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REVIEW ARTICLE

Measuring board diversity: A systematic literature review of data sources, constructs, pitfalls, and suggestions for future research

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Abstract

The purpose of this systematic literature review is to provide a comprehensive overview of the methods used to measure board diversity. We develop a framework to structure empirical studies and develop an agenda for future research. We selected 61 empirical articles from an initial sample of 1035. This study discusses the different data collection methods. We group director and board attributes into the constructs of structural, demographic, and cognitive diversity. We identify four different approaches to combining and measuring diversity: non-index, single-index, cross-indices, and inter-indices. We find that measuring board diversity requires a mixture of archival and primary research, as well as various methods such as applying indices, constructing heterogeneity scores, and using machine learning approaches to infer directors' attributes. We contribute to research by providing a framework that structures measuring techniques for board diversity, a future research agenda, and insights on potential window-dressing.

KEYWORDS

board attributes, board diversity, cognitive characteristics, measurement, structural characteristics, systematic literature review

JEL CLASSIFICATION

G30, G34, M14, M19

1 | INTRODUCTION

The board of directors (BoD) comprises the highest representatives of a company's governance body (Aggarwal et al., 2019). The BoD decides on a company's future strategic direction, and is responsible for executing the strategy and evaluating its outcomes (Arnaboldi et al., 2020; Forbes & Milliken, 1999). Past research has provided rich evidence that the choice of strategy, execution, and evaluation appears closely linked to the composition of the BoD (Hambrick, 2007; Hambrick & Mason, 1984). In recent years, board

diversity, in particular, has attracted substantial interest from regulators, investors, stakeholders, and business researchers (Field et al., 2020; Grosvold et al., 2007; Lu et al., 2022). However, an established definition of board diversity has yet to be agreed. The Global Reporting Initiative's (GRI) 2021 standards (Disclosure 2–10) recommends that companies should report on diversity in their BoD, using the categories of (i) gender, (ii) age groups (under 30, 30–50, and over 50), and (iii) other relevant indicators such as minorities or vulnerable groups (GRI, 2022). Gender diversity, often defined as the percentage of non-male executives, has already taken root in the legislation of

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many OECD countries through quotas (Adams et al., 2015) but practitioners are expecting further extensions of diversity requirements. Recent survey data suggest that 74% of private equity firms—that is, the epitome of hard-nosed shareholder value orientation—plan to evaluate gender diversity data of their investments, and 63% plan to even monitor the ethnicity of board members (Baboolall & Nee, 2022).

However, boards do not simply become more diverse by having a lower number of male executives. The fact that board diversity, including gender issues, is not yet fully defined means that the term can often be highly controversial (Carter et al., 2003; Hafsi & Turgut, 2013). Unpacking the GRI's box of minorities or vulnerable groups (GRI, 2022), multiple other diversity aspects of boards could be considered. These include a structural component of the entire board as a group, as well as individual executive traits, such as age, disability, education, ethnicity, marital status, nationality, neurodiversity, non-binarism, personality traits, political orientation, sexual orientation, socioeconomic status, or specific expertise (Adams et al., 2015; Ali et al., 2014; Harjoto et al., 2018). Inconsistencies in the definition of board diversity lead to different measurements, and thus allegedly different results (Adams et al., 2015). To increase the validity of the research, the same variables should depict the same construct (Ben Selma et al., 2022). Therefore, this study provides answers to the research question: “Which methodologies are used to gather and evaluate board diversity measures?”

We conduct a systematic literature review (SLR) to address this question. From an initial sample of 1035 articles, we selected a set of 61 seminal, peer-reviewed empirical journal articles. Based on our findings, we develop an analytical framework for the different methodologies of assessing board diversity. Our study groups prior research into three distinct constructs. The first group includes the structural characteristics of the BoD, such as board independence and leadership duality. The second group consists of demographic attributes, such as gender, age, or nationality. The third group further divides demographic diversity into cognitive characteristics, such as expertise and education.

Our review contributes to future research and corporate practice in several ways. We identify four unique methodologies of indices, and provide advice on using each proxy: Non-index methods should only be used for simple and individual measurements of diversity attributes, as they do not consider the combined effects of the BoD. Single-index methods may be used to combine multiple demographic attributes into one measure, but they should focus on either demographic or structural diversity to avoid imprecision. Cross-indices methods should be used to analyze broader aspects of diversity by constructing separate measures for demographic and structural characteristics, and they are especially useful for cross-country comparisons in low-regulation countries. Inter-indices methods provide measures for internal group dynamics and may be used to differentiate cognitive from demographic elements of the BoD—yet, they might still neglect the influence of demographic attributes on cognitive characteristics.

Overall, our contributions to research are threefold: we synthesized the literature on board diversity, developed a framework for

measuring diversity, and identified future research directions. Our contributions to practice include highlighting the need for better information disclosure on diversity and emphasizing the importance of distinguishing between structural, cognitive, and demographic diversity. By synthesizing the findings, we offer insights into best practices and propose an agenda for future research.

2 | THEORETICAL BACKGROUND AND ANALYTICAL FRAMEWORK

The composition of corporate boards is influenced by a complex hierarchical structure, with various factors exerting top-down influence (Zattoni et al., 2023). At the highest level, institutional or country-specific factors, such as regulations and social norms, play a significant role in shaping board composition (Zattoni et al., 2020). These factors are followed by company-level factors, including ownership structure, which is assigned to the level below. Finally, board diversity is primarily influenced by group-level factors, which describe the structural or demographic characteristics of the BoD (Zattoni et al., 2020). This multi-dimensional framework highlights the interplay between different levels of influence in shaping the composition of corporate boards (Lu et al., 2022). We will now elaborate on resource dependence theory, which is a predominant theoretical lens to interpret board diversity, before we differentiate between the types of board diversity.

2.1 | Resource dependence theory

Corporate governance research has extensively examined the attributes of individual directors and the overall composition of boards, drawing on resource dependence theory (Zattoni et al., 2023). Resource dependence theory posits a nuanced understanding of the internal and external resource dependencies of organizations. This theory, first put forward by Pfeffer and Salancik (1978), is predicated on the idea that organizations are not self-sufficient, but rather exist in an interdependent environment and requires the acquisition of resources to excel. Resource acquisition often leads organizations to interact and engage with various entities, resulting in a relationship of mutual dependence (Hillman, 2015; Hillman et al., 2000). Resource dependence theory is primarily characterized by the premise that organizations seek to minimize uncertainty, and establish autonomy over resource flows through their relationships with external stakeholders (Zattoni et al., 2023).

Resource dependence theory holds particular relevance to research on corporate governance and board diversity because it offers insights into how organizations strategically manage their dependencies and control their environments (Hillman et al., 2000). When applied to corporate governance, resource dependence theory underscores the importance of a diverse and effective BoD. Diverse boards bring a wide range of perspectives, knowledge, expertise, and networks that can enhance the organization's ability to identify and leverage external resources effectively, navigate complex

environments, and manage external dependencies (Adams et al., 2015; Aggarwal et al., 2019; Hillman, 2015). Given the dynamic and complex nature of the business environment (Hsu et al., 2022), board diversity is seen as a critical element in improving the advisory and oversight functions of boards (García-Meca et al., 2015; Pfeffer & Salancik, 1978). Board diversity has emerged as a critical issue in the field of corporate governance, with growing recognition of the importance of board diversity in promoting effective decision-making and mitigating agency problems (Adams et al., 2015; Fama & Jensen, 1983; Field et al., 2020; Hart, 1995; Jensen & Meckling, 1976). In this context, board diversity serves as a strategic mechanism for organizations to enhance their resilience, adaptability, and autonomy by diversifying their access to critical resources, connections, and competencies.

