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Governance for Pension Plans' Sustainable Transition: The Moderating Role of Corporate Social Identity

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ABSTRACT

Pension plans may either limit their sustainability approach to commercial purposes or adopt governance practices aligned with sustainability principles, thereby strengthening their *Corporate Social Identity* (CSI). This paper explores the moderating role of CSI in the relationship between traditional corporate governance mechanisms and pension plans' sustainable investment choices. The study covers a representative sample of Italian pension funds, social welfare funds, and individual pension plans. It employs proprietary survey data collected through ad-hoc questionnaires for the period 2021–2023, combined with detailed hand-collected information on governance structures and board members' characteristics. The results confirm the main assumptions of the Upper Echelons Theory, showing that directors' demographic and cognitive characteristics significantly shape the sustainability orientation of pension funds. CSI further amplifies these effects by moderating the relationship between governance attributes and ESG investment choices. The study highlights the role of internal governance mechanisms and organisational culture in the sustainable transition of pension funds and extends the application of the Upper Echelons Theory by introducing CSI as a complementary governance dimension.

JEL Classification: G23, G38, Q56

1 | Introduction

External factors, primarily market and regulatory pressures, push pension funds and other complementary pension schemes to integrate environmental, social, and governance (ESG) factors into their investment decisions. Indeed, the need to be compliant with the sustainable development goals (United Nations 2015) and the sustainable finance regulation requires these institutional investors to integrate sustainable issues into the securities' selection and management and to disclose ESG risks and impacts (Alda 2021; Boermans and Galema 2019; Egli et al. 2022; Sethi 2005). Besides, particularly for pension plans, the IORPII directive (UE 2016/2341) introduced significant innovations in governance issues, providing a strong impetus for a more focused ESG view. At the same time, for complementary

pension plans, the higher attention paid to sustainability is a way to meet stakeholders' expectations, ensure their engagement, and comply with fiduciary duties (Rojanamon et al. 2012; Redman 2018).

On the path toward an increasing orientation toward sustainability, market actors may be at different stages: sustainability may characterize a high or low range of investment lines and products, and financial portfolios can be managed by applying more or less sophisticated ESG strategies. These investment decisions can be conditioned by internal factors determining whether institutional investors are ready to integrate sustainability into their strategic and operating choices effectively. In this sense, it is possible to distinguish between a “shelf” sustainability, which characterizes just some products offered by

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the financial institution, and a more holistic approach, in which sustainability pervades the firms' governance models and organizational structures (Biggeri et al. 2024).

This study fits into the strand of literature that seeks to investigate the role of governance practices in conditioning the orientation of pension funds toward responsible investing (Clark and Urwin 2008).

First, the analysis deals with some board's characteristics (e.g., the size and gender diversity in the board) to evaluate their relationship with sustainable investment choices. Then, this relationship is moderated by considering specific governance practices linked to sustainability (e.g., the presence of an ESG committee and remuneration policies related to sustainability goals), from which it is possible to derive the *Corporate Social Identity (CSI) of the financial institution*. CSI refers to how a company defines, manages, and communicates its identity about Corporate Social Responsibility. It highlights the company's stance on ethical, environmental, and social issues and its commitment to sustainable practices. A financial intermediary's CSI includes the entity's distinctive elements, starting from its governance structure and reaching the coherence and consistency of its offering to the market (Akomea-Frimpong et al. 2022; Shi et al. 2017; Tan and Cam 2015; Naveed et al. 2020; Muñoz 2020).

The paper aims to answer the following research questions:

RQ1. *Do the board of directors' structure and composition impact the pension plans' orientation to sustainability in investment decisions?*

RQ2. *Can the pension plans' Corporate Social Identity moderate such a relationship?*

We collected data from different sources. First, we used a proprietary and hand-collected dataset containing information on the board's composition and board members' features for a representative sample of Italian pension plans, social welfare funds, and individual pension plans. Second, we integrated this dataset with other survey-based variables collected through a questionnaire submitted to the sample in collaboration with the "Forum per la Finanza Sostenibile" (FFS) for the years 2021–2023.

European countries, including Italy, must adhere to a harmonized regulation concerning institutions for occupational retirement provision. Nonetheless, it is essential to conduct a country-specific study, given the considerable variations in the characteristics of the mandatory pension system, which can significantly impact the national markets for supplementary pension plans. Within the European Union, the Italian case holds particular relevance. Traditionally, the adoption of complementary pension schemes among Italian families has been limited, primarily because of the prominence of the public and compulsory pension system. The proportion of public pension expenditure in Italy as a percentage of GDP, approximately 4%, is the highest in Europe, surpassed only by Greece (Eurostat Statistics 2024). Nevertheless, Italy is grappling with the most significant challenges associated with an aging population, leading to heightened pressure on public spending. According

to the latest OECD Report on Pensions, Italy stands out among countries with some of the most notable advancements in life expectancy: Italy currently boasts the second-highest median age (after Japan) (OECD 2024). Projections by the United Nations indicate that by 2050, Italy is anticipated to have the highest median age after Japan and Korea (United Nations 2020). The acceleration of the old-age to working-age ratio has prompted a substantial reform of the pension system, fostering increased demand for complementary pension arrangements. The complementary pension market is destined (perhaps forced) to grow to compensate for the downsizing of the public sector. Moreover, Italy is one of Europe's fastest-growing markets for sustainable and responsible investing (Eurosif 2021). For this reason, the Italian case emerges as a suitable case study for the transition to sustainable pension schemes. In addition to these reasons, one contingent opportunity is the availability of unique proprietary data about the Italian context to conduct the study.

Our results indicate that a board with a high representation of women is related to a more thorough integration of sustainability issues into the investment policy, in terms of the integration of ESG factors, the coverage ratio for sustainable investments, and the number of ESG strategies implemented. Furthermore, our findings indicate that the CSI, particularly the presence of sustainability-oriented governance practices, covers an enabling role in favouring the relationships between board characteristics and sustainable investment policies: the board size, the presence of committees, the board gender/educational/age diversity, and the members' external ties, when moderated by governance practices committed to sustainability criteria, turn out to influence ESG investment decisions.

