firm's excess value: total and idiosyncratic risks display negative correlations, while systematic risk exhibits a positive correlation with *EXVAL*.[10]

4.2. The influence of BD on excess value and the moderating effect of ESG engagement

Table 2 shows the results of estimating equation [4] for path *c* (direct effect). Panels A and B consider BD and ESG separately, respectively. Panel C includes both variables simultaneously. Finally, Panel D additionally accounts for their interaction effects. Consistent with the mainstream literature (Berger & Ofek, 1995; Hoechle et al., 2012; Kuppuswamy & Villalonga, 2016; Servaes, 1996; Villalonga, 2004b), the impact of BD on a firm's excess value is negative and statistically significant at the 1 % level, revealing a diversification discount. This finding holds across the alternative proxies for the degree of diversification. Further, the economic significance of the results is stronger for *HERF*. As Panel A reports, the effect of *HERF* is negative and statistically significant (β_1 = -0.5028, $p < 0.01$); if *HERF* increases by one standard deviation, *EXVAL* decreases by 10.79 percentage points. Moreover, stronger ESG engagement is associated with a value discount, with the economic significance of this coefficient being weaker than that associated with BD. In Panel B, where we only consider *ESGscore* (β_1 = -0.0272, $p < 0.01$), if *ESGscore* increases by one standard deviation, *EXVAL* decreases by 5.19 percentage points.

Panel D adds the interaction effect between BD and ESG. Columns (8) to (10) compute the interaction effects using the continuous measures of both variables. All interaction coefficients are positive and statistically significant at the 5 % level or better. Thus, Hypothesis 1 is supported. To

[9] STATA log files with the outputs of our empirical analyses are available upon request.

[10] This seemingly counterintuitive positive relationship between *SYSRISK* and *EXVAL* suggests that the higher a firm's systematic risk, the higher the value that investors attribute to the reduction in idiosyncratic risk from diversification. Although not shown in the Appendix, the correlation between systematic risk and other measures of value, such as market capitalisation and the market to book ratio, are negative. We are grateful to one of the reviewers for bringing this point to our attention.

Table 1
Descriptive statistics.

Variable	No. of obs.	Mean	Std dev.	Min.	p25	Median	p75	Max.
EXVAL	14,764	−0.0650	0.7126	−1.3860	−0.5427	−0.0132	0.4031	1.3860
Degree of diversification								
NUMSEG	15,927	1.5046	0.8073	1	1	1	2	7
HERF	15,927	0.1378	0.2146	0	0	0	0.2934	0.8557
ENTROPY	15,927	0.2214	0.3485	0	0	0	0.4775	1.9408
ESG engagement								
ESGscore	7,803	3.8294	1.9089	0.0273	2.3493	3.4333	5.1430	9.2673
Firm risk								
TOTALRISK	15,205	0.0269	0.0140	0.0092	0.0174	0.0238	0.0324	0.0977
SYSRISK	15,066	1.0482	0.4693	−0.1011	0.7536	1.0438	1.3420	2.2775
IDRISK	15,066	1.8415	1.4635	−0.5842	0.8266	1.5983	2.5204	6.7468
Controls								
SIZE	15,927	13.8043	1.8434	9.7614	12.4962	13.7782	15.0726	18.1320
LEVERAGE	15,927	0.2279	0.1955	0	0.0265	0.2108	0.3649	0.7361
PROFITAB	15,927	0.0235	0.3329	−1.9914	0.0048	0.0710	0.1468	0.5848
INVEST	15,927	0.0484	0.0542	0.0004	0.0150	0.0303	0.0600	0.3026
CASH	15,927	0.1324	0.1417	0.0001	0.0274	0.0859	0.1867	0.6955
TANG	15,927	0.5116	0.4100	0.0181	0.1815	0.3804	0.7821	1.8830
AGE	5,051	3.6137	0.8819	0	3.0910	3.6109	4.2626	5.3659
GEODIV	15,367	0.5927	0.4913	0	0	1	1	1
RIVALRY	15,927	0.9180	0.0758	0	0.8976	0.9459	0.9609	0.9774

better interpret our results, Columns (11) to (13) consider ESG engagement as a binary variable (*dumESGscore*) in the interaction term,[11] which equals 1 if a firm's *ESGscore* is equal to or above the yearly sample median, and zero otherwise. Most results remain robust, except for the interaction term *NUMSEG* × *dumESGscore*, which has no statistical significance. For example, in Column (12), the coefficient of *HERF* × *dumESGscore* ($\beta_3 = 0.2220$, $p < 0.01$) suggests that the diversification discount is 22.20 percentage points lower in firms with above-median ESG engagement compared to those with below-median ESG. Specifically, the coefficient of *HERF* for below-median ESG firms is −0.5192 ($p < 0.01$), which decreases by almost a half for above-median ESG firms ($\beta_2 + \beta_3 =$ -0.5192 + 0.2220 = -0.2972). Consequently, a standard deviation increase in *HERF* reduces *EXVAL* by 11.14 percentage points in firms with low ESG engagement; however, it only causes a reduction of 6.38 percentage points in more ESG-engaged companies.

Complementarily, we graphically depict the moderating effect of ESG in the diversification-excess value relationship in Fig. 2. The Y-axis represents *EXVAL*, while the X-axis measures the level of BD based on *HERF*. The red line corresponds to the subsample of firm-year observations with an *ESGscore* below the yearly sample median. Although lower ESG-engaged firms reach higher *EXVAL* values for *HERF* levels approximately below 0.4, the value loss is greater as the firm increases its diversification. Firms with lower ESG engagement exhibit a more negative slope of the diversification-excess value relationship than their higher ESG engagement counterparts, who exhibit a flatter slope. Again, this graph illustrates that greater ESG helps mitigate value losses from BD.

Additional robustness tests use alternative definitions of BD and ESG.[12] First, our results are robust to the use of either three- or two-digit SIC groupings to compute the extent of BD. Second, our findings also hold when we measure a firm's ESG engagement using individual ESG pillar scores. Finally, we incorporate an instrumental-variable 2SLS estimation approach that accounts for the endogeneity of the diversification decision. These 2SLS estimations of equation [4] are provided in Table A4. of the Appendix. The Durbin-Wu-Hausman test presents a p-value equal to zero across all estimations, thus causing the null hypothesis that diversification is exogenous to be rejected. Consequently, the 2SLS estimates are more consistent than OLS ones. The Cragg-Donald and Sargan tests confirm the validity of our chosen instruments regarding their instrument relevance and exogeneity, respectively. Our main results also hold after controlling for endogeneity. The diversification discount persists. Further, this negative impact of diversification on firm value is moderated by a firm's ESG. Stronger engagement in ESG practices, as represented by the firm having an above-median ESG score. substantially reduces the negative marginal effect of diversification on a firm's value (by around 65–87 %).[13]

4.3. Diversification and ESG engagement: Influence on a firm's risk

Table 3 presents the results of equation [5] estimations to test Hypotheses 2a to 2c on the impact of BD and ESG on a firm's risk (path *a* in Fig. 1). We analyse different risk components: idiosyncratic, systematic, and total risks. Panel A excludes the interaction effects, while Panel B considers them. As Panel A shows, BD negatively affects idiosyncratic and total risks, with statistically significant results across all proxies

[11] Further robustness checks replace the individual control variable of *ESGscore* by its binary variable of *dumESGscore* in the regressions which use the latter one in the interaction term. The results remain similar.

[12] These robustness analyses are available in Table A3. of the Appendix.

[13] Additional robustness analyses are conducted by considering two variables as endogenous: diversification and ESG engagement. In this case, three instrumental variables are applied: the aggregate market share accounted for diversified firms operating in a firm's core sector, the median ESG engagement in a firm's core sector, and a binary variable of the existence of ESG-based compensation with the firm. These results are displayed in Table A5. of the Appendix and remain robust. Moreover, we conduct additional robustness analyses by re-calculating the first two aforementioned instrumental variables while considering all firms but excluding the focal firm in each case. The results are robust and available upon request. We thank an anonymous reviewer for valuable insights in this regard.

Table 2
The effect of ESG and BD (and their interplay) on excess value: OLS estimations (path *c*).