2.2 | Types of board diversity: Structural, demographic, and cognitive

The concept of board diversity is multifaceted and can be operationalized in different ways, depending on the context and research question (Hafsi & Turgut, 2013; Harrison & Klein, 2007; Zattoni et al., 2023). It includes demographic, structural, and cognitive elements, which, together, can augment the organization's ability to anticipate and respond to external demands and opportunities. Resource dependence theory posits that organizations strategically constitute their boards to tap into a variety of resources, reduce uncertainty, and minimize resource constraints (Zattoni et al., 2020; Zattoni et al., 2023). A diverse board functions as a bridge that connects the organization with a wide array of external actors, offering improved access to resources, market intelligence, legitimacy, and credibility. Therefore, it is essential to adopt

a nuanced and context-specific approach to measuring and analyzing board diversity. When measuring diversity in a multi-dimensional context, most recent studies have divided board diversity into the different constructs structural, demographic, and cognitive diversity. The three constructs are not directly measurable but can be built by dividing them into their indicators (Aggarwal et al., 2019; Ben-Amar et al., 2013; Veltri et al., 2021). Incorporating resource dependence theory in studies on board diversity is particularly advantageous, as it provides a theoretical lens to scrutinize the mechanisms through which diverse boards facilitate the organization's ability to manage dependencies, reduce uncertainty, and adapt to environmental changes (Pfeffer & Salancik, 1978). In the realm of corporate governance research, leveraging resource dependence theory enables scholars to explore the multiple facets of board diversity, encompassing the characteristics of individual directors, ownership structures, and group-level influences, within a comprehensive framework that underscores the intricate interplay between internal governance mechanisms and external resource environments (Lu et al., 2022; Zattoni et al., 2020). We structure the review according to an inductively developed framework (Figure 1).

Structural diversity refers to the heterogeneity of a board's structure and comprises the attributes of board independence, leadership duality, and board size (Adams et al., 2015). Structural diversity can also be defined as statutory diversity. Statutory diversity comprise all governance mechanisms that incentivize management to protect shareholder value (Adams et al., 2015; Ben-Amar et al., 2013). Either regulations require or best practices recommend the implementation of statutory diversity (Ben-Amar et al., 2013). For example, scholars refer to leadership (CEO) duality when a firm's CEO is also the chairman of the BoD. Such a structure may reduce tensions but could also diminish the independence of the BoD (Beji et al., 2021).

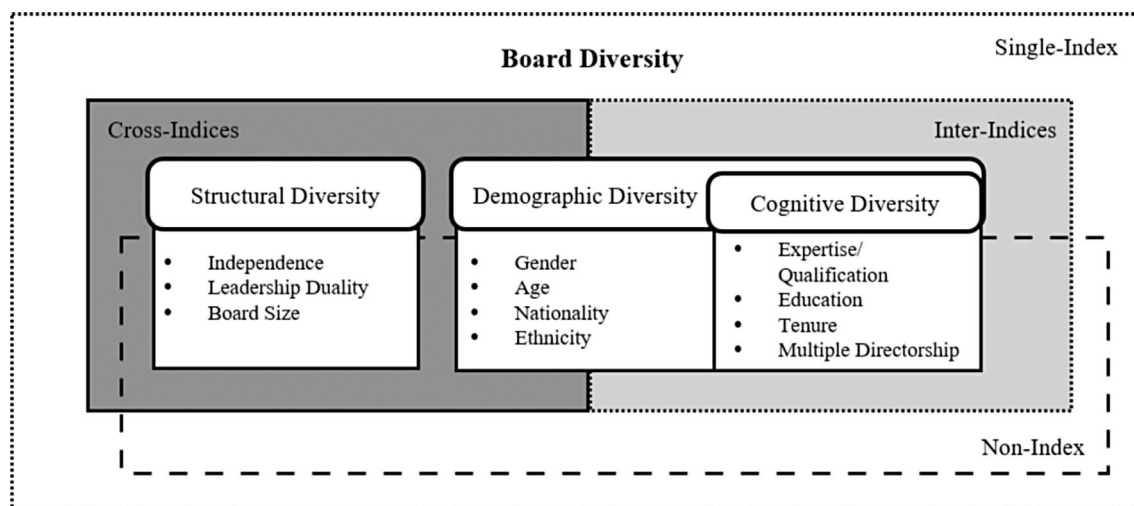


FIGURE 1 Framework to cluster board diversity measurements. Structural diversity is based on the BoD attributes (independence, leadership duality, and board size); demographic diversity is based on directors' attributes (gender, age, nationality, and ethnicity) and can be further sub-categorized into cognitive diversity attributes (expertise/qualifications, education, tenure, multiple directorships). The non-index refers to studies measuring multiple diversity attributes as individual effect sizes. The single-index refers to studies measuring one combined effect of multiple diversity attributes. The cross-indices refer to studies measuring two combined effects of diversity attributes, one related to the structural attributes and the other to the demographic attributes. Similarly, the inter-indices refer to studies measuring two combined effects of diversity attributes, in this case, one related to demographic attributes and the other to the sub-category of cognitive attributes.



Demographic diversity comprises demographic (observable) and cognitive (unobservable) constructs (Bernile et al., 2018; Li & He, 2021; Maznevski, 1994; Milliken & Martins, 1996). One of the most discussed attributes of demographic diversity is gender, which has been the subject of increased attention not only from scholars but also from the regulatory perspective (Adams & Ferreira, 2009; Terjesen et al., 2009). The gender ratio has been included in most meta-analyses in this field of research. Post and Byron (2015) found an overall positive relationship between gender diversity and firm performance. Furthermore, studies distinguish between the age ranges of board members, as generations differ in terms of values, habits, and experiences (Cucari et al., 2018). In addition, nationality and ethnicity include multiple characteristics related to social norms, religion, or language (Lee et al., 2018). As companies become more international, foreign directors bring cultural experience and knowledge regarding newly developed markets (Carpenter & Westphal, 2001; Ruigrok et al., 2007).

Cognitive diversity refers to the variety of experiences, qualifications, and education of board members. Resource dependence theorists argue that a greater variety of qualifications and experiences might positively contribute to the organization through a broader range of resources (Hillman et al., 2000). Education is closely related to cognitive performance, so higher levels of education may lead to a quicker and better understanding of complex issues, problem-solving, and increased decision-making (Zlate & Enache, 2015). Tenure can serve as a proxy for cognitive diversity. Long director tenure can strengthen the understanding of business and management processes (Ben-Amar et al., 2013; Forbes & Milliken, 1999) and commitment to the organization (Zona, 2016).

Figure 1 assigns the various measurement combinations of the three constructs (structural, demographic, and cognitive diversity) to four measurement indices. Indices are composite measures that combine multiple attributes from one or more constructs into single measures of effect.