Our paper intends to contribute to the still limited literature on the sustainability choices applied by pension plans (Woods and Urwin 2010; Boermans and Galema 2019; Rempel and Gupta 2020; Alda 2021; Egli et al. 2022). Focusing on the supplementary pension industry (Akomea-Frimpong et al. 2022; Clark and Urwin 2008; Rempel and Gupta 2020; Sethi 2005), we contribute to the widening of the sectors analysed under the Upper Echelons Theory, as our theoretical background theory (Baker et al. 2020; Neely et al. 2020).

This paper fills a critical research gap by delving into the challenges specific to pension funds while implementing specific sustainability-linked governance choices. In doing so, the study proposes an innovative measure of CSI, which assesses the implementation of particular sustainability governance practices. This measure can help identify pension funds that adopt a holistic approach to sustainability, not limited to offering sustainable financial products, but pervasive in corporate governance choices. Therefore, our analysis provides an important contribution to assessing the financial effects of sustainability governance decisions.

Our analysis includes the overall consideration of a large number of directors' demographic and personal attributes to explain sustainability-oriented strategies, which received less attention from the existing literature (Golden and Zajac 2001; Judge and Talaular 2017; Hendry and Kiel 2004; Reeves et al. 2018; Weitzner and Peridis 2011). Compared to other studies specifically dedicated to the corporate governance of pension plans,

our study verifies the contribution of CSI as a moderator in affecting the relationship between governance structures and investment decisions. It emphasizes how specific governance choices produce effects on financial portfolios only if supported by an adequate holistic approach to sustainability.

The paper is structured as follows: Section 2 proposes a review of the existing literature and defines the hypotheses subsequently tested. Section 3 presents the characteristics of the sample analysed, the data sources, and the methods used in the analysis. Section 4 presents the main results, and the closing paragraph proposes some conclusions and the study's implications.

2 | Literature Review and Theoretical Background

The board is responsible for an organization's overall strategic direction and oversight and for monitoring management activities. Recently, ESG profiles have been included in the strategic plans of pension schemes that are more oriented towards sustainability issues, with the consequent need to expand the board's scope of action (e.g., Baselga-Pascual et al. 2018). This is also a result of the regulatory orientation, which recommends that pension plans adopt an appropriate governance system to ensure sound and prudent management, while also considering ESG issues.

This paper analyses the boards' characteristics as critical determinants for adopting sustainable investment decisions. Therefore, we consider some board features: the board size, the presence of board committees, and some directors' demographic characteristics, such as their diversity (in terms of gender, nationality, age, and education), in addition to their external connections. Unlike previous studies, which primarily focus on the role of individual aspects of the board's structure and composition (e.g., the size, the independence, etc.), we conduct an overall analysis of the board's features, analyzing their relation to the sustainability of pension plans.

From a theoretical perspective, we consider the Upper Echelons Theory (Hambrick and Mason 1984; Carpenter et al. 2004; Hambrick 2007), which states a close link between board characteristics, especially the demographic ones, and organizations' strategies, decisions, and outcomes (e.g., Abatecola and Cristofaro 2020; Ferretti et al. 2024). Notably, such a theoretical framework affirms that certain personal features (gender, age, nationality, education, etc.) may represent directors' values and skills, as well as the knowledge base and consequently influence the organizations' policies (Forbes and Milliken 1999; Cannella and Monroe 1997; Carpenter et al. 2004).

At the same time, consideration must be given to empirical evidence showing that the demographic characteristics of directors affect their way of performing their tasks with evident effects on the organization's outcomes (e.g., Carpenter and Westphal 2001; Jensen and Zajac 2004; Tuggle et al. 2010; Tejerina-Gaite and Fernández-Temprano 2021). Additionally, in light of this evidence, we focus on the relationship between certain boards' features and sustainability-related decisions within pension plans, considering that empirical research on this specific segment of the financial sector remains scarce.

In any case, from the theoretical standpoint, since the foundational paper of Hambrick and Mason (1984), the Upper Echelons Theory has inspired a substantial body of empirical research exploring how the personal attributes of directors relate to firm outcomes. Over time, the theory's analytical focus has broadened—initially concentrating on executives, especially CEOs and top management (Hambrick and Quigley 2014; Hambrick et al. 2015; Donatella and Tagesson 2021), and later expanding to include non-executive roles, notably members of the board of directors. As for the latter, there is broad scholarly agreement that the personal characteristics of board members play a significant role in shaping firm outcomes. We therefore intend to contribute to this discussion by focusing on the relationship between boards' characteristics and sustainability-related decisions within pension plans, as a specific segment of the financial system. Indeed, the use of the Upper Echelons Theory studying the boards' attributes-outcomes link is prevalent in the management literature. Thanks to our study, we intend to contribute to the widening of the sectors examined under such a theoretical framework. This is also important if we consider that literature underlines how the Upper Echelons Theory has long been quite neglected in regulated industries, such as the financial industry (Hertrampf et al. 2025). Besides, the previous studies that have focused on the financial sector, particularly the banking one, have mainly investigated, under the Upper Echelons Theory, the influence of boards' traits on performance and risk-taking (e.g., Rost and Osterloh 2010; Ferretti et al. 2024), while we use such a theory to investigate the influence of pension plans boards' attributes on sustainability investment decisions.

In other words, the use of the Upper Echelons Theory for the analysis of the link between the board's attributes and sustainability-related choices could offer a theoretically grounded approach to contribute to the existing financial literature (Hertrampf et al. 2025) and particularly to the studies of pension plans. Indeed, if the Upper Echelons Theory has been widely adopted in management studies (e.g., Abatecola and Cristofaro 2020; Neely et al. 2020), it remains underexplored in the finance literature.