	Dependent variable: EXVAL												
	Panel A: Diversification			Panel B: ESG	Panel C: Diversification and ESG			Panel D: Diversification, ESG, and their interplay					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Constant	−1.3866***	−1.5018***	−1.5116***	−0.4078**	−0.3867**	−0.4538**	−0.4633**	−0.1954	−0.3766*	−0.3827*	−0.3529*	−0.4286**	−0.4348**
	(0.1127)	(0.1129)	(0.1129)	(0.1964)	(0.1966)	(0.1967)	(0.1967)	(0.2083)	(0.1961)	(0.1961)	(0.1950)	(0.1959)	(0.1958)
BD													
NUMSEG	−0.1370***				−0.0955***			−0.2161***			−0.1131***		
	(0.0161)				(0.0184)			(0.0466)			(0.0204)		
HERF		−0.5028***				−0.3807***			−0.8073***			−0.5192***	
		(0.0540)				(0.0647)			(0.1337)			(0.0794)	
ENTROPY			−0.3077***				−0.2236***			−0.5051***			−0.3254***
			(0.0338)				(0.0396)			(0.0847)			(0.0489)
ESG engagement													
ESGscore				−0.0272***	−0.0227**	−0.0216**	−0.0219**	−0.0658***	−0.0391***	−0.0399***	−0.0314***	−0.0291***	−0.0304***
				(0.0103)	(0.0101)	(0.0102)	(0.0101)	(0.0190)	(0.0111)	(0.0110)	(0.0121)	(0.0108)	(0.0108)
Interaction effects													
NUMSEG × ESGscore								0.0265**					
								(0.0107)					
HERF × ESGscore									0.0989***				
									(0.0282)				
ENTROPY × ESGscore										0.0638***			
										(0.0179)			
NUMSEG × dumESGscore											0.0262		
											(0.0163)		
HERF × dumESGscore												0.2220***	
												(0.0854)	
ENTROPY × dumESGscore													0.1579***
													(0.0516)
Control variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	14,764	14,764	14,764	7,213	7,213	7,213	7,213	7,213	7,213	7,213	7,213	7,213	7,213
F-statistic	21.64***	21.50***	21.46***	12.76***	13.10***	13.18***	13.09***	13.73***	13.83***	13.82***	12.77***	13.25***	13.29***

This table shows the ordinary least squares (OLS) estimation results of equation [4] (path *c*) with clustered standard errors at the firm level. The dependent variable is a firm's excess value (*EXVAL*). Panel A considers business diversification as the explanatory variable, which is measured by three alternative proxies: the number of segments at the four-digit Standard Industry Classification (SIC) grouping (*NUMSEG*), Herfindahl index (*HERF*), and total entropy index (*ENTROPY*). Panel B includes environmental, social, and governance (ESG) engagement as the explanatory variable, approximated by the equally-weighted average of the scores of the three ESG (*ESGscore*). Panel C simultaneously accounts for both business diversification and ESG engagement. Panel D adds the interaction effect between business diversification and ESG engagement. Firm size (*SIZE*), financial leverage (*LEVERAGE*), profitability (*PROFITAB*), capital investment (*INVEST*), cash holdings (*CASH*), asset tangibility (*TANG*), and industry and year fixed effects are controlled in all regressions. The F-statistic tests the joint significance of all independent variables. Standard errors appear in parentheses under the coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

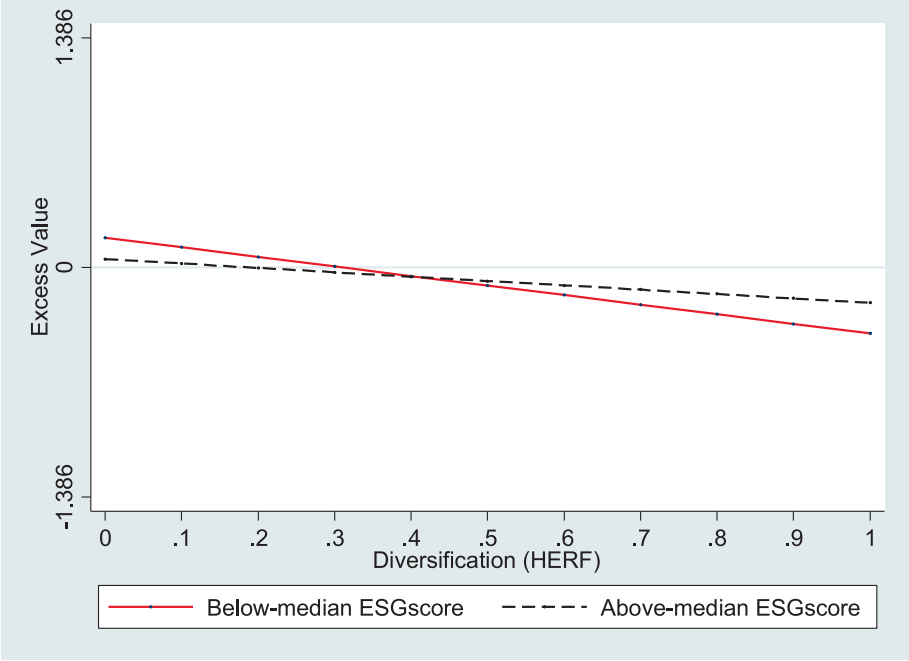

Fig. 2. The diversification-excess value relationship for low and high ESG-engaged firms.

except for *NUMSEG*. This may be due to *NUMSEG's* narrower ability to capture the scope of diversification compared to the other two continuous proxies (*HERF* and *ENTROPY*).

These findings support Hypothesis 2a. Additionally, they reveal that the risk-mitigating benefits of diversification for reducing idiosyncratic risk also extend to a firm's total risk, albeit with a weaker economic magnitude. For example, *HERF* has a negative and significant effect of *IDRISK* (δ_2 = -0.2344, $p < 0.05$); a standard deviation increase in *HERF* reduces idiosyncratic risk (as proxied by *IDRISK*) by 5.03 percentage points. The same variation in *HERF* reduces total risk (as measured by *TOTALRISK*) by only 0.05 percentage points. Meanwhile, ESG has a null effect on idiosyncratic risk, but a strongly significant negative effect on systematic and total risks. Therefore, Hypothesis 2b also receives strong support. Further, the risk-reducing effect of ESG for systematic risk is also extended, albeit more weakly in economic terms, to total risk. For instance, *ESGscore* impacts *SYSRISK* negatively (δ_1 = -0.0264, $p < 0.01$). If *ESGscore* increases by one standard deviation, this reduces systematic risk (as proxied by *SYSRISK*) by five percentage points; however, this same change causes a substantially lower reduction in total risk of only 0.09 percentage points.

Panel B of Table 3 additionally considers the interaction effect between BD and ESG. The results do not support Hypothesis 2c. The coefficients of the interaction effect are positive and statistically significant (beyond the 5 % level) in total risk regressions. Thus, we can rule out the possibility that the interaction effect of BD and ESG reduces a firm's total risk. Therefore, although we showed earlier that a firm's ESG engagement enhances the value effects of diversification, no mediating path is channelled by the interplay between the two strategies since the latter interaction variable does not significantly affect a firm's risk (Baron and Kenny's (1986) first condition (path *a*) does not hold).

Additionally, we perform several robustness checks.[14] Again, our findings remain robust to the measurement of BD at either the three- or two-digit SIC code level. Among individual ESG pillars, the results hold when the scores of the environmental and social pillars are used, while the governance pillar score displays no statistical significance. This is consistent with prior research that finds lower insurance benefits from the governance pillar because of its weaker ability to legitimate a firm's efforts in sustainability and endow it with credibility in the eyes of stakeholders (Fuente et al., 2022; Godfrey et al., 2009). Finally, we re-estimate the risk models (equation [5]) by using an alternative proxy for each type of risk based on the Fama and French (1993) three-factor model.

Finally, we repeat these estimations using 2SLS to control for potential endogeneity of diversification. The results are shown in Table A6. of the Appendix. The Durbin-Wu-Hausman test does not reject the null hypothesis of exogeneity of diversification in most regressions[15] for which endogeneity is not a concern in our risk models. Further, OLS estimations (explained earlier) are preferable since they produce more consistent estimations than 2SLS.

4.4. The mediating role of corporate risk in the relationship between ESG/BD and excess value

The final two Baron and Kenny (1986) mediation conditions are tested in Table 4. Panel A shows the estimations of path *b,* which evaluates the impact of a firm's risk (the hypothesised mediator) on excess value. Clearly, a firm's total risk significantly affects excess value beyond the 1 % level of statistical significance (β_1 = -9.0528, $p < 0.01$). A standard deviation decrease in *TOTALRISK* increases a firm's excess value by 12.67 percentage points. Panel B evaluates the last condition (path *c'*, equation [7]) by considering BD, ESG, and their interaction with the variable for total risk. The results show that both the coefficients of the interaction term and total risk preserve their statistical significance. Thus, total risk does not mediate the interaction effect of BD and ESG on a firm's value. Moreover, the effect of BD and ESG remains statistically significant and does not weaken compared with the previous estimation.

The results also hold when applying the 2SLS instrumental variable estimation to correct for potential endogeneity of diversification (as reported in Table A7. of the Appendix). Our evidence is also robust to the use of a binary variable of ESG (based on the yearly sample median ESG

[14] These results are available upon request.

[15] Only the regressions with *IDRISK* as the dependent variable present a Durbin-Wu-Hausman statistic which rejects the null hypothesis of exogeneity.

Table 3
The impact of ESG and BD on a firm's risk (idiosyncratic, systematic, and total risks) [path *a*].