First, studies that measure the impact of various attributes (e.g., independence and gender) as separate items, are assigned to the non-index group. For example, Ali et al. (2014) analyzed the relationship between board diversity and firm performance by measuring, first, the impact of gender on firm performance and, second, the impact of age on firm performance.

Second, studies that form one index by measuring multiple attributes as one effect are referred to as single-index. This group includes sources that measure board diversity by picking out attributes from a single construct and analyzing the impact as a whole (e.g., demographic diversity). For example, Upadhyay and Zeng (2014) combine gender and ethnic director attributes into one single index by summing the two individual standardized values to analyze the combined effect of board diversity on corporate opacity. Some authors do not distinguish between cognitive and demographic diversity (e.g., Ntim & Soobaroyen, 2013; Sun et al., 2020). We assigned studies that combined attributes from the cognitive and demographic diversity constructs and measured them as one effect to the single-index group.

Some studies use two separate single indices to measure board diversity because they differentiate by construct. We divided these studies into either the group of cross-indices or the group of inter-indices. We speak of cross-indices if constructs are independent in content. A study might measure multiple structural diversity attributes as a single effect and additionally measure multiple demographic diversity attributes as a single effect. For example, Hafsi and Turgut (2013) build one structural diversity index by combining attributes such as independence, leadership duality, and board size, and a second demographic/cognitive diversity index by combining attributes such as gender, age, and tenure to measure the relationship of board diversity and corporate social performance.

We speak of inter-indices if constructs are dependent. For example, cognitive diversity is a sub-group of demographic diversity. We assigned studies that measure cognitive and demographic diversity as two separate effects to the group of inter-indices. Harjoto et al. (2018) build, for example, a demographic diversity index by measuring the gender, racial, and age characteristics as well as a cognitive diversity index by analyzing the experience and tenure of the directors. Previous SLRs limited their research to board gender diversity (e.g., Kirsch, 2018; Nguyen et al., 2020), analyzed the topic in the context of financial institutions (Khatib et al., 2021), or focused on the antecedents and performance effects of board diversity (e.g., Zattoni et al., 2023). Baker et al. (2020) conducted a bibliometric analysis on board diversity in which they listed the most cited and influential articles with their authors. They concluded, in line with Khatib et al. (2021), that most of the current literature focuses on gender diversity and suggested including other diversity aspects such as age, nationality, ethnicity, or professional background (Baker et al., 2020).

3 | METHODOLOGY

Following prior research (Lueg & Radlach, 2016; Sult et al., 2023), we conducted a SLR to identify different approaches to the measurement of board diversity. The search was in line with Baker et al. (2020), except that our search was broader and aimed to include more aspects. We applied the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Figure 2) and followed a multistep search approach (Denyer & Tranfield, 2009; Page et al., 2021). First, we searched three different databases: Science Direct, Wiley Online Library, and EBSCO. The search included only English journal articles with the keywords board* AND divers* AND demograph* (gender OR age OR nationality OR ethnic) OR cognitive (expertise OR education OR tenure) OR structur* OR composition OR characteristics in the titles, keywords, or abstracts of the sources. The search varied slightly among the databases, due to differences in the use of asterisks (*) and the additional option of a filter for empirical studies on EBSCO. This initial search yielded an overall result of 1035 sources.

Second, we removed 244 duplicates from the sample. We then discarded 276 articles that were not published in journals rated 1–4* in the 2021 Academic Journal Guide (AJG) of the Association of

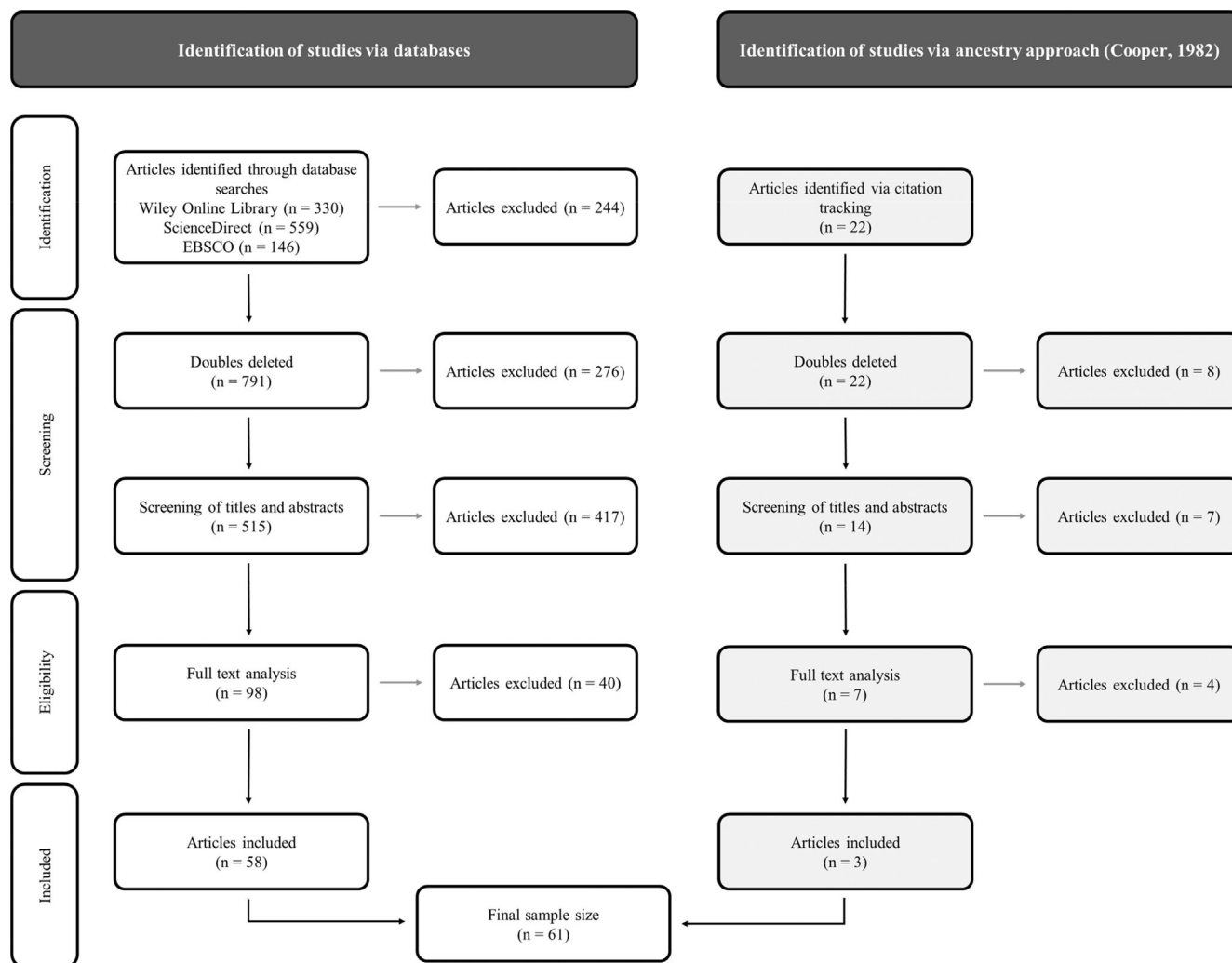


FIGURE 2 Selection process following the PRISMA framework (Page et al., 2021).