Moreover, we extend the use of the Upper Echelons Theory to a set of the board's characteristics (not only single features), following a holistic perspective. By doing that, we contribute to enhancing the Upper Echelons Theory's suitability as a comprehensive framework for studying the influence of the overall board's traits on outcomes (Hertrampf et al. 2025) by focusing on the financial sector and, within this, on pension plans.

In the following, we underline the relation stated by previous studies between each board's features and sustainability. Based on this, we formulate our related hypotheses.

2.1 | Board Size

Board size has been frequently investigated in the financial sector, focusing on its impact on sustainability. In this regard, some studies on sustainability-related disclosure show a positive relation between the level of transparency and the board size (Gurol and Lagasio 2023; Ali et al. 2021; Jizi et al. 2014; Kiliç et al. 2015), while others do not find a significant link (Matuszak et al. 2019; Orazalin 2019). Non-unique results

are also found for sustainability-related practices: some studies show a positive correlation between board size and stakeholder engagement (Cosma et al. 2021; Allegrini and Greco 2013; Kaymak and Bektas 2017), and others do not (e.g., Sharmeen et al. 2019).

Additionally, research on boards' size shows that fewer directors are more effective at monitoring and controlling management than larger ones, as well as more efficient in coordination (De Andres and Vallelado 2008; Said et al. 2009; Rao et al. 2012). Nevertheless, in the case of industries characterized by complexity and a high degree of regulation, as the financial sector is, a higher number of directors is associated with an increase in the effectiveness of the board by reducing the workload for each member (De Andres and Vallelado 2008; Grove et al. 2011). Moreover, a large number of board members equips the board with expertise, external connections, and stakeholder representation (Dalton and Dalton 2005; Allegrini and Greco 2013; Song and Windram 2004) that bring various values, knowledge, ideas, and perspectives for better supervising managerial decision-making processes (Pfeffer and Salancik 2003). Building on these latter arguments, large boards may have more diversity in skills, capabilities, education, and stakeholder representation than a smaller board. In this respect, we believe a larger board size may also ensure a more suitable composition in terms of different directors' attributes, and as a result, positively contribute to the effective implementation of institutions' strategies. This is consistent with the Upper Echelons Theory (Hambrick and Mason 1984), which posits that the personal attributes of directors may be considered drivers of their ability to effectively perform their functions within the boardroom, with beneficial effects in challenging and monitoring the management decision-making process (Ferretti et al. 2024). In essence, Upper Echelons Theory highlights that board members may also be considered active agents who shape institutions' trajectory through their unique perspectives and experiences.

On this basis, we think that a larger board size may also positively contribute to the definition of sustainability-oriented investment decisions.

Therefore, we develop our first hypothesis as follows:

H1. *Board size is positively associated with the sustainability of pension plans' investment choices.*

2.2 | Board Committee

Although internal board committees (such as nomination, remuneration, and risk and control committees) are not explicitly charged with sustainability issues, they may impact organizations' decisions, including sustainability choices.

For example, the nomination committee could assess board members susceptible to including a sustainability perspective within the organization (Iannuzzi et al. 2023); these members could then positively influence board decisions about sustainability. Moreover, the remuneration committee could propose remuneration policies linked to sustainability goals, promoting

board decisions more oriented to sustainability improvement (Bel-Oms and Segarra-Moliner 2022). Lastly, the risk and control committee could contribute to assessing and managing ESG risks, highlighting the potential adverse impacts of ESG topics and defining the adequate presidium. Hence, the presence of these committees could help create a corporate culture that is more focused on sustainability by increasing awareness of ESG factors and risks in the organizations' management and strategies.

From the above, it follows that the distribution of roles, functions, and responsibilities of directors may be achieved through the establishment of various board committees with investigative, propositive, and advisory functions. Consistent with the Upper Echelons Theory (Hambrick and Mason 1984), such committees are able to positively impact the quality of the recommendations to the full board.

The presence of different focused committees, therefore, may contribute to the development of the institutions' strategies, including those related to sustainability.

Therefore, we develop our second hypothesis as follows:

H2. *The number of board committees is positively associated with the sustainability of pension plans' investment choices.*

2.3 | Gender Diversity

The issue related to gender diversity within boards of directors has also been discussed in depth in the financial industry. The majority of results reveal that the presence of female directors positively impacts sustainability-related issues (i.e., disclosure and reporting, responsible procedures, etc.). Nevertheless, some papers outline that the positive effect is actual under specific conditions, such as the female percentage threshold (Buallay et al. 2022), the presence of a female CEO (Setó-Pamies 2015), the type of sustainable pillar considered: environmental (Galletta et al. 2022) versus governance (Al-Jaifi 2020).

Gender diversity may contribute to improving the effectiveness of the board's monitoring. This seems to be due to certain behavioral peculiarities of women: they can reduce conflicts within the board because of their personal attributes, skills, and gender-related values, resulting in a more balanced decision-making process (Jensen and Meckling 1976; Matuszak et al. 2019). Moreover, women seem more empathetic toward stakeholders' expectations (e.g., Samara et al. 2019; Nielsen and Huse 2010). Additionally, gender diversity within the boards allows for a more significant number of interconnections, expertise, and qualifications that can improve the board's role in performing its tasks also in the sustainability area (Bear et al. 2010; Nadeem et al. 2019). In this sense, the potential positive effect of the presence of women does not relate to gender itself but rather to the fact that women provide different values and professional experience in comparison with men, which improves the decision-making process of the board and enables the board to perform its tasks better (Boulouta 2013). In addition, women seem to be

more sensitive to sustainable initiatives than men due to some of their psychological traits, such as availability, empathy, and attention to the well-being of others (Eagly et al. 2003).

Once again, according to the Upper Echelons Theory (Hambrick and Mason 1984), the background characteristics of the board directors, including gender, may affect the institution's strategy: more gender diversity within the board may lead to more effective strategies, including those related to sustainability.