	Panel A: Estimations without moderating effects								
	Dependent variable: IDRISK			Dependent variable: SYSRISK			Dependent variable: TOTALRISK		
Constant	5.2046***	5.1409***	5.1394***	0.4907**	0.4966**	0.4830**	0.0417***	0.0413***	0.0411***
	(0.4879)	(0.4833)	(0.4832)	(0.2105)	(0.2115)	(0.2118)	(0.0046)	(0.0046)	(0.0046)
BD									
NUMSEG	−0.0277			−0.0235**			−0.0004*		
	(0.0248)			(0.01118)			(0.0002)		
HERF		−0.2344**			−0.0652			−0.0025***	
		(0.0919)			(0.0503)			(0.0010)	
ENTROPY			−0.1212*			−0.0487			−0.0014***
			(0.0560)			(0.0308)			(0.0005)
ESG engagement									
ESGscore	−0.0103	−0.0109	−0.0109	−0.0264***	−0.0262***	−0.0264***	−0.0005***	−0.0005***	−0.0005***
	(0.0150)	(0.0149)	(0.0149)	(0.0080)	(0.0080)	(0.0080)	(0.0001)	(0.0001)	(0.0001)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	2,573	2,573	2,573	2,573	2,573	2,573	2,576	2,576	2,576
F-statistic	76.97***	77.87***	77.56***	28.09***	28.17***	28.17***	39.23***	39.58***	39.42***
	Panel B: Estimations including moderating effects								
	Dependent variable: IDRISK			**Dependent variable: SYSRISK**			**Dependent variable: TOTALRISK**		
Constant	5. 4539***	5.2041***	5.2075***	0.4671**	0.4819**	0.4703**	0.0441***	0.0418***	0.0417***
	(0.4744)	(0.4748)	(0.4745)	(0.2217)	(0.2142)	(0.2147)	(0.0048)	(0.0046)	(0.0046)
BD									
NUMSEG	−0.1984***			−0.0073			−0.0020***		
	(0.0514)			(0.0300)			(0.0005)		
HERF		−0.8270***			0.0724			−0.0075***	
		(0.2141)			(0.1248)			(0.0024)	
ENTROPY			−0.5011***			0.0223			−0.0048***
			(0.1298)			(0.0773)			(0.0014)
ESG engagement									
ESGscore	−0.07333***	−0.0376**	−0.0383**	−0.0204*	−0.0200**	−0.0212***	−0.0011***	−0.0007***	−0.0008***
	(0.0227)	(0.0165)	(0.0165)	(0.0113)	(0.0080)	(0.0081)	(0.0002)	(0.0002)	(0.0001)
Interaction effects									
NUMSEG × ESGscore	0.0353***			−0.0033			0.0003***		
	(0.0100)			(0.0056)			(0.0001)		
HERF × ESGscore		0.1302***			−0.0302			0.001**	
		(0.0440)			(0.0256)			(0.0004)	
ENTROPY × ESGscore			0.0819***			−0.0153			0.0007***
			(0.0266)			(0.0156)			(0.0002)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	2,573	2,573	2,573	2,573	2,573	2,573	2,576	2,576	2,576
F-statistic	75.84***	77.18***	76.76***	27.15***	27.17***	27.19***	38.87***	39.00***	38.96***

This table shows the ordinary least squares (OLS) estimation results of equation [5] (path *a*) with clustered standard errors at the firm level. The dependent variable is, alternately, a firm's idiosyncratic (*IDRISK*), systematic (*SYSRISK*), and total risks (*TOTALRISK*). Panel A accounts for the effect of business diversification and environmental, social, and governance (ESG) engagement considered individually, while Panel B includes their interaction. Business diversification is measured by three alternative proxies: the number of segments at the four-digit SIC grouping (*NUMSEG*), Herfindahl index (*HERF*), and total entropy index (*ENTROPY*). ESG engagement is approximated by the equally-weighted average of the scores of the three ESG pillars (*ESGscore*). Firm size (*SIZE*), financial leverage (*LEVERAGE*), profitability (*PROFITAB*), capital investment (*INVEST*), cash holdings (*CASH*), asset tangibility (*TANG*), firm age (*AGE*), the geographical diversification dummy (*GEODIV*), rivalry in the firm's core industry (*RIVALRY*), and industry and year fixed effects are controlled in all regressions. The F-statistic tests the joint significance of all independent variables. Standard errors appear in parentheses under the coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

engagement) to compute the interaction effects.[16] Overall, these results do not suggest any mediating effect channelled by a firm's risk.

Additionally, we perform robustness analyses for the mediating effect by applying the structural equation modelling (SEM) approach[17] (Iacobucci et al., 2007; Zhang & Zhou, 2022). Iacobucci et al. (2007) note the potential of SEM to improve the estimation accuracy of mediating effects (as given by smaller standard errors) compared to regression techniques. Specifically, we use this technique to compute the Sobel test (Sobel, 1982), which contrasts the null hypothesis of no difference between the direct (path *c*) and indirect effects (path *c'*) of BD and ESG on *EXVAL*. Table 5 displays the z-statistic of the Sobel test in addition to the relative size of the indirect to the direct effect. The Sobel test suggests that the existence of a mediating effect of a firm's risk in the relationship of BD and ESG with *EXVAL* depends on the BD measure. Considering these results, we conclude that Hypothesis 3 is not

[16] These results are available upon request.
[17] We implement the *medsem* command in STATA to perform the mediation analyses.

Table 4
Mediation analyses of a firm's total risk in the interplay between BD and ESG: OLS estimations [paths *b* and *c'*].

	Dependent variable: *EXVAL*			
	Panel A: The effect of firm risk on excess value	Panel B: The effect of the interplay between BD and ESG on excess value, adding the mediator (risk)		
	(1)	(2)	(3)	(4)
Constant	−0.7572***	0.4711**	0.2747	0.2665
	(0.1396)	(0.2234)	(0.2113)	(0.2115)
Firm risk				
TOTALRISK	−9.0528***	−13.3707***	−13.5501***	−13.5323***
	(0.8486)	(1.4627)	(1.4629)	(1.4627)
BD				
NUMSEG		−0.2443***		
		(0.0460)		
HERF			−0.9150***	
			(0.1319)	
ENTROPY				−0.5729***
				(0.0833)
ESG				
ESGscore		−0.0824***	−0.0514***	−0.0524***
		(0.0187)	(0.0109)	(0.0109)
Interaction effects				
NUMSEG × ESGscore		0.0304***		
		(0.0106)		
HERF × ESGscore			0.1128***	
			(0.0279)	
ENTROPY × ESGscore				0.0728***
				(0.0176)
Control variables	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
No. of obs.	14,083	7,187	7,187	7,187
F-statistic	24.32***	17.06***	17.12***	17.14***

This table shows the ordinary least squares (OLS) estimation results of equations [6] (path *b*) and [7] (path *c'*) with clustered standard errors at the firm level. The dependent variable is a firm's excess value (*EXVAL*). Panel A considers the impact of a firm's total risk on excess value. Panel B estimates the impact of business diversification, environmental, social, and governance (ESG) engagement, and their interaction when the mediator (a firm's total risk) is controlled for. Business diversification is measured by three alternative proxies: the number of segments at the four-digit Standard Industry Classification (SIC) grouping (*NUMSEG*), Herfindahl index (*HERF*), and total entropy index (*ENTROPY*). ESG engagement is approximated by the equally-weighted average of the scores of the three ESG pillars (*ESGscore*). Firm size (*SIZE*), financial leverage (*LEVERAGE*), profitability (*PROFITAB*), capital investment (*INVEST*), cash holdings (*CASH*), asset tangibility (*TANG*), and industry and year fixed effects are controlled in all regressions. The F-statistic tests the joint significance of all independent variables. Standard errors appear in parentheses under the coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5
Sobel test results (mediation effects): Structural equation model.

Independent variable	Mediator	Dependent variable	Sobel test (z)	Indirect effect / Direct effect
NUMSEG, ESGScore, NUMSEG × ESGscore	TOTALRISK	EXVAL	−2.597***	1.327
HERF, ESGScore, HERF × ESGscore	TOTALRISK	EXVAL	−1.471	0.129
ENTROPY, ESGScore, ENTROPY × ESGscore	TOTALRISK	EXVAL	−1.891*	0.186

***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

supported.

5. Alternative mechanisms driving the value of the diversification-ESG interplay

The lack of support for Hypotheses 2c and 3 implies that the effect of the diversification-ESG interplay on a firm's excess value is not mediated by a firm's risk. Rather, this interplay has a significant and direct impact on firm value. This result rules out the idea that the value effect of BD and ESG is exclusively driven through the risk channel. Instead, it suggests that their interaction effect on firm value may directly arise from the additional benefits and costs that ESG practices provide to multi-business firms. To test whether such direct benefits and costs may play a role in explaining why a firm's ESG engagement can enhance the value of BD (Hypothesis 1), we adopt a contingent approach and examine this relationship under several contrasting scenarios of business relatedness and monitoring mechanisms.

First, the aforementioned interaction benefits stem from both aspects: ESG practices help diversified firms to manage the heightened challenges of coordinating their diverse stakeholder interests (Bach & Allen, 2010). Additionally, BD enables the exploitation of scale-free capabilities produced by the diffusion of ESG practices across multiple business segments (Mammen et al., 2021). ESG engagement is likely to fuel the corporate value advantages of BD to a greater extent in firms that have a more heterogeneous business portfolio. Firms with more related diversification enjoy lower switching costs to redeploy resources across business segments (Dickler et al., 2022). This reduces ESG's usefulness in further facilitating resource reallocations. Conversely, unrelated diversified companies display a more complex array of stakeholder interests, which demand an extra effort to deal with such resource reallocations. ESG can improve a firm's stakeholder relationships, which heightens their support to redeploy resources across business segments (Fombrun et al., 2000).

We run our baseline model of equation [4] by splitting our sample into two subsamples based on the yearly sample median of Jacquemin and Berry's (1979) related entropy index. Panel A of Table 6 reports the results. As expected, the moderating effect of ESG on the diversification-excess value relationship has no statistical significance in the subsample of higher related diversifiers. Conversely, stronger ESG engagement does alleviate the diversification discount in the subsample of less related diversification. This evidence concurs with Su and Tsang (2015), who find that improving stakeholder relationships is more beneficial for unrelated diversifiers due to their more diverse stakeholder voices.

Second, since both BD and ESG engagement can be opportunistically used by managers to satisfy their own best interests at the expense of shareholder value maximisation, combining the two strategies may worsen a firm's agency costs. Consequently, we expect ESG to enhance

Table 6
Alternative mechanisms driving the value of the interplay between diversification and ESG engagement.