Business Schools (AJG, 2021). This resulted in a total of 515 articles which were underwent a more in-depth screening of the titles and abstracts. Third, we eliminated 417 articles since they did not fit the following inclusion criteria:

1. We only included articles that specifically deal with board diversity. For example, we excluded articles that focus on the Top Management Team (TMT) since they only address the most influential executive directors of the organization (e.g., Hambrick & Mason, 1984; Saeed et al., 2022).
2. Our study aims to analyze board diversity as a construct of multiple attributes. Thus, studies focusing on a specific single variable such as gender diversity (e.g., Nguyen et al., 2015), or an individual board member such as the CEO (e.g., Withisuphakorn & Jiraporn, 2017) were excluded from this study.
3. Since this study is intended to find out how the authors measured the constructs, our included articles have to be empirical. Therefore, we excluded non-empirical studies, such as review articles or other forms of publications from the sample (Adams et al., 2015).

We identified 98 articles that qualified for a full-text analysis. Fourth, we excluded 40 articles that did not fit the inclusion criteria based on the full-text analysis. In the fifth step, we conducted the ancestry approach by Cooper (1982). Hereby, we additionally included three articles from the references in the sample that fit our inclusion criteria. Thus, our final sample comprises 61 sources.

4 | DESCRIPTIVE ANALYSIS

Figure 3 provides an overview of the number of articles published annually between 1996 and 2022 for the four indices defined above. The results reveal that the number of published articles and the use of combined indices (e.g., single, cross, and inter-indices) in this period has generally trended upwards, with a peak in 2019. The findings confirm not only a growing interest in the topic of board diversity in the literature but also a reinforced intention to measure multiple attributes in form of an index.

Figure 4 depicts the contributions by their respective field according to the AJG journal guide (AJG, 2021). Most of the

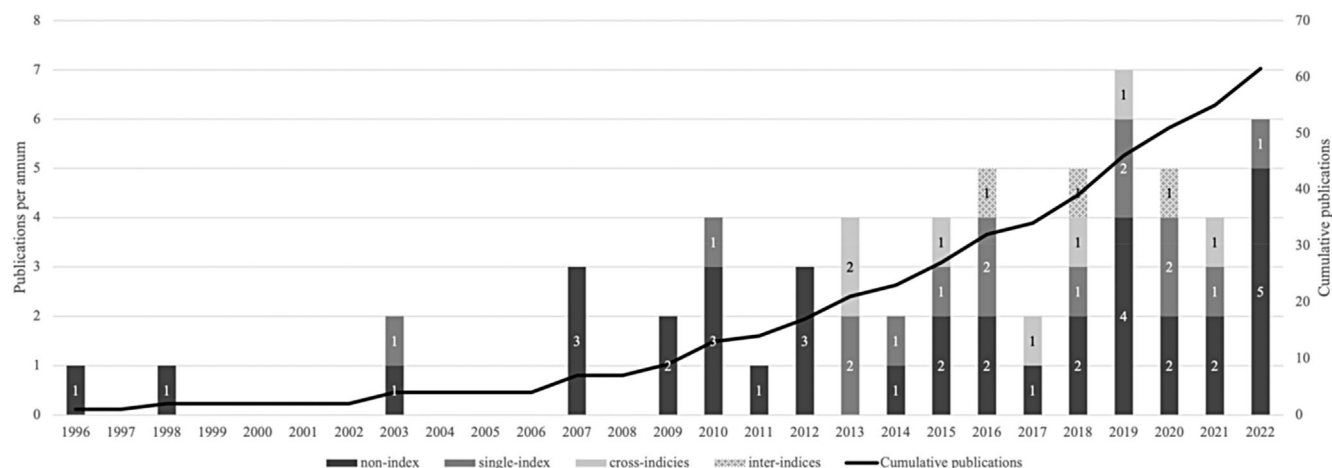


FIGURE 3 Publications per annum broken down by indices.

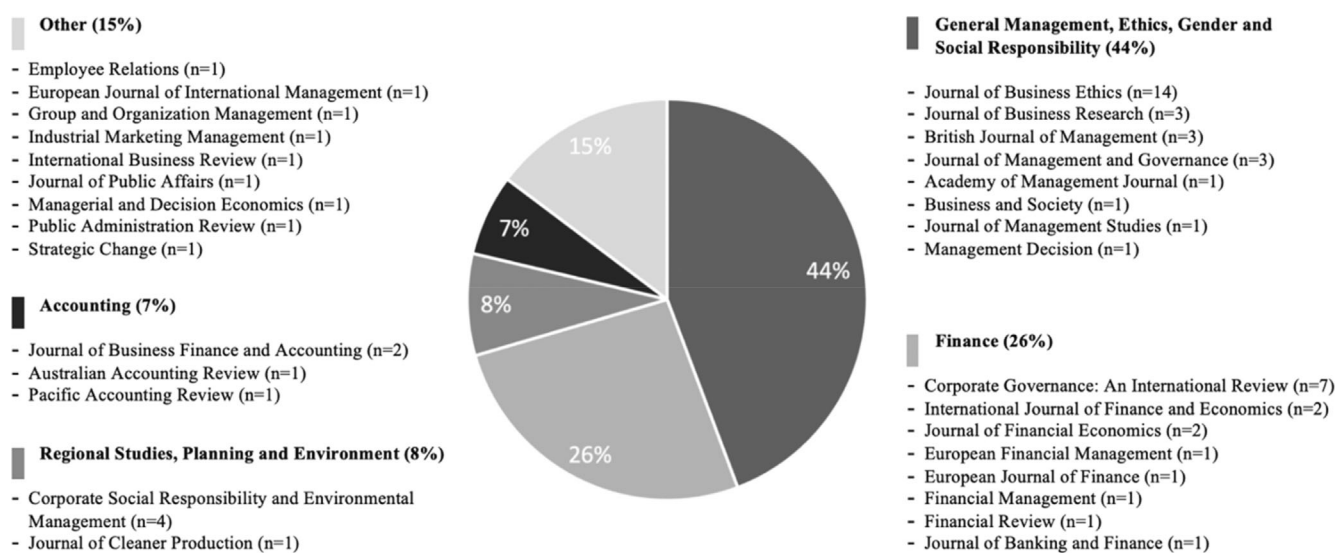


FIGURE 4 Publication fields classified by the AJG (2021).

contributions are in the fields of general management, ethics, gender, and social responsibility (44%). The *Journal of Business Ethics* ($n = 14$) is particularly dominant. The field of finance also accounts for a large proportion of the articles included (26%). *Corporate Governance: An International Review* ($n = 7$) is the second most influential outlet. Other fields cover regional studies, planning, and environment (8%) followed by accounting (7%) and others (15%). The broad spectrum of fields illustrates the interdisciplinary nature of the topic.

Figure 5 shows the geographic regions of the study sample. Most studies investigate North America (33%), Asia Pacific (29%), Europe (22%), and the Middle East and Africa (16%). Some scholars combine several countries in one study such as Germany, France, and Sweden. Still, most of the scholars focused on a single country rather than using a multi-national sample.