Therefore, we develop our third hypothesis as follows:

H3. *Board gender diversity is positively associated with the sustainability of pension plans' investment choices.*

2.4 | Nationality Diversity

Among the diversity drivers, scholars have also recently focused on the presence of foreign directors on the boards of financial institutions. Generally, the relationship between nationality diversity and sustainability-related issues is positive, like when disclosure is investigated (Issa et al. 2022; Ali et al. 2021).

Appointing directors of different nationalities could allow a more extensive representation of stakeholder groups, as in the case of foreign shareholders (Ibrahim and Hanefah 2016). Furthermore, foreign directors may be bearers of different cultural values and perspectives, as well as experts of their country specificities; all this could enhance the effectiveness of the decision-making process, also in terms of non-financial topics (Ruigrok et al. 2007).

Additionally, the board's experiences from an international context may be considered as a valuable source of individual competencies able to impact sustainability practices (Katmon et al. 2019).

Even in this case, in line with the Upper Echelons Theory (Hambrick and Mason 1984), it is possible to consider the nationality, as one of the directors' attributes, a key predictor of an institution's strategic direction.

Therefore, we develop our fourth hypothesis as follows:

H4. *Board nationality diversity is positively associated with the sustainability of pension plans' investment choices.*

2.5 | The Average Age of Directors

The average age of directors represents another factor contributing to the debate on the potential impact of certain board members' attributes on organizations' decisions, including sustainability-related issues. In particular, reducing the average age of directors may positively help diversity in terms of personality, skills, attitude, work values, and behaviors (Ferrero-Ferrero et al. 2015).

Some studies find that a young age improves stakeholders' engagement (Diamantopoulos et al. 2003; Klineberg et al. 1998).

Other studies show that younger directors tend to express more significant concern for the environment and social dynamics (Diamantopoulos et al. 2003; Klineberg et al. 1998; Mohai and Twilight 1987).

On the other side, a growing age of directors is associated with risk aversion and conservatism, due to the weakening of cognitive capabilities (e.g., learning ability and memory) and the decline of energy, dynamism, and motivation with age (Hambrick and Mason 1984; Bantel and Jackson 1989). According to the Upper Echelon Theory, this may limit their monitoring and advisory ability and negatively impact the quality of the decision-making process (Hambrick and Mason 1984). Older directors, moreover, may have greater resistance to changes and innovative strategies (Zajac and Westphal 1996; Grimm and Smith 1991).

We therefore believe that a higher average age of directors may be associated with a limited capacity for actively monitoring and advising the management, with negative effects on the success of strategies, including those related to sustainability issues.

Therefore, we develop our fifth hypothesis as follows:

H5. *The average age of directors is negatively associated with the sustainability of pension plans' investment choices.*

2.6 | Educational Diversity

Having diverse educational backgrounds in boardrooms is a valuable way of promoting diversity, which can be beneficial for strategic decision-making and meeting the demands and expectations of stakeholders (Shatnawi et al. 2022; Hillman and Dalziel 2003). Board members with different educational backgrounds can offer unique competencies, knowledge, and skills, leading to a broader range of solutions and alternatives for strategic decisions (Beji et al. 2021). Directors with higher levels of education are more likely to absorb new ideas and understand financial and non-financial issues (Beji et al. 2021).

Studies have shown that well-diversified directors, in terms of education level, are more likely to be involved in sustainability-related activities and, consequently, more committed (Yousfi and Béji 2020).

Even if scant, the existing literature suggests that educational diversity positively impacts sustainability-related activities (Beji et al. 2021).

Based on the above and in harmony with the Upper Echelons Theory (Hambrick and Mason 1984), we believe that the diversity of directors' educational backgrounds may ensure better performance in monitoring the investment strategies (Minton et al. 2014; García-Sánchez et al. 2017).

Therefore, we develop our sixth hypothesis as follows:

H6. *Board educational diversity is positively associated with the sustainability of pension plans' investment choices.*

2.7 | Directors' External Connections

Board members may have political connections through their involvement in political campaigns, advocacy organizations, or personal relationships with politicians or government officials. They may also have connections to specific political parties or ideologies. Literature shows that there may be a correlation between board members' political connections and the organizations' ESG activities. On the one hand, political connections could lead to conflicts of interest or prioritize political considerations over ESG goals, especially regarding disclosure. Board members with political connections may be more focused on advancing their own interests or political agendas, which may not always align with the company's ESG priorities (Rashid and Hossain 2021; Muttakin et al. 2015; Chaney et al. 2011). On the other hand, board members with political connections may be able to leverage their relationships and knowledge to advocate for policies and initiatives that align with the ESG goals (De Andres and Vallelado 2008; Qian and Chen 2021). Besides, organizations with political directors may be subject to more public and governmental scrutiny (Chen et al. 2017; Fernández-Gago et al. 2018; Xu and Liu 2020) and consequently may be under more significant pressure to invest in sustainable activities (Chiu and Sharfman 2011; Marquis and Qian 2014). In contexts where politicians are viewed negatively by the social community because of corruption scandals (Ramón-Llorens et al. 2019), political directors may use sustainability to protect their reputation and maintain or enhance their political legitimacy, which could lead to political or professional promotion (Marquis and Qian 2014; Zhang 2017; Wang et al. 2018).

Our paper extends the latter stream of research by exploring other types of connections beyond the political ones as relevant components of board social capital. Board members may have academic connections through professional backgrounds, such as holding degrees from prestigious universities and connections to educational institutions or research organizations (White et al. 2014; Cho et al. 2017).

Additionally, board members may have financial connections through their relationships with executives, investors, or financial institutions (Joh and Jung 2018). Moreover, board members may have social connections through their networks and relationships, such as belonging to exclusive clubs or social circles. These connections may provide access to influential people or resources (Wang et al. 2006).

Some studies (e.g., Perez-Batres and Doh 2014) suggest a positive relationship between the number of board ties to reputable universities/non-profit organizations and sustainability-related issues.