	PANEL A: By diversification relatedness					
	Dependent variable: Excess value					
	Low related diversif.	High related diversif.	Low related diversif.	High related diversif.	Low related diversif.	High related diversif.
Constant	−0.0160	−0.7625*	−0.3725*	−0.5632	−0.3676*	−0.6145
	(0.2313)	(0.4521)	(0.2161)	(0.3889)	(0.2158)	(0.3879)
BD						
NUMSEG	−0.3479***	−0.0084				
	(0.0638)	(0.0900)				
HERF			−0.9060***	−0.4623		
			(0.2040)	(0.3125)		
ENTROPY					−0.6291***	−0.2173
					(0.1326)	(0.1746)
ESG						
ESGscore	−0.0919***	−0.0023	−0.0376***	−0.0459	−0.0388***	−0.0377
	(0.0204)	(0.0504)	(0.0116)	(0.0343)	(0.0116)	(0.0298)
Interaction effects						
NUMSEG × ESGscore	0.0503***	−0.0038				
	(0.0140)	(0.0198)				
HERF × ESGscore			0.1209***	0.0754		
			(0.0460)	(0.0627)		
ENTROPY × ESGscore					0.0874***	0.0344
					(0.0296)	(0.0344)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	5,760	1,453	5,760	1,453	5,760	1,453
F-statistic	11.50***	4.40***	10.86***	4.59***	11.00***	4.50***
	PANEL B: By analyst monitoring					
	Dependent variable: Excess value					
	Low analyst coverage	**High analyst coverage**	**Low analyst coverage**	**High analyst coverage**	**Low analyst coverage**	**High analyst coverage**
Constant	0.4657	0.5657*	0.3166	0.4139	0.3041	0.4091
	(0.3520)	(0.2951)	(0.3463)	(0.2820)	(0.3463)	(0.2822)
BD						
NUMSEG	−0.1973***	−0.1892***				
	(0.0699)	(0.0565)				
HERF			−0.5569**	−0.8107***		
			(0.2370)	(0.1601)		
ENTROPY					−0.3629**	−0.4906***
					(0.1490)	(0.1015)
ESG						
ESGscore	−0.0941***	−0.0590***	−0.0598***	−0.0382***	−0.0606***	−0.0387***
	(0.0336)	(0.0213)	(0.0207)	(0.0127)	(0.0206)	(0.0127)
Interaction effects						
NUMSEG × ESGscore	0.0288	0.0226*				
	(0.0177)	(0.0121)				
HERF × ESGscore			0.0667	0.1002***		
			(0.0623)	(0.0305)		
ENTROPY × ESGscore					0.0457	0.0624***
					(0.0387)	(0.0194)

(*continued on next page*)

Table 6 (*continued*)

	PANEL A: By diversification relatedness					
	Dependent variable: Excess value					
	Low related diversif.	High related diversif.	Low related diversif.	High related diversif.	Low related diversif.	High related diversif.
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	2,375	4,838	2,375	4,838	2,375	4,838
F-statistic	7.35***	10.97***	7.37***	11.23***	7.34***	11.18***
	PANEL C: By debt monitoring					
	Dependent variable: Excess value					
	Low leverage	**High leverage**	**Low leverage**	**High leverage**	**Low leverage**	**High leverage**
Constant	−0.4139	−0.4993*	−0.6476**	−0.6285**	−0.6407***	−0.6371**
	(0.2966)	(0.2686)	(0.2798)	(0.2512)	(0.2808)	(0.2512)
BD						
NUMSEG	−0.2233***	−0.1775***				
	(0.0610)	(0.0599)				
HERF			−0.6615***	−0.7650***		
			(0.2220)	(0.1555)		
ENTROPY					−0.4406***	−0.4641***
					(0.1363)	(0.1003)
ESG						
ESGscore	−0.0627**	−0.0551**	−0.0319*	−0.0362***	−0.0343**	−0.0358***
	(0.0251)	(0.0249)	(0.0172)	(0.0133)	(0.0171)	(0.0132)
Interaction effects						
NUMSEG × ESGscore	0.0236*	0.0238*				
	(0.0125)	(0.0143)				
HERF × ESGscore			0.0466	0.1130***		
			(0.0486)	(0.0319)		
ENTROPY × ESGscore					0.0379	0.0688***
					(0.0293)	(0.0209)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	3,123	4,090	3,123	4,090	3,123	4,090
F-statistic	10.28***	8.62***	9.97***	8.80***	10.07***	8.74***

This table shows the ordinary least squares (OLS) estimation results of equation [4] with clustered standard errors at the firm level by subsamples. Panel A divides the sample into two subsamples based on the median level of Jacquemin and Berry's (1979) related entropy index (firm-year observations with above and below median related entropy). Panel B splits the full sample based on the yearly sample median analyst coverage, measured by the number of analysts' forecasts of earnings per share for a one-year horizon (firm-year observations with above and below median analyst coverage). Panel C splits the full sample based on the yearly sample median of financial leverage (firm-year observations with above and below median leverage). The dependent variable is a firm's excess value (*EXVAL*). Business diversification is measured by three alternative proxies: the number of segments at the four-digit Standard Industry Classification (SIC) grouping (*NUMSEG*), Herfindahl index (*HERF*), and total entropy index (*ENTROPY*). A firm's environmental, social, and governance (ESG) engagement is approximated by the equally-weighted average of the scores of the three pillars (*ESGscore*). Firm size (*SIZE*), financial leverage (*LEVERAGE*), profitability (*PROFITAB*), capital investment (*INVEST*), cash holdings (*CASH*), asset tangibility (*TANG*), and industry and year fixed effects are controlled in all regressions. The F-statistic tests the joint significance of all independent variables. Standard errors appear in parentheses under the coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

BD's to a greater extent under stronger corporate monitoring. This helps curb managerial opportunistic behaviour and diversification over-investment and, consequently, ensures that greater genuineness in the firm's ESG engagement can enhance its value (Godfrey, 2005). Specifically, we consider two alternative external monitoring tools: analyst coverage and corporate debt. The literature broadly shows that they curb agency problems in corporate strategies (Fuente & Velasco, 2020; Gentry & Shen, 2013).

We run our baseline model of equation [4] by splitting our sample into two subsamples based on the yearly sample median of the ratio of total debt to total assets and yearly sample median of the number of analysts' EPS forecasts one year ahead. Panel B in Table 6 demonstrates that ESG only enhances the value impact of BD in the subsample of high analyst monitoring. This is consistent with our arguments for t stakeholder relationship improvement only when agency problems are kept under control using appropriate monitoring devices. Panel C provides further supporting evidence; the interaction term between BD and ESG only exhibits statistical significance in the high leverage subsample.

Additionally, Fig. 3 illustrates the moderating role of ESG across the subsamples based on related diversification, analyst monitoring, and debt monitoring. After each subsample regression, we depict how the slope of the association between BD and a firm's excess value changes depending on the relative ESG level. Stronger ESG engagement substantially reduces the negative slope of the diversification-excess value