Scholars use different methodologies to collect information about the demographic and structural composition of the BoD. Table 1

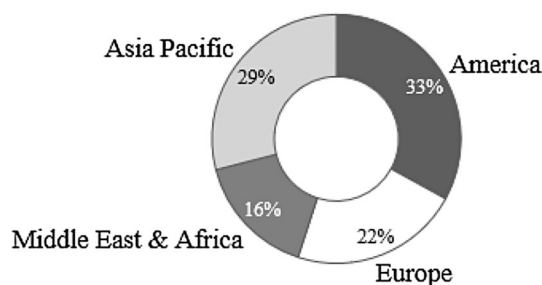


FIGURE 5 Publications by region.

shows the distribution by research method. Double entries can occur because some studies use multiple data sources.

Most studies rely on secondary data (87% of the sample). Studies that rely on secondary data collect information from databases ($n = 35$), firm disclosures ($n = 38$), social media networks ($n = 3$),

TABLE 1 Publications by research method.

Secondary	
Database ($n = 35$)	Aggarwal et al. (2019), Ali et al. (2014), Arnaboldi et al. (2020), Bear et al. (2010), Ben-Amar et al. (2013), Bernile et al. (2018), Böhren and Strøm (2010), Carter et al. (2010), Carter et al. (2003), Chang et al. (2017), Chidambaran et al. (2022), Cumming and Leung (2021), Farag and Mallin (2016), Field et al. (2020), García-Meca et al. (2015), Hafsi and Turgut (2013), Harjoto et al. (2018), Harjoto and Rossi (2019), Islam et al. (2022), Kaczmarek and Nyuur (2022), Kagzi and Patky (2023), Khan and Baker (2022), Li et al. (2018), Li and He (2021), Miller and Del Carmen Triana (2009), Ntim (2015), Ntim and Soobaroyen (2013), Post et al. (2011), Ben Selma et al. (2022), Shukla and Dwivedi (2016), Sun et al. (2020), Sun et al. (2022), Upadhyay and Zeng (2014), Wang and Clift (2009)
Firm information ($n = 25$)	Ararat et al. (2015), Brammer et al. (2007), Carter et al. (2010), Coffey and Wang (1998), Galia and Zenou (2012), Gyapong et al. (2016), Hagendorff and Keasey (2012), Harjoto and Rossi (2019), Hoang et al. (2017), Hoang et al. (2018), Kaczmarek and Nyuur (2022), Kang et al. (2007), Khan and Baker (2022), Khan et al. (2019), Li and He (2021), Mahadeo et al. (2012), Ntim (2015), Ntim and Soobaroyen (2013), Post et al. (2011), Ruigrok et al. (2007), Sarhan et al. (2019), Shukla and Dwivedi (2016), Sun et al. (2022), Veltri et al. (2021), Wang and Clift (2009), Zaid et al. (2020)
Social networks ($n = 3$)	Carter et al. (2010), Khan and Baker (2022), Veltri et al. (2021)
Press articles/News articles ($n = 3$)	Brammer et al. (2007), Khan et al. (2019), Veltri et al. (2021)
Survey providers ($n = 3$)	Buse et al. (2016), Erhardt et al. (2003), Miller and Del Carmen Triana (2009), Hoang et al. (2018)
Primary	
Interviews ($n = 3$)	Azmat and Rentschler (2017), Islam et al. (2022), Siciliano (1996)
Correspondence with firms ($n = 3$)	Ararat et al. (2015), Carter et al. (2010), Gazley et al. (2010)
Survey ($n = 4$)	Gazley et al. (2010), Siciliano (1996), Hoang et al. (2017), Zona et al. (2013)

press releases ($n = 3$), and survey providers ($n = 3$). The most frequently used databases are ICC/RiskMetrics ($n = 11$) and BoardEx ($n = 5$), which provide consolidated information about the directors' demographic attributes. BoardEx (2022) collects data that include, for example, directors' gender, nationality, education, and experience, but clearly states that it does not collect or display data on directors' ethnicity. ISS/RiskMetrics provides information on race and ethnicity through publicly available information collected by analyzing websites, LinkedIn profiles, and business publication sites, as well as identifying affiliations between directors and ethnic associations (ISS, 2022). One explanation for the popularity of secondary sources could be that information on directors is often difficult to find, incomplete, and laborious to analyze (ISS, 2022). The most frequently used firm disclosures are annual reports ($n = 18$) and firms' websites ($n = 12$). Scholars use firms' disclosures either as the only source or in addition to other sources for validation purposes (Gros vold et al., 2007).

Besides secondary data, scholars rely on primary data. Primary data may serve as a remedy when secondary data may reach their limits (e.g., when collecting unobservable director attributes) (Li & He, 2021). Only a few studies rely either fully or partly on primary data ($n = 10$) in the form of interviews ($n = 3$), communication with the firm in the form of phone calls or mailings ($n = 3$), and surveys ($n = 4$). Scholars also use primary data such as some form of correspondence with firms to substitute for missing data from the annual reports or websites (e.g., Ararat et al., 2015). However, primary research designs also have their limitations (e.g., Carter et al., 2003). For example, surveys may suffer from low response rates (Hiebl & Richter, 2018). Thus, a major problem is the ability to access the board members (Ararat et al., 2015) and, even if access is granted, they may

provide biased data, as more diverse companies want to showcase their diversity (Carter et al., 2003).

Concluding, the choice of which variables to include depends on both prior literature and data availability (Bernile et al., 2018; Li et al., 2018). Large data providers such as BoardEx focus their collection on the US and UK region (BoardEx, 2022) and such a regional focus makes it especially difficult to conduct research in emerging markets (Baker et al., 2020). Limitations of the data collection process are also a common problem in board research. For example, director's age is one of the most commonly measured and disclosed variables but still suffers from missing data (Ali et al., 2014). This problem is also evident in Aggarwal et al. (2019), who deleted an entire variable in their index of demographic diversity due to a lack of observations. Hence, data availability frequently constrains the creation of diversity indices (Li & He, 2021). Another indicator for the difficulty of information gathering can be recognized by comparing the authors' definition of diversity with the later measured attributes: the variety of characteristics discussed is often not in line with the variables investigated (e.g., Coffey & Wang, 1998; Farag & Mallin, 2017; Galia & Zenou, 2012; Gazley et al., 2010; Sarhan et al., 2019).

5 | CONTENT ANALYSIS: BOARD DIVERSITY CONSTRUCTS

The sample presents two distinct viewpoints regarding the inclusion of director attributes. One approach advocates for expanding the diversity dimension beyond just gender, as previous research has utilized a limited number of indicators (Midavaine et al., 2016). The other approach suggests adopting the best practices from previously used

TABLE 2 Diversity attributes by measurement technique.

Diversity construct and variables	No. of studies	Dichotomous	Absolute number	Percentage	Coefficient of variation	Category	Other	N/A	Heterogeneity index
Structural									
Independence	14	3	-	7	-	-	3	1	3
Leadership duality	5	5	-	-	-	-	-	-	0
Board size	3	-	2	-	-	-	1	-	0
Demographic									
Gender	58	18	3	31	-	-	4	2	18
Age	34	1	-	-	4	16	10	3	14
Nationality	16	8	1	6	-	-	1	-	8
Ethnicity	25	-	3	9	-	11	2	1	9
Cognitive									
Qualification/Expertise	20	-	-	1	-	14	3	2	9
Education	19	1	-	2	-	12	3	1	8
Tenure	14	-	1	-	3	10	-	-	10
Multiple directorship	5	-	1	1	-	2	1	-	1

constructs (Li & He, 2021). This highlights the prevalent uncertainty in the literature, where researchers strive to align with prior work (Hafsi & Turgut, 2013).