Considering different types of connections of directors, we believe it is possible to consider the whole set of relations that define the directors' managerial and social background, which, in harmony with the Upper Echelons frame (Hambrick and Mason 1984), may favour the board's role in shaping institutions' strategies. In other words, all the directors' connections may affect the institutions' approach to various issues, including the sustainability-related ones, and therefore their overall strategic direction.

Therefore, we develop our seventh hypothesis as follows:

H7. *Directors' external connections are positively associated with the sustainability of pension plans' investment choices.*

Lastly, we assume synergistic effects among different corporate governance mechanisms exist. To this end, we propose an innovative indicator of CSI, measuring the adoption of specific sustainability governance practices (e.g., ESG committee, sustainability-related remuneration policies, etc.) within pension plans. They may contribute to defining whether the pension plans adopt a holistic approach in managing and communicating their identity regarding corporate social responsibility. Such an indicator may indeed be considered a potential enabler of the relationship between governance characteristics (e.g., board attributes) and sustainability-related decisions.

All this is grounded on the potential virtuous complementarity of governance mechanisms: a governance mechanism may be positively interrelated with other governance practices thanks to a "mutual enhancement" (Aguilera et al. 2008; Allegrini and Greco 2013). This means that adopting one mechanism may increase the effectiveness of the others and vice-versa (Cassiman and Veugelers 2006). Mainly, the plural characteristics of the board, on one side, and committees, remuneration policies, and other corporate governance mechanisms specifically related to sustainability issues (the CSI), on the other, should work together in a coordinated manner aimed to achieve the organizations' goals, including the sustainability-related strategies.

Therefore, we develop our eighth hypothesis as follows:

H8. *Corporate Social Identity amplifies the relationship between board characteristics and the sustainability of pension plans' investment choices.*

3 | Data and Methodology

3.1 | Data

The analysis focuses on a sample of 108 pension plans (see Table 1) and 1174 members of the boards of directors of these plans. The sample includes all respondents to a questionnaire distributed within the pension plan industry by the "Forum per

TABLE 1 | Sample composition.

Pension plan type	Obs	%	% cum.
Open pension funds (OPFs)	18	16.67	16.67
Contractual pension funds (CPFs)	33	30.56	47.22
Pre-existing pension funds (PrePFs)	18	16.67	63.89
Social welfare fund (SWFs)	19	17.59	81.48
Individual pension plans (IPPs)	20	18.52	100.00
Total	108	100	

la Finanza Sostenibile—FFS”. It also pertains to the board’s composition in the year preceding the conclusion of the last available questionnaire (referring to boards with a three-year mandate active between 2021 and 2023). The sample includes all types of pension plans operating in Italy, in particular open pension funds (OPFs), contractual pension funds (CPFs), pre-existing pension funds (PrePF), social welfare funds (SWFs), and individual pension plans (IPPs). Table 1 shows the composition of the sample. In details, OPFs are pension funds promoted by banks, insurance companies, asset management companies and investment companies. They support both occupational and personal plans. They do not have legal personality; nonetheless, their assets are required to be separated with respect to those of the financial company that manages them. CPFs are pension funds established through collective bargaining agreements between employer associations and trade unions that are usually negotiated at the industry level, or sometimes with reference to specific geographical areas. CPFs only support occupational pension plans and have legal personality (i.e., there is legal separation between the pension fund and the sponsors). PrePF are pension funds that were already operating before the entry into force of Legislative Decree no. 124 of 1993. They are both autonomous and non-autonomous (book reserves). SWFs are social security institutions referred to in Legislative Decrees 509/1994 and 103/1996. They are established as an association or foundation and aim to provide pension, mostly basic, and welfare benefits for various categories of self-employed persons, and in some cases employees, and their family members and survivors. IPPs are individual pension plans implemented through life insurance contracts, established after the entry into force of Legislative Decree no. 252 of 2005. They are subject to the same rules that apply to new pension funds with respect to members’ rights, portability and transparency. Offered by insurance companies, they only support personal plans. They do not have legal personality; nonetheless, their assets are required to be separated with respect to those of the insurance company sponsoring them. They can be with-profit (traditional policies) or unit-linked policies (Source: COVIP).

Our sample can be considered highly representative of the Italian market. In fact, the 108 pension plans included in our analysis collectively manage euro 251.4 billion in assets under management (AUM) and approximately 9.4 million members. These figures correspond to about 82% of the total AUM and 87% of the total members of supplementary pension schemes in Italy in 2023, according to COVIP data. Therefore, while not covering the entire universe of Italian pension and social welfare funds, the sample effectively represents the vast majority of the market in terms of both size and participants.

The data used in the study was derived from various sources. The first is represented by a proprietary dataset explicitly created for the study, which collects, drawing mainly from pension plans’ websites and public documentation, a set of variables descriptive of the structure and qualitative composition of the boards. The high number of variables collected can be divided into two sets. The first set collects information on board structure and includes the following variables: board size and committees’ presence. The second set of variables considers the qualitative composition of the boards. In this case, the sample of 1103 board members is analysed individually. For each of them,

the following information was collected: type and role on the board of directors, other roles within the pension plan (i.e., CEO, CFO), personal characteristics (i.e., gender, age, nationality, education, reputation, corporate experience, commitment, and networking). Among the variables collected, those with a percentage of missing data higher than 20% were not considered in the econometric analysis. However, all the variables allowed for a qualitative assessment of pension plans’ board characteristics (see Section 3.1.1).

The second data source comprises proprietary survey data gathered through the FFS questionnaire administered between 2021 and 2023. Participation was voluntary, and the information provided by the pension plans was analysed only in aggregated and anonymous form, ensuring confidentiality. This enabled analysis of sustainability practices from two complementary perspectives: (1) investment policies and (2) corporate governance practices. Section 3.1.2 presents a descriptive analysis of the sample concerning sustainable investment decisions.