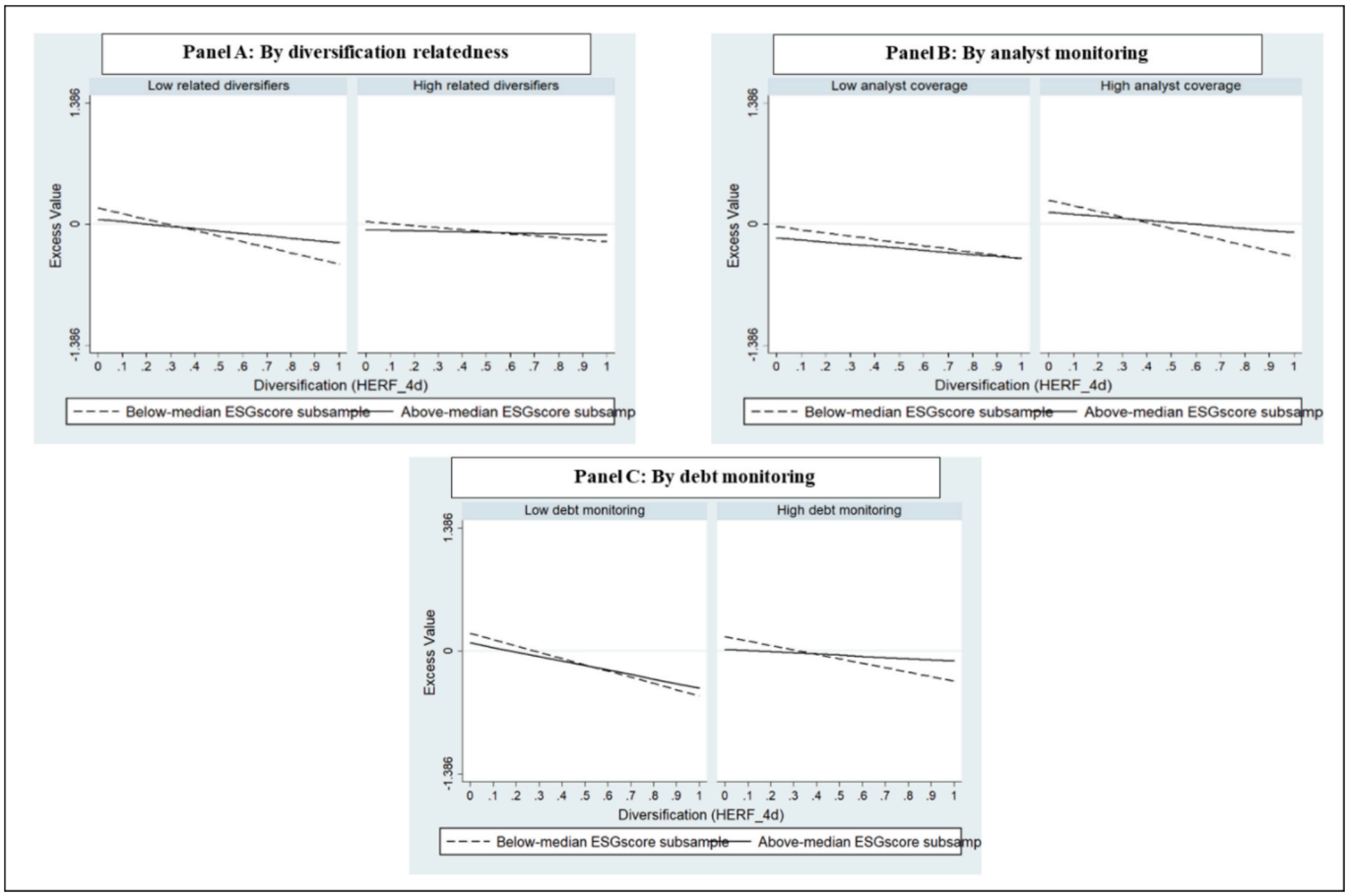

Fig. 3. The moderating effect of ESG engagement on the diversification-excess value relationship: Alternative value driving mechanisms.

relationship under a more heterogeneous business portfolio and stronger external monitoring mechanisms.

6. Conclusions

6.1. Theoretical implications

First, we bring fresh evidence to the contingency-based view of the BD-value relationship (Andrés et al., 2017a, 2017b; Mackey et al., 2017; Santaló & Becerra, 2008; Su & Tsang, 2015). To the best of our knowledge, our study is pioneering in examining the influence of the interplay between BD and ESG engagement in a firm's value grounded on a risk-based framework. Further, it extends the discourse on advancing risk measurement methodologies within the strategic management literature (Ruefli et al., 1999). We combine insights from the agency and stakeholder lenses to elaborate a more comprehensive argument about how BD and ESG engagement strategies can jointly improve corporate risk management and enhance firm value. We answer recent research calls which advocate the need to investigate further the joint effects of these strategies (Guerras-Martín et al., 2020), given that BD performance may be affected by the firm's stakeholder relationships. By incorporating ESG, we expand the appraisal of stakeholder management and show the reinforcing effects of a non-market strategy, ESG, in enhancing the value of a market strategy like BD. This idea ties in with the literature highlighting the need for greater awareness of integrated market and non-market strategies since they can be complementary in enhancing a firm's performance (Banerjee et al., 2019; Holburn & Vanden Bergh, 2014). Additionally, the stakeholder approach (Berman et al., 1999) provides us with a unique integrating framework (Cornell & Shapiro, 1987) to open up traditional theories, such as agency theory, to the appraisal of a broader range of stakeholder claims other than those for shareholder only. Overall, a firm's ESG engagement is a valuable partner to BD in encouraging stakeholders' contributions to the company over a longer-term horizon. This idea ties in with recent research, such as Banerjee et al. (2019), who note that market and non-market strategies are mutually reinforcing in achieving the twin outcomes of performance and legitimacy, respectively.

Second, our scrutiny of BD and ESG as complementary risk management strategies offers a better understanding of the underlying mechanisms which connect their advantages to value creation within companies. Analysing each one separately reveals an incomplete picture of the different overall risk management abilities across companies. The sum of the insurance benefits of BD and ESG individually in terms of value gains or prevention of value losses for companies may substantially differ once their joint effects are considered. Further, we answer recent calls for further theorisation of ESG as an insurance mechanism (Wang et al., 2020). We also show the importance of going beyond the simple shareholder-manager interest alignment, which the traditional diversification literature has been mainly restricted to, to account for a wider stakeholder universe, as advocated by ESG engagement. By assessing the interrelationship between these risk-reducing strategies, we promote further development of an integrated risk management perspective (Hagigi & Sivakumar, 2009). This can help better exploit the potential complementarities between strategic responses and in designing more efficient ones to hedge a firm's risk exposure.

Third, we show that the value advantage of BD and ESG engagement does not solely occur indirectly through their individual risk-reducing benefits. Although both strategies serve as two complementary strategic tools for risk management, their interaction effect on a firm's value is not channelled through risk. This leaves room to explore alternative

channels which may produce synergies and complementarities between these strategies and align their implementation to advance value creation within firms.

6.2. Contextual implications

Although a fine-grained comparison across different institutional settings lies outside the scope of our study, our evidence does point to some interesting contextual implications. This is especially true for diversified firms in a common law country such as the U.S., which grants the strongest legal protection for shareholders through more stringent institutional regulations (La Porta et al., 1998) and minimises manager-shareholder agency conflicts. This enables us to isolate the risk-reducing motivation from agency-based driven ones. In particular, we show that accounting for the interests of a wider stakeholder audience through ESG engagement can enhance the value of a market strategy such as BD, not merely as a consequence of complementary risk reduction advantages.

In the U.S. context, BD and ESG have been regarded as two manifestations of agency costs based on the shareholder-manager conflict. Whilst shareholders can diversify their portfolio of equity investments, other stakeholders (including managers) cannot do so with their firm-specific investments. Consequently, managers and other stakeholders may be interested in BD and ESG to reduce a company's risk in their own interests and regardless of the impact on a firm's value. However, we show that combining BD and ESG can positively affect firm value. We also outline some direct benefits of this interaction. Moreover, we find that this positive interaction effect strengthens under strong monitoring mechanisms, even in the context of the highest institutional protection of shareholder interests.

6.3. Practical implications

A key recommendation is the potential for combining strategies that buffer a firm's exposure to different sources of risk. Our study provides clues for managers about the importance of strengthening the moral capital attached to their firms. The associated benefits can spread to other ongoing strategies and better protect their companies against potential adverse shocks (Ding et al., 2021). In an increasingly unpredictable world, building corporate resilience is crucial for firms to endure over time and recover from adversity.

ESG actions can help endow firms with a corporate purpose (Henderson & Van Den Steen, 2015), which reinforces stakeholder involvement in the company and promotes better alignment between a firm's diversification strategy and the interests of its full array of stakeholders. A central challenge for corporate decision-makers comes from the trade-off between the interests of shareholders and non-financial stakeholders within their firms. These interests need to be adequately aligned as strategies unfold. If not, stakeholder groups whose interests are impaired are likely to obstruct certain corporate decisions and prompt the board of directors to reconcile the divergent interests. This can distract the attention of the board, which is a valuable and limited resource, and impair its monitoring and advising ability.

Finally, our evidence presents interesting insights for policymakers about the importance of not only strengthening the institutional legal protection of a firm's credit providers (e.g. shareholders and creditors) but also encouraging a firm's investment in ESG practices. This can ensure that companies show increasing awareness of the importance of supporting interest alignment with a wider population of stakeholders who enhance their business activity on several fronts. In particular, policymakers should support a more consistent and accurate measurement of ESG engagement to foster comparability across time, industries, and geographic settings. Additionally, they should implement ESG-friendly policies aligned with corporate policies on the same and reward them in some way.

6.4. Limitations and future research directions

Future works should seek to understand context's role in the value outcomes of combining several corporate insurance strategies, such as ESG engagement and BD, to capture potential contingencies at the macro-level, as pointed out by Jackson et al. (2019). For example, the value of jointly implementing these strategies may vary in dissimilar contextual scenarios. Such scenarios can occur across all business cycle stages, each of which may require hedging a different risk. Economic upturns and downturns may affect stakeholder demand pressure (Hannah et al., 2021) and the reward for being trustworthy in the market (Lins et al., 2017). In particular, the joint performance of BD and ESG after the massive negative shock of the COVID-19 pandemic, and gauge the extent to which these strategies (individually and jointly) help hedge against the risks. This can help in designing effective hedging practices for companies to strengthen their resilience against future adverse shocks.

Furthermore, a wider perspective of risk can be extremely enriching. Recent works (e.g. Crane & Matten, 2021) suggest that societal risk should be considered, which all firms face and simultaneously contribute to. Scholars can explore how the prevalence of risk-mitigating strategies in certain industries can alleviate the portion of risk that these industries' firms bring to the economy, which may be crucial during negative market shocks.

Similarly, future work can explore alternative institutional contexts (other than the U.S.) that offer weaker shareholder rights protection and where agency conflicts are likely to emerge. This can help to assess which managerial motivations for engaging in BD and ESG strategies simultaneously dominate: the wealth expropriation versus risk-reduction hypotheses. A multi-country dataset can help compare institutional settings with different enforcement of shareholder rights protections (La Porta et al., 1998).

Moreover, the COVID-19 pandemic has shown the key role played by essential stakeholders in ensuring corporate continuity. Therefore, a finer-grained identification of stakeholders can make their prioritisation easier (Crane & Matten, 2021) and promote a better knowledge of the relative importance of each stakeholder group's firm-specific investments. This can help harmonise corporate strategies, such as BD, to the demands of the most prominent stakeholders within each firm. Scholars can also consider groups of stakeholders according to their different prominence based on the particularities of each corporate strategy. For example, ESG may have important synergistic effects with collaborative strategies such as strategic alliances, for which trust between partners serves as the cornerstone (Fombrun et al., 2000). ESG actions can increase partner willingness to collaborate and may increase the likelihood of joint efforts being successful. This benefit can be particularly salient when partners display conflicting interests, such as in coopetition.