We evaluate the different measurement techniques of board diversity based on the analytical framework (Figure 1). Table 2 shows which variables are included and how they are individually measured in the different diversity constructs. The following section will further elaborate on Table 2. The Supplementary Online Appendix S1 provides a more detailed overview of the variables and measures.

5.1 | Structural diversity

The structure of BoDs and their differences fall under the construct of structural diversity. Attributes that can differ on this level are defined as board independence, CEO-duality, or board size. The different attributes are combined in various ways to build a structural diversity index, which is also referred to as statutory diversity (Aggarwal et al., 2019; Ben-Amar et al., 2013). This measurement is often related to agency theory and focuses on the control of the BoD, and the separation of the CEO from the board leadership (Ararat et al., 2015).

Independence is the most researched structural board attribute. The most common measures are the proportion of outside to inside directors (e.g., Ben-Amar et al., 2013), dichotomous measures that account for the directors independence status (e.g., Aggarwal et al., 2019), and the use of Blau (1977) heterogeneity index (e.g., Aggarwal et al., 2019). The Blau (1977) index is defined as $1 - \sum P_i^2$, with P describing the proportion of individuals in a category and i the overall number of categories. The index takes on values between zero and one, depending on the number of categories (Harjoto et al., 2015). A value closer to zero indicates a more homogenous

group and a value closer to one indicates greater heterogeneity (Ararat et al., 2015; Harjoto et al., 2015). To measure leadership duality, scholars relied on a dichotomous measure that indicates whether the chairperson of the board is also the CEO or not (Ben-Amar et al., 2013; Hoang et al., 2017). Only two studies included the board size as a measure (Beji et al., 2021; Hafsi & Turgut, 2013). Scholars either relied on absolute values (Beji et al., 2021) or calculated the relative board size by dividing the number of board members of a respective firm by the average board size of all firms in the underlying sample (Hafsi & Turgut, 2013).

5.2 | Demographic diversity

Demographic characteristics are mostly observable and thus frequently researched (Beji et al., 2021; Milliken & Martins, 1996). In sum, 58 out of the 61 studies of the sample integrate gender into a diversity index. Prior studies have reported similar findings (Baker et al., 2020; Khatib et al., 2021). The two remaining studies that did not integrate gender relied on age, expertise, and some form of qualifications as proxies (Chidambaram et al., 2022; Shukla & Dwivedi, 2016). Most of the empirical research ($n = 31$) focuses on the percentage of female directors on the BoD (e.g., Wang & Clift, 2009). Others relied on the Blau (1977) index ($n = 17$) of heterogeneity and one on the Shannon index. Alternatively, studies used a dichotomous measure ($n = 18$) that equals one if a woman is present on the board (and zero otherwise) or count the number of female members of the BoD (Gyapong et al., 2016). One study by Ben-Amar et al. (2013) also included the CEO's gender within a dichotomous measure.

Age is the second most researched attribute. Over half of the studies ($n = 34$) analyzed the effects of the directors' age. The

individual members are mostly categorized into age bands of varying ranges. Khan et al. (2019) created a dichotomous measure that indicates whether a director is older/younger than 50. Ntim and Soobaroyen (2013) and Midavaine et al. (2016) relied on seven different age categories (i.e., under 30, 30–39, 40–49, 50–59, 60–69, 70–79, and 80 and above). It is important that age bands are in line with the demographic distribution of the respective country or region. Siciliano (1996) used under 20 as an age group for directors, which is the lowest starting point in our sample. Again, most scholars combined these categories into a single index using the Blau (1977) index. Some scholars argue that the BoD is the most diverse when, for example, at least 40% of the age categories are represented in the BoD (Islam et al., 2022). The coefficient of variation and the standard deviation are also widely accepted methods to analyze the distribution of age across BoDs because continuous attributes cannot be measured accurately using the Blau index.

Another important attribute is nationality. Scholars measure nationality using a dichotomous variable (Ararat et al., 2015), combining dichotomous indicators in a heterogeneity index (e.g., Ararat et al., 2015; Gazley et al., 2010; Hoang et al., 2017), and taking the percentage of foreign and non-foreign board members (Khan & Baker, 2022). One study also refers to the number of different nationalities represented on the board (Zaid et al., 2020).

The demographic character of the director's ethnicity, sometimes referred to as race, is the third most mentioned item in the sample. Nearly half of the empirical studies created categories, ranging from five to 13, to distinguish between different ethnic groups. Similar to the measurement of age, half of this sample relied on a heterogeneity index ($n = 9$) (e.g., Miller & Del Carmen Triana, 2009). Almost the same number of studies investigated the percentage of minorities (e.g., Carter et al., 2003) but fewer counted the number of minorities on the BoD (e.g., Carter et al., 2010).

5.3 | Cognitive diversity

The expertise and occupational qualifications of the board members are the subject of wide research interest and mainly related to resource dependence theory (Carter et al., 2010). Twenty studies in the sample focused on these cognitive attributes. As before, categories were defined as a checklist for specific expertise that was found to be important. Scholars were mostly interested in backgrounds in finance ($n = 10$), accounting ($n = 9$), legal/law ($n = 7$), business and management ($n = 6$), and engineering ($n = 5$). The number of backgrounds used in these categories range from as low as three to the 12 defined by Shukla and Dwivedi (2016). Further techniques measure a narrower focus in terms of, for example, the percentage of financial expertise or business-educated members of the BoD (Beji et al., 2021).

Most of the 19 studies that analyze the influence of education use categories to differentiate between different degrees. These groups vary in terms of their start and end points. Ben Selma et al. (2022) sets the first of their six criteria as “lower than high school”

and ends with directors having a PhD. Ararat et al. (2015), who studied companies in Turkey, started their categories with elementary education, rising to PhD. Most of the scholars use four categories to divide their sample, and eight combine their categories into a heterogeneity index. Two studies used a percentage of “highly educated” directors among the BoD, referring to at least a Master's or PhD degree. One study analyzed the impact of having directors with western education on the BoD (Post et al., 2011).

Tenure can be classified starting from under 1 year up to more than 20 years. Ratios range from one-year to four-year steps. Most scholars measure tenure by standardizing the categories using the Blau (1977) index. The coefficient of variation was used three times in the studies reviewed.

To measure the degree of multiple directorships, two studies created categories representing the number of seats from one, up to four and more seats (Harjoto et al., 2015; Li & He, 2021). Bernile et al. (2018) used the mean number of boards the director currently serves on and Beji et al. (2021) the percentage of members serving on multiple boards.

5.4 | Recommendations

The leadership position is the only variable suitable to measure on a dichotomous scale because it is a single position in the BoD structure held by a single member, either the CEO or another outside board member. Gender, which is described on a nominal scale and therefore does not include a clear ranking, is seen to be mostly measured through either a dichotomous scale (Azmat & Rentschler, 2017; Gyapong et al., 2016), the number of females (e.g., Bear et al., 2010) or the ratio of female and male board members (Erhardt et al., 2003). To measure gender-specific characteristics, scholars should choose an index that reaches its maximum at equal distribution. If the indicator uses percentage values, it does not consider that gender diversity decreases from a share of women of more than 50%, since homogeneity among the board members increases. The same argument also holds for the variable nationality. If the author describes directors as either foreign or non-foreign (Aggarwal et al., 2019; Ben Selma et al., 2022), a heterogeneity index might be used to increase the overall accuracy.