3.1.1 | Board of Directors’ Features

This section analyses the structure and composition of the boards included in the study. The 108 boards in the sample include 1174 members, for whom individual data were collected as described above. It is important to note that board composition is, on average, stable for at least three consecutive years. This helps to mitigate potential endogeneity issues, as the data on board composition precede the sustainability-related data available for the period 2021–2023. The analyses consider the composition of boards that had been active for at least 1 year before completing the last available questionnaire.

Table 2 shows the descriptive statistics (mean, standard deviation, minimum, and maximum) for each variable that can describe the features and composition of the boards considered. The size of the sample boards ranges from a minimum of 4 members to a maximum of 20. The average is around 11 members. Generally, the boards in the sample are relatively large because some pension plan categories also include a share of members nominated by employees. On average, the presence of women on the boards is just below 20%, with a minimum of 0 and a maximum of around 50%. The presence of members of non-Italian nationalities is almost negligible. In general, the data show a relatively high average age among board members. Regarding education, the data show that the average diversity rate is relatively low. Finally, the board members have consistent external ties of a heterogeneous nature (i.e., political, social, financial, and academic), with an average value of 2.35.

Among the 1174 board members, slightly more than 200 are women. Remarkably, in only one instance out of the 108 boards, a woman holds the position of board president; in all other cases, women serve as ordinary board members without specific executive functions.

Out of the 1174 members, only 43 are foreign nationals (with citizenship other than Italian), and no single nationality dominates besides Italian. The average age of the board members

TABLE 2 | Board features: descriptive statistics.

Variable	Obs	Mean	Std. dev.	Min	Max
SIZE	106	11.19192	3.93487	4	20
COMM	108	0.36633	0.48421	0	1
WOMEN	107	0.19531	0.14384	0	0.66666
NATIONALITY	106	0.03563	0.10404	0	0.5
AGE	106	58.74878	4.64152	48	70
EDU_DIV	108	0.28901	0.21660	0	1
TOTALTIES	108	2.34653	1.16134	0	4

TABLE 3 | Integration of ESG criteria.

Pension plans type	ESG_INVEST			
	1		0	
	Obs.	%	Obs.	%
Open pension funds (OPFs)	17	20.00	1	4.35
Contractual pension funds (CPFs)	25	29.41	8	34.78
Pre-existing pension funds (PrePFs)	12	14.12	5	21.74
Social welfare fund (SWFs)	17	20.00	3	13.04
Individual pension plans (IPPs)	14	16.47	6	26.09
	85	100.00	23	100.00
	(78.70%)		(21.30%)	

is relatively high, ranging from the youngest at 32 to the oldest at 90. The board members come from a wide range of educational backgrounds, although economics-related disciplines are the most common. Furthermore, the analysis of the 1103 members reveals a diverse landscape regarding their external connections. This comprehensive assessment allows for a detailed understanding of the governance structures of the pension plans within the sample.

3.1.2 | Sustainability Investment Choices

This section analyses the characteristics of the pension plans included in the sample in terms of sustainability investment choices. Focusing on this aspect, we consider three main dimensions (which will later serve as dependent variables in regression analysis): (1) the integration of ESG criteria into investment decisions, (2) the coverage ratio of sustainable investments over total assets under management, and (3) the number of ESG strategies adopted

in the investment portfolio management. Table 3 describes the sample in terms of ESG criteria integration in the investment policy. For each category of pension plans, the table shows the number of plans that integrate ESG criteria into their investment decisions and those that do not. In general, 78.70% of the sample integrates ESG factors, with relevant differences across pension plan types.

All, except one, of the 85 pension plans that integrate ESG criteria have coverage rates of the sustainable investment to total assets under management exceeding 25%. Nearly half of the plans exhibit coverage rates ranging from 75 to 100% of the total assets under management.

Regarding the ESG strategies adopted by the pension plans, we distinguish six types of strategies commonly applied to the main asset classes (equities, corporate bonds, and government bonds): exclusions, international conventions, best-in-class, thematic investing, engagement, and impact investing. To capture this, we created an indicator based on the sum of strategies applied across the three asset classes: each strategy adopted earns 1 point per asset class, yielding a maximum possible score of 18. The data show that about half the pension plans in the sample achieve a score of 3 or below. Notably, no plan reaches the maximum score.

3.2 | Methodology

To assess whether the board of directors' structure and composition impact the pension plans' orientation to sustainability in investment decisions, we employ three different dependent variables reflecting different aspects of responsible investing: (1) a dichotomy variable indicating if the pension plan includes ESG criteria in investment decisions (ESG_INVEST); (2) a discrete increasing variable about responsible investing coverage ratio to total assets under management (ESG_RATE_COV); and (3) a discrete variable built as an indicator derived from the sum of sustainable strategies adopted by the plan for selecting securities to be included in financial portfolios (ESG_STRATEGY). These variables are constructed using exclusive survey data collected in collaboration with the Forum per la Finanza Sostenibile (FFS).

For all the estimations, our main independent variables are represented by the characteristics in terms of structure and composition of the boards of directors. In particular, the variables relate to the traditional board characteristics of the pension plans, namely

TABLE 4 | Summary of the dependent, independent and control variables.

Variable name	Variable description
Group of dependent variables: investment policies	
ESG_INVEST	Dummy variable: 1 = if the pension form includes ESG criteria in investment decisions, 0 = if not included. <i>Question source: Do you include ESG criteria in your investment decisions?</i>
ESG_STRATEGY	Discrete variable constructed as an indicator derived from the summation of sustainable strategies adopted: 1 point for each strategy adopted (exclusions, international conventions, best in class, thematic investments, engagement, impact investing)—max 6 points per asset class. <i>Question source: Concerning Equity, Corporate Bonds and Government Securities, what ESG strategies do you adopt?</i>
ESG_RATE_COV	Discrete increasing variable: 0 = zero coverage rate, 1 = 0%–25%, 2 = 25%–50%, 3 = 50%–75%, 4 = 75%–100% <i>Question source: What is the sustainable investment policy coverage ratio to total assets under management?</i>
Group of independent variables: board characteristics	
SIZE	Discrete variable corresponding to the number of members of the pension plan board of directors
COMM	Dummy variable: 1 = if within the board there are committees, 0 = otherwise
WOMEN	Continuous variable corresponding to the percentage of women on the board of directors
NATIONALITY	Continuous variable corresponding to the percentage of foreign members on the board of directors
AGE	Continuous variable corresponding to the average age of board members