Next, this study has used the lenses of agency and stakeholder theories to examine the theoretical underpinnings that explain the possible interaction between BD and ESG engagement and its impact on firm value and risk. Future research can explicitly formulate contrasting hypotheses that capture the convergences and divergences of the agency and stakeholder theories on how BD and ESG engagement affect firm value and risk. In particular, scholars can examine the stakeholder versus shareholder orientations within firms.

Another important topic is the intersection between ESG engagement and other characteristics of the portfolio of businesses in diversified firms (e.g. relatedness and geographical diversification). For example, the institutional setting should receive particularly close attention (Pérez-Cornejo et al., 2023). A firm's ESG action may shape geographical diversification outcomes differently depending on the extent of stakeholder orientation in the institutional environment in which the firm is headquartered as well as those in which the international diversified firm operates.

Our research has focused on the interplay of BD and ESG to limit

symmetric risk. Scholars should examine whether such an interplay may also reduce the downside risk by limiting potential losses or whether it may enhance upside potential by creating a springboard to access future growth opportunities. Studies suggest that these strategies, considered separately, are a source of growth options for companies (Andrés et al., 2017a, 2017b; Fombrun et al., 2000; Fuente et al., 2022). Embedding such options into better and more trustworthy stakeholder relationships can grant certain firms privileged access to investment opportunities and reduce competitive pre-emption. Improving stakeholder ties can increase the flexibility of exercising such future growth options and thus, enhance their value. Finally, achieving an appropriate mix of different strategies to both limit a firm's downside risk and increase its upside potential may require firms to have an appropriate match between their corporate policies and top management team. In particular, a firm's CEO profile is crucial. For example, future work can explore whether CEO career horizon, which can influence their prioritisation between short- and long-term focused strategic decisions, may determine the mix of strategies.

CRediT authorship contribution statement

Gabriel de la Fuente: Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Conceptualization. **Margarita Ortiz:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Conceptualization. **Pilar Velasco:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Conceptualization.

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Appendix

Table A1
Variable description.

Variable	Description	Source	Label
Excess value	Berger and Ofek's (1995) excess value measure. It is the natural logarithm of the ratio of a firm's market value to its imputed value. Market value is the sum of market value of equity, preferred stock, and total debt. Imputed value is the sum of all a firm's segment imputed values, each of which is the product of the firm's sales allocated in that business segment and corresponding industry median (based on unisegment firms operating in the same SIC code group) of the enterprise value/ sales multiple.	Worldscope	EXVAL
Business diversification			
Number of segments	Number of a firm's segments computed at the four-digit SIC code business level.	Worldscope	NUMSEG
Herfindahl index	Herfindahl index calculated as one minus the sum of the squared proportions of each firm's segment sales (at the four-digit SIC code level) to firm total sales (Hirschman, 1964).	Worldscope	HERF
Total entropy	Jacquemin and Berry's (1979) total entropy index.	Worldscope	ENTROPY
ESG engagement			
Overall ESG score	A firm's engagement in overall environmental, social, and governance (ESG) practices, computed as the equally-weighted average of the scores of the environmental, social, and governance pillars.	LSEG	ESGscore
A firm's risk			
A firm's total risk	The standard deviation of daily returns over the year.	Datastream	TOTALRISK
A firm's systematic risk	The average daily betas over the year from rolling regressions on equation [3].	Datastream	SYSRISK
A firm's idiosyncratic risk	The average daily values of the natural logarithm of the ratio of $1 - R^2$ to R^2, with R^2 being the coefficient of determination from the rolling regressions on equation [3].	Datastream	IDRISK
Control variables			
Firm size	A firm's size, measured as the natural logarithm of total assets.	Worldscope	SIZE
Firm leverage	A firm's leverage, calculated as the ratio of total debt to total assets.	Worldscope	LEVERAGE
Firm profitability	A firm's profitability, measured as the ratio of earnings before interest and taxes to total sales.	Worldscope	PROFITAB
Firm investment	A firm's investment activity, calculated as the ratio of capital expenditures to total sales.	Worldscope	INVEST
Cash holdings	A firm's cash holdings, calculated as the ratio of total cash to total assets.	Worldscope	CASH
Asset tangibility	A firm's asset tangibility, measured as the ratio of fixed assets to total assets.	Worldscope	TANG
Firm age	The natural logarithm of a firm's age (the difference between the current year and the firm's founding year).	Worldscope	AGE
Geographical diversification	A dummy variable which equals 1 if the firm has more than one geographical segment, and zero otherwise.	Worldscope	GEODIV
Industry rivalry	Degree of rivalry in the two-digit SIC industry in which each firm primarily operates. Rivalry is proxied by the Herfindahl index based on the sales shares of firms belonging to each industry group (two-digit SIC code level).	Worldscope	RIVALRY

Table A2
Spearman pairwise correlation matrix.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
1. **EXVAL**	1.0000																
2. **NUMSEG**	−0.1117***	1.0000															
3. **HERF**	−0.1151***	0.8820***	1.0000														
4. **ENTROPY**	−0.1109***	0.9287***	0.9904***	1.0000													
5. **ESGscore**	−0.0854***	0.2259***	0.2210***	0.2259***	1.0000												
6. **TOTALRISK**	−0.1534***	−0.1998***	−0.2023***	−0.2067***	−0.3392***	1.0000											
7. **SYSRISK**	0.1390***	0.0003	0.0139*	0.0132	−0.1445***	0.0867***	1.0000										
8. **IDRISK**	−0.2549***	−0.1638***	−0.1685***	−0.1741***	−0.3013***	0.4413***	−0.5997***	1.0000									
9. **SIZE**	0.1695***	0.2418***	0.2167***	0.2287***	0.5855***	−0.4783***	0.2056***	−0.5730***	1.0000								
10. **LEVERAGE**	0.0328***	0.1103***	0.1074***	0.1081***	0.0980***	−0.0537***	0.0387***	−0.0544***	0.3838***	1.0000							
11. **PROFITAB**	−0.0237***	0.1021***	0.0988***	0.1004***	0.1546***	−0.3375***	−0.1434***	−0.1598***	0.2276***	0.0686***	1.0000						
12. **INVEST**	0.0536***	−0.0810***	−0.1023***	−0.0999***	−0.0421***	0.0034	0.0453***	−0.0056**	0.0770***	0.1271***	0.0801***	1.0000					
13. **CASH**	0.1009***	−0.1529***	−0.1531***	−0.1541***	−0.1660***	0.1702***	0.0725***	0.0943***	−0.3198***	−0.3755***	−0.1809***	−0.1714***	1.0000				
14. **TANG**	−0.1043***	−0.0037	−0.0254***	−0.0231***	0.1084***	−0.0168**	−0.0456***	0.0335***	0.1143***	0.2297***	0.0752***	0.5649***	−0.3004***	1.0000			
15. **AGE**	−0.0529***	0.2744***	0.2872***	0.2906***	0.3158***	−0.2793***	−0.0116	−0.2370***	0.2972***	0.0120***	0.1224***	−0.0678*	−0.1773***	0.1035***	1.0000		
16. **GEODIV**	−0.0196**	0.1489***	0.1958***	0.1900***	0.1908***	−0.1450***	0.1314***	−0.2484***	0.1621***	−0.0752***	0.0883***	−0.2276***	0.0593***	−0.2347***	0.1369***	1.0000	
17. **RIVALRY**	−0.0525***	−0.0166**	−0.0004	−0.0017	−0.0335***	0.0148*	0.0842***	−0.0405***	−0.0651***	−0.0678***	−0.0741***	−0.0853***	0.1300***	−0.1747***	−0.0782***	0.1551***	1.0000

***, **, and * denote statistical significance at the 1 %, 5 %, and 10 % levels, respectively.

Table A3
The effect of ESG and BD (and their interplay) on excess value: OLS estimations [path *c*] with alternative proxies.

	Dependent variable: EXVAL											
	Diversification, ESG engagement, and their interplay											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Constant	−0.1815	−0.3230	−0.3319	−0.1971	−0.3193	−0.3280	−0.1385	−0.2882	−0.2956	−0.0776	−0.2454	−0.2513
	(0.2130)	(0.2087)	(0.2087)	(0.2105)	(0.2077)	(0.2078)	(0.1997)	(0.1954)	(0.1952)	(0.1814)	(0.1731)	(0.1730)
BD												
NUMSEG	−0.1787***			−0.1545***			−0.1839***			−0.1901***		
	(0.0339)			(0.0274)			(0.0355)			(0.0461)		
HERF		−0.6809***			−0.5904***			−0.6996***			−0.6910***	
		(0.1079)			(0.0872)			(0.1252)			(0.1419)	
ENTROPY			−0.4208***			−0.3624***			−0.4327***			−0.4294***
			(0.0674)			(0.0546)			(0.0769)			(0.0899)
ESG engagement												
ESscore	−0.0425***	−0.0221**	−0.0230**									
	(0.0158)	(0.0098)	(0.0098)									
ENV				−0.0330**	−0.0165**	−0.0172**						
				(0.0138)	(0.0081)	(0.0081)						
SOC							−0.0397***	−0.0206**	−0.0214**			
							(0.0144)	(0.0094)	(0.0094)			
GOV										−0.0487***	−0.0309***	−0.0313***
										(0.0137)	(0.0074)	(0.0073)
Interaction effects												
NUMSEG × ESscore	0.0198**											
	(0.0082)											
HERF × ESscore		0.0748***										
		(0.0236)										
ENTROPY × ESscore			0.0483***									
			(0.0147)									
NUMSEG × ENV				0.0163**								
				(0.0074)								
HERF × ENV					0.0621***							
					(0.0201)							
ENTROPY × ENV						0.0400***						
						(0.0127)						
NUMSEG × SOC							0.0183**					
							(0.0073)					
HERF × SOC								0.0675***				
								(0.0244)				
ENTROPY × SOC									0.0438***			
									(0.0148)			
NUMSEG × GOV										0.0174**		
										(0.0084)		
HERF × GOV											0.0607**	
											(0.0246)	
ENTROPY × GOV												0.0393**
												(0.0155)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	7,213	7,213	7,213	7,213	7,213	7,213	7,213	7,213	7,213	7,213	7,213	7,213
F-statistic	13.38***	13.47***	13.46***	13.27***	13.40***	13.38***	13.40***	13.39***	13.39***	13.89***	14.01***	13.90***