For age, which can be structured by years, a precise measure could be built by an overall value with the coefficient of variation or by categories, which can then be standardized. Hereby a reasonable start and end point must be defined. Commonly, the first group could include directors under 30 and end at over 65, with five age bands. Education can be ranked as a cardinal or ordinal scale. A precise measure should group the variables into four to five characteristics, depending on the country and demographic settings.

Consistent with earlier studies, demographic attributes are frequently examined due to their easily observable nature (Erhardt et al., 2003). Cognitive attributes, such as education, are unobservable and difficult to analyze, therefore survey designs or interviews can be used to increase the validity of the information. Sometimes the

structural measure additionally includes firm-level characteristics such as the percentage of state ownership (e.g., Hoang et al., 2017). These variables may not be included in a combined index because they do not refer to the group characteristics of the BoD.

6 | SYNTHESIS

Prior studies combined different director characteristics into single constructs. Yet, there are differences in combinations, definitions, and detail regarding diversity frameworks. Table 2 combines these approaches and gives an overview of the variables used to define and measure board diversity. Our study shows clear differences in terms of conceptualization and board diversity measuring techniques. We group the literature into four different methods (non-index, single-index, inter-indices, and cross-indices). We elaborate on the four methods in the following.

6.1 | Non-index measures

The development of different constructs should be preferred to better account for the complexity of diversity. Referring to demographic diversity, the least accurate measurements are absolute numbers and individual, non-connected attributes. The most common technique in the extant literature is the use of non-index measurements (Hafsi & Turgut, 2013). In our sample, more than half of the studies ($n = 36$) did not use an index. They measured indicators individually, including three variables on average. Such approaches are valid and simple but do not consider the combined effect of the BoD (Hoang et al., 2017). Some scholars argue that the accuracy can be increased by using relative statistical constructs (e.g., Hafsi & Turgut, 2013). Others, however, disagree and state that a ratio or percentage cannot represent diversity and thus fosters inaccuracy in the effects and outcomes (e.g., Aggarwal et al., 2019). When referring to structural diversity, it makes sense to use relative terms to increase comparability among the different boards (Hafsi & Turgut, 2013).

6.2 | Single-index measures

A more accurate prediction can be made when combining different (demographic) attributes to form a single index. A single index measures the joint influence of different dimensions instead of measuring individual dimensions (Erhardt et al., 2003; Sun et al., 2022). Scholars argue, that the overall behavior of the BoD is influenced by its members, thus the combined interactive effect should be considered (Ben-Amar et al., 2013). Overall, 15 studies used a combined diversity index (e.g., Arnaboldi et al., 2020; Bernile et al., 2018; Sarhan et al., 2019). This approach can be understood as a good and precise measure if it concentrates on a single dimension of diversity, such as demographic data. If it additionally includes structural characteristics (e.g., Sun et al., 2022), it could lead to imprecise results. This method

therefore should consider either demographic or structural diversity. The studies show that when using a single index, more individual attributes are considered compared to the non-index studies (4.47 attributes on average). While most scholars design their diversity index with standardized heterogeneity indices for each variable, some only refer to percentages (e.g., Arnaboldi et al., 2020; Gyapong et al., 2016). One study by Creek et al. (2019) adopts the guidelines of the Kinder, Lydenberg and Domini (KLD) database when combining the individual variables. The KLD database provides a simple guide on what variables to use and how to measure them. Accordingly, a board is considered diverse if at least four seats are held by women, members of ethnic minorities, or disabled persons. In boards with fewer than 12 members, one-third of the members have to fit the stated criteria to conclude that the BoD is diverse (Creek et al., 2019). A common strategy when building a single index is that of standardizing each of the individual heterogeneity indices to a value of zero to one, and then summing them into a combined index value (e.g., Harjoto et al., 2015; Sun et al., 2020). In one study, the number of women, ethnic and foreign members of the BoD was summarized and an overall percentage of the total number of members was calculated (Sarhan et al., 2019). Khan and Baker (2022) measured their demographic attributes, both individually and as an overall index, and found a significant and positive influence of the combined index on sustainable corporate performance. In addition, Bernile et al. (2018) broke down their index, including both demographic and cognitive factors, and also found that the combined effect, not the individual attributes, was the main driver of the outcome on firm risk.

6.3 | Cross-index measures

Cross-indices analyze a broader perspective on diversity and can be especially useful when comparing structural aspects of BoD. The eight studies in this sample constructed two individual measures regarding the demographic and structural characteristics, using a mean of 6.75 attributes in their construct (e.g., Aggarwal et al., 2019; Beji et al., 2021; Ben-Amar et al., 2013). To combine the demographic values, most scholars referred to the method of modifying the Blau index values by multiplying the value of each attribute with the number of the categories divided by the number of categories minus one ($K/(K-1)$) (Agresti & Agresti, 1978). Three authors then divided the variables into terciles—below average = 0, to average = 1, to above average = 2 (Ben-Amar et al., 2013; Hafsi & Turgut, 2013; Hoang et al., 2017), while one study summed the standardized values directly into a combined index (Ararat et al., 2015). In line with the single-index results, the effect of the combined index had a more significant impact than the individual variables (Ararat et al., 2015). Aggarwal et al. (2019) concluded that it is necessary to differentiate between demographic and structural constructs to obtain accurate results on the measurement of firm performance in their case. On the other hand, Hafsi and Turgut (2013) argued that the results of analyzing structural diversity depends on the country setting: due to the regulations in their US setting, the variance across the firm was relatively

low, thus neither the leadership duality nor the size and independence resulted in clear results. Future research could use this differentiation method to measure cross-country board relationships in countries where the statutory regulations are low.

6.4 | Inter-index measures

To further distinguish demographic diversity, Harjoto et al. (2015), Midavaine et al. (2016), and Li and He (2021) used inter-indices by delimiting the cognitive from the demographic elements of the BoD, which is argued to be more in line with the existing literature. They differentiated between four to six overall components. The two indices were each in line with the earlier explained approach by Harjoto et al. (2015). The combining of cognitive and demographic attributes adds additional complexity but results in a precise measure that accounts for the internal group mechanisms of the BoD. Critics argue that the inter-indices are ambiguous because such an index neglects the fact that demographic attributes could influence the cognitive characteristics of the director (Bernile et al., 2018; Sun et al., 2020). On the other hand, Harjoto et al. (2018) found different influences of each index on corporate innovation, advising against their aggregation into a single index. Studies can rely on inter-indices when analyzing a specific country, ideally where the structural diversity is highly mandated by country law (e.g., United States, India) and therefore has only a minor influence on the overall BoD.

7 | DISCUSSION AND FURTHER RESEARCH AGENDA

Scholars seeking to explore the intricacies of board diversity face multiple challenges and opportunities, and there are several promising avenues for future research. The following key issues emerge from the literature and can be clustered into distinct thematic areas.