(Continues)

TABLE 4 | (Continued)

Variable name	Variable description
EDU_DIV	Continuous variable corresponding to the percentage of board members with education other than “economics degree.”
TIES_P	Dummy variable: 1 = if within the board, at least one member has political ties, 0 = otherwise
TIES_S	Dummy variable: 1 = if within the board, at least one member has social ties, 0 = otherwise
TIES_F	Dummy variable: 1 = if within the board, at least one member has financial ties, 0 = otherwise
TIES_A	Dummy variable: 1 = if within the board, at least one member has academic ties, 0 = otherwise
TOTALTIES	Discrete variable constructed as an indicator derived from the sum of previous dummy variables (TIES_P, TIES_S, TIES_F, TIES_A)
Group of control variables	
AUM	Assets under management in millions of euro
Ms	Number of people enrolled in the pension plan
D_FUND	Dummy variable: 1 = if the pension plan is a pension fund, 0 = otherwise

Note: This table describes the dependent, independent, and control variables used in our analyses.

size of the board (SIZE), presence of committees (COMM), gender (WOMEN), nationality (NATIONALITY), age (AGE), and education diversity of the board members (EDU_DIV), and political, social, financial, academic ties of the board members (TOTALTIES). These variables are derived from a proprietary dataset developed by the authors specifically for this research.

Table 4 describes the dependent and independent variables, as well as the control variables used in the subsequent estimations of the regression models. In terms of control variables, we use three different indicators: the first two (AUM and Ms) are size-type control variables that describe the dimension of pension plans in terms of assets under management and number of members. The third variable (D_FUND) is a dummy variable that defines the different types of pension plans analysed (pension funds or other categories).

TABLE 5 | Moderator variable: *Corporate Social Identity*.

CSI	Discrete variable that describes the pension plan's Corporate Social Identity level. The variable is built as an indicator (sum of ESG_BOARD, ESG_SYSTEM, ESG_REM). It can take a value from 0 to 3.
ESG_BOARD	Dummy variable: 1 = if within the board there are specific ESG-related responsibilities, 0 = otherwise <i>Question source: Have specific ESG-related responsibilities been assigned within the board?</i>
ESG_SYSTEM	Dummy variable: 1 = if there are other systems (out of the board) in place to oversee ESG issues, 0 = otherwise <i>Question source: Are there other ESG-related responsibilities outside the board?</i>
ESG_REM	Dummy variable that describes if, in the pension plan remuneration policy, a sustainability indicator to assess the achievement of ESG goals is used: 1 = if there is an ESG policy remuneration, 0 = otherwise <i>Question source: Do you use specific indicators to assess the achievement of set sustainability goals within the remuneration policy?</i>

Note: This table describes the moderator variable (CSI) used in the study.

To explore the moderating role of sustainability-related governance practices, we construct an additional variable: CSI. This composite indicator captures the degree to which a pension plan is committed to sustainability-oriented governance and is based on three dichotomous components: (1) the presence of ESG-related responsibilities within the board (ESG_BOARD); (2) the presence of internal systems or procedures to manage ESG issues (ESG_SYSTEM); (3) the inclusion of ESG goals in executive remuneration policies (ESG_REM). Table 5 describes the moderator variable CSI in detail and includes information on the variables from which it is derived.

Table A1 shows the descriptive statistics (mean, standard deviation, minimum, and maximum) for each variable used in the study, and Table A2 shows the correlation analysis between them. Correlation between variables is acceptable and not likely to affect subsequent analyses.

From a methodological point of view, models using logistic and Tobit regressions are predominantly adopted to study the associations between variables. In particular, we use the logistic regression when the dependent variable is ESG_INVEST. On the other hand, we use Tobit regression in the case of ESG_RATE_COV and ESG_STRATEGY, which are discrete variables and accept a limited number of values. The model's estimations are based on the following equations:

$$\begin{aligned} \text{ESG_INVEST}_i = & \beta_0 + \beta_1 \text{AUM} + \beta_2 \text{Ms} \\ & + \beta_3 \text{D_FUND} + \beta_4 \text{SIZE} + \beta_5 \text{COMM} \\ & + \beta_6 \text{WOMEN} + \beta_7 \text{NATIONALITY} + \beta_8 \text{AGE} \\ & + \beta_9 \text{EDU_DIV} + \beta_{10} \text{TOTALTIES} + u_i \end{aligned} \quad (1)$$

$$\begin{aligned} \text{ESG_RATE_COV}_i = & \beta_0 + \beta_1 \text{AUM} + \beta_2 \text{Ms} \\ & + \beta_3 \text{D_FUND} + \beta_4 \text{SIZE} + \beta_5 \text{COMM} \\ & + \beta_6 \text{WOMEN} + \beta_7 \text{NATIONALITY} + \beta_8 \text{AGE} \\ & + \beta_9 \text{EDU_DIV} + \beta_{10} \text{TOTALTIES} + u_i \end{aligned} \quad (2)$$

$$\begin{aligned} \text{ESG_STRATEGY}_i = & \beta_0 + \beta_1 \text{AUM} + \beta_2 \text{Ms} \\ & + \beta_3 \text{D_FUND} + \beta_4 \text{SIZE} + \beta_5 \text{COMM} \\ & + \beta_6 \text{WOMEN} + \beta_7 \text{NATIONALITY} \\ & + \beta_8 \text{AGE} + \beta_9 \text{EDU_DIV} \\ & + \beta_{10} \text{TOTALTIES} + u_i \end{aligned} \quad (3)$$

To further explore the relationship between board characteristics and sustainable investment policies, we test interaction effects by introducing CSI as a moderator. Specifically, each board feature is interacted with CSI in extended models. In the baseline model of the study, we choose to use the dataset as cross-sectional due to the low variability of certain independent variables over the period considered, while reserving the panel data approach for subsequent robustness tests (Section 4.1).