This table shows the ordinary least squares (OLS) estimation results of equation [4] (path *c*) with clustered standard errors at the firm level. The dependent variable is a firm's excess value (*EXVAL*). Environmental, social, and governance (ESG) engagement is alternatively approximated by the equally-weighted average of the scores of the environmental and social pillars (*ESscore*), environmental pillar (*ENV*), social pillar (*SOC*), and governance pillar (*GOV*). Business diversification is measured by three alternative proxies: the number of segments at the four-digit Standard Industry Classification (SIC) grouping (*NUMSEG*), Herfindahl index (*HERF*), and total entropy index (*ENTROPY*). The interaction effect between business diversification and ESG engagement is added. Firm size (*SIZE*), financial leverage (*LEVERAGE*), profitability (*PROFITAB*), capital investment (*INVEST*), cash holdings (*CASH*), asset tangibility (*TANG*), and industry and year fixed effects are controlled in all regressions. The F-statistic tests the joint significance of all independent variables. Standard errors appear in parentheses under the coefficients. ***, **, and * indicate statistical significance at the 1 %, 5 %, and 10 % levels, respectively.

Table A4
The effect of ESG, BD, and their interplay on excess value: 2SLS estimations (BD as endogenous variable) [path *c*].

	Dependent variable: EXVAL					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	6.5635***	1.9225***	1.7035***	2.1923***	0.0601	−0.0820
	(0.8884)	(0.4185)	(0.3877)		(0.2735)	(0.2692)
				(0.3923)		
BD						
NUMSEG	−5.2376***			−2.6861***		
	(0.6257)			(0.2916)		
HERF		−19.9079***			−11.5740***	
		(2.4413)			(1.2475)	
ENTROPY			−11.9127***			−7.1578***
			(1.4108)			(0.7645)
ESG engagement						
ESGscore	−1.5018***	−0.6177***	−0.5865***	−0.5344***	−0.2870***	−0.2895***
	(0.1798)	(0.0757)	(0.0694)		(0.0324)	(0.0323)
				(0.0593)		
Interaction effects						
NUMSEG × ESGscore	0.9299***					
	(0.1126)					
HERF × ESGscore		3.6497***				
		(0.4541)				
ENTROPY × ESGscore			2.1569***			
			(0.2590)			
NUMSEG × dumESGscore				1.7470***		
				(0.1962)		
HERF × dumESGscore					9.9742***	
					(1.1047)	
ENTROPY × dumESGscore						6.2367***
						(0.6825)
Control variables						
SIZE	0.0746***	0.0449**	0.0513**	0.1577***	0.1068***	0.1157***
	(0.0217)	(0.0217)	(0.0211)		(0.0210)	(0.0212)
				(0.0238)		
LEVERAGE	0.6897***	0.9169***	0.8465***	0.2114*	0.5701***	0.5063***
	(0.1555)	(0.1739)	(0.1637)	(0.1252)	(0.1353)	
						(0.1317)
PROFITAB	0.2516***	0.2344***	0.2230***	0.0182	0.1033	0.0955
	(0.0804)	(0.0812)	(0.0780)	(0.0640)	(0.0662)	
						(0.0654)
INVEST	−1.6953**	−1.8153**	−1.7196**	0.3035	−0.8222	−0.7850
	(0.8472)	(0.8768)	(0.8419)	(0.6642)	(0.7172)	(0.7096)
CASH	−0.2040	−0.7234**	−0.5751**	0.0278	−0.4560*	−0.3595
	(0.2429)	(0.2856)	(0.2654)	(0.2109)	(0.2358)	(0.2282)
TANG	−0.0202	−0.085	−0.0706	−0.3483***	−0.2798***	−0.2578***
	(0.0955)	(0.0945)	(0.0922)	(0.0777)	(0.0782)	(0.0780)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	7,030	7,030	7,030	7,030	7,030	7,030
F-statistic	5.67***	5.40***	5.75***	6.11***	6.80***	6.90***
Weak identification test (Cragg-Donald statistic)	36.90***	34.76***	37.49***	45.93***	46.27***	47.22***
Sargan overidentification test p-value	0.3746	0.4180	0.4532	0.2801	0.9434	0.8220
Durbin-Wu-Hausman test p-value	0.000	0.000	0.000	0.000	0.000	0.000

This table shows the two-stage least squares (2SLS) estimation results of equation [4] (path *c*), considering diversification as an endogenous variable and two instrumental variables for it: the number of analysts' forecasts of earnings per share for a one-year horizon and aggregate market share for diversified firms operating in a firm's core sector. The dependent variable is a firm's excess value (*EXVAL*). Business diversification is measured by three alternative proxies: the number of segments at the four-digit Standard Industry Classification (SIC) grouping (*NUMSEG*), Herfindahl index (*HERF*), and total entropy index (*ENTROPY*). Environmental, social, and governance (ESG) engagement is approximated by the equally-weighted average of the scores of the three ESG pillars (*ESGscore*). The interaction effect between diversification and ESG engagement is computed alternatively by using *ESG score* and taking a binary variable based on the level of *ESGscore* (which equals 1 if a firm's *ESGscore* is equal to or above the yearly sample median, and zero otherwise). Firm size (*SIZE*), financial leverage (*LEVERAGE*), profitability (*PROFITAB*), capital investment (*INVEST*), cash holdings (*CASH*), asset tangibility (*TANG*), and industry and year fixed effects are controlled in all regressions. The F-statistic tests the joint significance of all independent variables. The Cragg-Donald statistic tests for instrument relevance, Sargan statistic tests for instrument validity, and Durbin-Wu-Hausman statistic tests for the exogeneity of the diversification variable. Standard errors appear in parentheses under the coefficients. ***, **, and * indicate statistical significance at the 1 %, 5 %, and 10 % levels, respectively.

Table A5
The effect of ESG, BD, and their interplay on excess value: 2SLS estimations (ESG and BD as endogenous variables) [path *c*].

	Dependent variable: EXVAL		
	(1)	(2)	(3)
Constant	0.2945	−0.3178	−0.4711
	(0.5242)		(0.3979)
		(0.4571)	
BD			
NUMSEG	−0.9191***		
	(0.2848)		
HERF		−5.2273***	
		(1.9027)	
ENTROPY			−3.0469***
			(1.0564)
ESG engagement			
ESGscore	−0.2167***	−0.1520***	−0.1578***
	(0.0458)	(0.0389)	(0.0375)
Interaction effects			
NUMSEG × dumESGscore	0.5868***		
	(0.1623)		
HERF × dumESGscore		4.4050***	
		(1.5792)	
ENTROPY × dumESGscore			2.6139***
			(0.8915)
Control variables			
SIZE	0.0913***	0.0757**	0.0857***
	(0.0252)	(0.0319)	(0.0292)
LEVERAGE	0.0907	0.2760**	0.2250*
	(0.0773)		(0.1197)
		(0.1411)	
PROFITAB	−0.0547	−0.0026	−0.0128
	(0.0337)	(0.0507)	(0.0460)
INVEST	1.7187***	0.9866*	1.0589**
	(0.3439)		
		(0.5736)	(0.5291)
CASH	0.5392***	0.2102	0.2944
		(0.2627)	(0.2243)
	(0.1436)		
TANG	−0.3589***	−0.3371***	−0.3200***
	(0.0514)	(0.0557)	(0.0518)
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
No. of obs.	7,213	7,213	7,213
F-statistic	18.19***	13.80***	14.79***
Weak identification test (Cragg-Donald statistic)	7.34***	3.84***	4.59***
	79.98***	101.11***	102.27***
Sargan overidentification test p-value	0.8154	0.6315	0.7575
Durbin-Wu-Hausman test p-value	0.000	0.000	0.000

This table shows the two-stage least squares (2SLS) estimation results of equation [4] (path *c*), considering two variables as endogenous: diversification, and environmental, social, and governance (ESG) engagement. Three instrumental variables are used: the aggregate market share accounted for diversified firms operating in a firm's core sector, the median ESG engagement in a firm's core sector, and a binary variable of the existence of ESG-based compensation with the firm. The dependent variable is a firm's excess value (*EXVAL*). Business diversification is measured by three alternative proxies: the number of segments at the four-digit Standard Industry Classification (SIC) grouping (*NUMSEG*), Herfindahl index (*HERF*), and total entropy index (*ENTROPY*). ESG engagement is approximated by the equally-weighted average of the scores of the three ESG pillars (*ESGscore*). The interaction effect between diversification and ESG engagement is computed by taking a binary variable based on the level of *ESGscore* (which equals 1 if a firm's *ESGscore* is equal to or above the yearly sample median, and zero otherwise). Firm size (*SIZE*), financial leverage (*LEVERAGE*), profitability (*PROFITAB*), capital investment (*INVEST*), cash holdings (*CASH*), asset tangibility (*TANG*), and industry and year fixed effects are controlled in all regressions. The F-statistic tests the joint significance of all independent variables. The Cragg-Donald statistic tests for instrument relevance (two statistics are shown, one for each instrumental variable), Sargan statistic tests for instrument validity, and Durbin-Wu-Hausman statistic tests for

exogeneity of the diversification variable. Standard errors appear in parentheses under the coefficients. ***, **, and * indicate statistical significance at the 1 %, 5 %, and 10 % levels, respectively.