7.1 | Methodological approaches and data collection

Scholars could consider employing mixed methods approaches to enhance data quality, particularly for unobservable aspects of diversity. Combining archival data with primary research, such as surveys, could be valuable. As demonstrated by Carter et al. (2010), the cross-checking of multiple sources, including databases, annual reports, LinkedIn, and phone calls, can reduce incomplete data. Carter et al. (2010) provide an example and combined the data from the ICCR database with cross-checking annual reports, LinkedIn, and additional phone calls to reduce incomplete data on ethnicity. The utilization of machine learning techniques offers potential for improving data accuracy and comprehensiveness. An example is the algorithm developed by Sood and Laohaprapanon (2018) to infer demographic attributes from directors' names. The machine learning classifier is considered to

have high precision and was used by Chidambaran et al. (2022) to infer board member ethnicity.

7.2 | Thematic extensions and geographical coverage

Studies in accounting research remain underrepresented, for example, in exploring multiple diversity constructs in the context of earnings quality. As an example, Hoang et al. (2017) analyze a multiple diversity construct in connection with earnings quality. With research indicating a potential link between diversity and ethical behavior (Khan et al., 2019), future work could examine the relationship between multiple diversity attributes and earnings management.

The scarcity of regional studies evidence on board diversity in Europe and the Middle East/African regions, despite their strict regulations on quotas and non-financial disclosures, calls for further inquiry (Adams et al., 2015). Studies could consider the unique governance systems and the impact of two-tier boards in countries such as Germany, Austria, and Poland. Cross-country research in these regions, similar to that of Sarhan et al. (2019), could provide valuable insights.

7.3 | Frameworks and constructs

The limited adoption and modification of existing board diversity frameworks and constructs (e.g., Hafsi & Turgut, 2013; Khan & Baker, 2022) pose challenges for cumulative research. Just Hoang et al. (2017), Hoang et al. (2018), and Beji et al. (2021) adopted the construct of a prior work by Hafsi and Turgut (2013), who developed a framework of diversity-in-boards and diversity-of-boards, referring to the demographic and structural differences. Scholars could strengthen the robustness of these frameworks by consistently employing the same measures and constructs, rather than making ad hoc modifications.

7.4 | Expertise and interdependence of attributes

Current studies predominantly focus on finance or accounting expertise. Future research could include sustainability expertise in the list of qualifications to explore its impact on board diversity.

In addition, researchers often overlook the possibility that an individual director may possess multiple diversity attributes (e.g., a young, foreign female). Thus, one director could lead to an increase in the overall diversity of the BoD without having enough power to trigger changes. As Kanter (1977) critical mass theory states, for change to occur, a critical mass of individuals is necessary. This aspect is not often addressed in the literature and, where it is, is mostly related to gender. But, it could also apply to other minorities, such as ethnicity or nationality (Creek et al., 2019; Joecks et al., 2013; Post et al., 2011). Future research could consider the interplay of various diversity attributes and their collective impact on board composition.

7.5 | Measurement and weighting

Most of the literature individually analyzes small quantities of diversity attributes such as gender, age, and education and only a minority of scholars build a combined construct. Only a few scholars have developed combined constructs. Future work could build overall indices by combining standardized values into a single metric to assess the cumulative effect of board diversity.

The assumption that all directors' attributes are equally important requires further scrutiny (Ben-Amar et al., 2013). When combining the individual attributes into a single index, most researchers just add the individual standardized measures, without taking their importance into account (e.g., Harjoto et al., 2015). Following the meta-analysis by Post and Byron (2015), who found significant differences in the performance effects of gender in countries where equality is low or high, future research could weigh the importance of each diversity attribute, or even apply techniques like Principal Components Analysis to measure the impact of individual indicators (Bernile et al., 2018; Hsu et al., 2022; Larcker et al., 2007; Tetlock, 2007).

7.6 | Diversity washing and showcasing

In light of increasing importance of diversity to investors and public perception (Baboolall & Nee, 2022), future research could explore diversity washing (Baker et al., 2022), where existing board members and shareholders may influence director selection to create a facade of diversity. Analysis of the ISS compensation data of firms listed in the S&P500 has recently revealed a shift in payment of a diverse leadership. The pay of racially and ethnically diverse and non-diverse CEOs was almost equal in 2015, whereas data from 2016 showed on average a 10% higher median pay for diverse CEOs (ISS, 2020). This show-casing problem can also be seen in an analysis by MSCI (2022). They looked at the racial/ethnic board diversity disclosure of MSCI USA Investable Market Index constituent companies. The majority, 84%, did not disclose information regarding directors' ethnicity, but among the 16% that did, about two-thirds had at least one diverse board member.

These six thematic areas highlight promising directions for future research on board diversity and can serve as a valuable framework for scholars to build on existing knowledge and contribute to a more comprehensive understanding of the topic.

8 | CONCLUSION

Our SLR provides answers to the research question: "Which methodologies are used to gather and evaluate board diversity measures?" Based on an initial sample of 1035 journal articles, we selected 61 empirical peer-review studies. We reviewed the current state of board diversity measurement approaches. Thereby, we contribute to contemporary research and practice.

8.1 | Contributions to research

First, we structured and synthesized the extant literature on board diversity based on a systematic and reproducible approach. We constructed a comprehensive map of knowledge in the field of board diversity. We highlighted inconsistencies in the definition and construction of the term board diversity. Future research can profit from applying uniform measuring techniques to increase the comparability of results.

Second, we extended previous literature reviews by developing a framework that structures measuring techniques for the variable board diversity into three unique constructs. Future scholars can use this framework as guidance for methodological research in the field of board diversity. Further, we give recommendations for individual measurement techniques such as building heterogeneity indices and combining multiple attributes to measure overall effect size. Future scholars may rely on our evaluation of the various measurement techniques when planning their studies.

Third, we provide a future research agenda and highlight potential research gaps. We conclude that a mixed method design can increase the quality of data, especially concerning cognitive diversity aspects. We further identify that most of the extant studies only consider a small number of director attributes. Future research can contribute by taking advantage of multiple directors' attributes when measuring board diversity. Additionally, as diversity becomes increasingly important for stakeholders (Baboolall & Nee, 2022; Lu et al., 2022), we highlight the potential of diversity washing as a focus topic of future research.

8.2 | Contributions to practice

First, we offer practitioners insights on contemporary approaches to measuring board diversity and outline potential inconsistencies. Often, multiple data sources were required to gain enough information for the studies, because not all companies provide the necessary data (Li & He, 2021). As a result, a lot of data points were dropped from the studies. To achieve better quality, better information disclosure is needed. Regulators must be more precise when giving advice and recommendations on firms' disclosed diversity aspects. A broader database including all relevant data could be built in the future, similar to the planned European single access point (DRSC, 2022).

Second, we emphasize that diversity is a complex concept that can be interpreted differently. Our work highlights the importance of the separation of structural, cognitive, and demographic diversity. This can, for example, provide ESG investors with more detailed information about the diversity on a company's board. Increased disclosure on board diversity can also prevent firms from intentionally withholding information to mislead ESG investors through impression management (Baker et al., 2022).

8.3 | Limitations

This study focuses on articles published in English and disregards studies published in other languages. Furthermore, we only included

studies published in journals rated (1–4*) by the AJG. Thus, this review might omit important studies published in other languages or journals. The authors' individual biases may have influenced the selection of studies. Although search terms were used to cover as many studies as possible, some articles related to other constructs may still have been omitted.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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