Table A6
The impact of ESG and BD on a firm's risk (total, idiosyncratic, and systematic risks): 2SLS estimations [path *a*].

Panel A: Estimations without moderating effects

	Dependent variable: IDRISK			Dependent variable: SYSRISK			Dependent variable: TOTALRISK		
Constant	4.3721***	4.2363***	4.1228***	0.6360***	0.6292***	0.6181***	0.0431***	0.0425***	0.0423***
				(0.1496)	(0.1664)	(0.1787)	(0.0033)	(0.0037)	(0.0039)
	(0.3308)	(0.3653)	(0.3948)						
BD									
NUMSEG	−0.2926***			−0.0251			−0.0006		
	(0.1127)			(0.0510)			(0.0011)		
HERF		−1.2923**			−0.1002			−0.0034	
		(0.5147)			(0.2344)			(0.0052)	
ENTROPY			−0.7828**			−0.0632			−0.0019
						(0.1393)			(0.0031)
			(0.3078)						
ESG engagement									
ESGscore	−0.0178*	−0.0181*	−0.0194*	−0.0278***	−0.0278***	−0.0279***	−0.0005***	−0.0005***	−0.0005***
	(0.0101)		(0.0104)	(0.0046)	(0.0046)		(0.0001)	(0.0001)	(0.0001)
		(0.0101)				(0.0047)			
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	2,519	2,519	2,519	2,519	2,519	2,519	2,521	2,521	2,521
F-statistic	96.83***	97.98***	96.89***	40.64***	40.53***	40.59***	66.67***	66.85***	66.83***
Weak identification test (Cragg-Donald statistic)	24.71***	19.89***	20.10***	24.71***	19.89***	20.10***	24.30***	19.65***	19.80***
Sargan overidentification test p-value	0.7081	0.4192	0.5217	0.7312	0.6741	0.6948	0.5245	0.5919	0.5641
Durbin-Wu-Hausman test p-value	0.0122	0.0297	0.0223	0.9760	0.8879	0.9211	0.8757	0.8663	0.8844

Panel B: Estimations including moderating effects

	Dependent variable: IDRISK			Dependent variable: SYSRISK			Dependent variable: TOTALRISK		
Constant	7.7344***	4.9454***	4.8613***	0.5782	0.6260***	0.6175***	0.0518***	0.0440***	0.0436***
	(2.0626)	(0.5029)	(0.5117)	(0.5578)	(0.1357)	(0.1294)	(0.0136)	(0.0032)	(0.0031)
BD									
NUMSEG	−2.8474			0.0310			−0.0079		
	(1.9750)			(0.5341)			(0.0131)		
HERF		−11.4911			0.3844			−0.0443	
		(11.3856)			(3.0720)			(0.0815)	
ENTROPY			−7.6066			0.2186			−0.0266
			(7.2125)			(1.8244)			(0.0483)
ESG engagement									
ESGscore	−0.9008	−0.4474	−0.4821	−0.0102	−0.0094	−0.0104	−0.0030	−0.0022	−0.0021
	(0.6177)	(0.4378)	(0.4507)	(0.1670)	(0.1181)	(0.1140)	(0.0041)	(0.0031)	(0.0030)
Interaction effects									
NUMSEG × ESGscore	0.4882			−0.0096			0.0013		
	(0.3383)			(0.0915)			(0.0022)		
HERF × ESGscore		2.0327			−0.0851			0.0076	
		(2.0355)			(0.5492)			(0.0145)	
ENTROPY × ESGscore			1.3368			−0.0494			0.0045
			(1.2763)			(0.3228)			(0.0085)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	2,519	2,519	2,519	2,519	2,519	2,519	2,521	2,521	2,521
F-statistic	33.02***	33.01***	29.01***	39.57***	39.17***	39.23***	59.80***	53.10***	53.61***
Weak identification test (Cragg-Donald statistic)	1.31	0.63	0.66	1.31	0.63	0.66	1.14	0.53	0.56
Sargan overidentification test p-value	0.4966	0.3022	0.3696	0.7441	0.6960	0.7191	0.6388	0.7737	0.7390
Durbin-Wu-Hausman test p-value	0.0161	0.0909	0.0579	0.9312	0.9109	0.9056	0.6473	0.6186	0.6203

This table shows the two-stage least squares (2SLS) estimation results of equation [5] (path *a*), considering two instrumental variables for diversification: the number of analysts' forecasts of earnings per share for a one-year horizon and aggregate market share accounted for diversified firms operating in a firm's core sector. The dependent variable are a firm's idiosyncratic (*IDRISK*), systematic (*SYSRISK*), and total risks (*TOTALRISK*) alternatively. Panel A accounts for the effect of business diversification and environmental, social, and governance (ESG) engagement considered individually, while Panel B includes the interaction effect between the two

explanatory variables. Business diversification is measured by three alternative proxies: the number of segments at the four-digit Standard Industry Classification (SIC) grouping (*NUMSEG*), Herfindahl index (*HERF*), and total entropy index (*ENTROPY*). ESG engagement is approximated by the equally-weighted average of the scores of the three ESG pillars (*ESGscore*). Firm size (*SIZE*), financial leverage (*LEVERAGE*), profitability (*PROFITAB*), capital investment (*INVEST*), cash holdings (*CASH*), asset tangibility (*TANG*), firm age (*AGE*), the geographical diversification dummy (*GEODIV*), rivalry in the firm's core industry (*RIVALRY*), and industry and year fixed effects are controlled in all regressions. The F-statistic tests the joint significance of all independent variables. The Cragg-Donald statistic tests for instrument relevance, Sargan statistic tests for instrument validity, and Durbin-Wu-Hausman statistic tests for the exogeneity of the diversification variable. Standard errors appear in parentheses under the coefficients. ***, **, and * indicate statistical significance at the 1 %, 5 %, and 10 % levels, respectively.

Table A7
Mediation analyses of a firm's risk in the interplay between BD and ESG: 2LS estimations [path *c'*].

	Dependent variable: EXVAL		
	(1)	(2)	(3)
Constant	8.8925***	3.8948***	3.6372***
	(1.1319)	(0.5826)	(0.5414)
Firm risk			
TOTALRISK	−35.1125***	−36.2826***	−35.9617***
	(4.0835)	(4.2164)	(4.0705)
Diversification			
NUMSEG	−5.7083***		
	(0.7029)		
HERF		−21.4176***	
		(2.6658)	
ENTROPY			−12.8589***
			(1.5517)
ESG			
ESGscore	−1.6564***	−0.6822***	−0.6520***
	(0.2034)	(0.0839)	(0.0776)
Interaction effects			
NUMSEG × ESGscore	1.0117***		
	(0.1263)		
HERF × ESGscore		3.9135***	
		(0.4944)	
ENTROPY × ESGscore			2.3210***
			(0.2841)
Control variables	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
No. of obs.	7,015	7,015	7,015
F-statistic	5.53***	5.43***	5.74***
Weak identification test (Cragg-Donald statistic)	33.87***	33.01***	35.25***
Sargan overidentification test p-value	0.4201	0.5650	0.5775
Durbin-Wu-Hausman test p-value	0.0000	0.0000	0.0000

This table shows the two-stage least squares (2SLS) estimation results of equation [7] (path *c'*), considering two instrumental variables for diversification: the number of analysts' forecasts of earnings per share for a one-year horizon and aggregate market share for diversified firms operating in a firm's core sector. The dependent variable is a firm's excess value (*EXVAL*). The explanatory variables are business diversification, environmental, social, and governance (ESG) engagement, and their interaction, controlling for the mediating variable (a firm's risk). Business diversification is measured by three alternative proxies: the number of segments at the four-digit SIC grouping (*NUMSEG*), Herfindahl index (*HERF*), and total entropy index (*ENTROPY*). ESG engagement is approximated by the equally-weighted average of the scores of the three ESG pillars (*ESGscore*). *TOTALRISK* is a firm's total risk. Firm size (*SIZE*), financial leverage (*LEVERAGE*), profitability (*PROFITAB*), capital investment (*INVEST*), cash holdings (*CASH*), asset tangibility (*TANG*), and industry and year fixed effects are controlled in all regressions. The F-statistic tests the joint significance of all independent variables. The Cragg-Donald statistic tests for instrument relevance, Sargan statistic tests for instrument validity, and Durbin-Wu-Hausman statistic tests for exogeneity of the diversification variable. Standard errors appear in parentheses under the coefficients. ***, **, and * indicate statistical significance at the 1 %, 5 %, and 10 % levels, respectively.

Data availability

The authors do not have permission to share data.

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