4 | Empirical Results

In this section, we report our main results about the impact of the board of directors' structure and composition on the pension plans' sustainable investment decisions. The aim is to understand the relationship between board characteristics and the sustainability investment choices implemented by the pension schemes in the sample. In this context, three different models were estimated, one for each dimension of sustainable investment choices (ESG_INVEST, ESG_RATE_COV, ESG_STRATEGY). Table 6 summarizes the hypotheses and empirical results. In Table 7, each column contains the results of one model, proposing the coefficients and the standard errors (in parentheses).

The first results show that only a few board characteristics directly influence sustainable investment decisions. Particularly, H3, H5, and H7 are supported consistently with our theoretical framework and in harmony with the existing literature (see Table 6).

The variable with the most significant influence is the presence of women on the boards (WOMEN). According to these findings, WOMEN seems to positively influence all investigated investment policy dimensions: the choice of integrating ESG

TABLE 6 | Summary of hypotheses and empirical results.

Hypothesis	Description	Expected relationship	Empirical support
H1	Board size	Positive	Supported with CSI
H2	Board committees	Positive	Supported with CSI
H3	Gender diversity	Positive	Supported
H4	Nationality diversity	Positive	Not supported
H5	Average age	Negative	Supported
H6	Educational diversity	Positive	Supported with CSI
H7	External ties	Positive	Supported
H8	CSI moderation	Amplifying effect	Strongly supported

TABLE 7 | Impact of the board of directors' structure and composition on the pension plans' sustainable investment decisions.

Variables	(1)	(2)	(3)
	ESG_INVEST	ESG_RATE_COV	ESG_STRATEGY
SIZE	0.00029 (0.07247)	0.07556 (1.14408)	−0.33958 (0.63097)
WOMEN	4.01301* (2.28017)	765,286* (29.57949)	77.74968*** (16.31335)
NATIONALITY	−1.92943 (2.62465)	1,669,118 (41.57234)	−28.86633 (22.92752)
AGE	−0.03143 (0.06169)	0.78635 (0.96244)	−0.908823* (0.53079)
COMM	−0.4918144 (0.56090)	2.309073 (8.67497)	7.91508 (4.78432)
TOTALTIES	−0.43778* (0.25284)	−4.81940 (3.59467)	−1.86565 (1.98249)
EDU_DIV	−1.00748 (1.36054)	−18.33945 (20.88996)	−6.67845 (11.521)
AUM	−0.00005 (0.00009)	0.00026 (0.00119)	0.00079 (0.00065)
Ms	3.46e-06 (4.28e-06)	0.00003 (0.999277)	0.00002 (0.0000153)
D_funds	−0.66427 (0.69567)	4.93662 (9.90186)	−1.95372 (5.46097)
_cons	4.41195 (3.97764)	1,191,883 (60.12726)	74.14064 (33.16072)
	Number of obs = 98	Number of obs = 98	Number of obs = 98
	LR chi ² (10) = 9.54	LR chi ² (10) = 11.24	LR chi ² (11) = 35.32
	Prob > chi ² = 0.4818	Prob > chi ² = 0.3394	Prob > chi ² = 0.0001
	Pseudo R ² = 0.0937	Pseudo R ² = 0.0111	Pseudo R ² = 0.0385

Note: This table reports the estimated three models' results, where the dependent variable is ESG_INVEST, ESG_RATE_COV, and ESG_STRATEGY, respectively. Model (1) is a logit regression, and Models (2) and (3) are Tobit regressions. Standard errors are in parentheses. One, two, or three asterisks represent the significance of the coefficients, with a probability level of 10%, 5%, and 1%, respectively: *** $p < 0.01$, * $p < 0.1$.

factors into the investment policy, the coverage rate of sustainable investments and the range of strategies that pension plans implement. The significance is highest for the latter aspect (ESG_STRATEGY) and lowest for the other two (ESG_INVEST and ESG_RATE_COV). Considering the overall structure of the boards, gender diversity has the most significant potential to influence investment decisions, encouraging a shift towards more sustainable choices. All this is consistent with the existing literature (e.g., Eagly et al. 2003; Bear et al. 2010; Nadeem et al. 2019). The ESG_STRATEGY is also influenced (with a $p < 0.1$) by the AGE variable consistently with most studies on this topic (e.g., Diamantopoulos et al. 2003; Klineberg et al. 1998; Mohai and Twight 1987). Finally, the determination to incorporate or exclude ESG factors from the investment policy hinges also on the connections that board members maintain with the external environment ($p < 0.1$) (Wang et al. 2006).

To delve deeper into the relationship between board characteristics and sustainable investment policies, we conducted supplementary regression analyses, introducing a moderation factor. Essentially, we address whether or not the presence of sustainability-oriented governance practices favors the previous relationships. The variable CSI, used as a moderator variable, describes the orientation of pension plan governance towards ESG criteria. CSI is calculated as a general indicator of the three dimensions previously described in Table 5 (ESG_BOARD, ESG_SYSTEM, ESG_REM). It can take a value from 0 to 3. As the value rises, pension plans increasingly adopt sustainable governance practices.

Before using the variable as a moderator, we introduced it as an additional independent variable in the previous models. Table 8 shows the estimation results. Note that CSI is significant in all estimates with a p value < 0.01 . In line with the existing literature (Aoki 2002; Cassiman and Veugelers 2006; Aguilera et al. 2008; Hoskisson et al. 2009; Allegrini and Greco 2013), this result indicates that a governance structure focused on sustainability increases the likelihood of a pension plan incorporating ESG factors into its investment policy, affects the extent of ESG investment coverage, and the variety of sustainability strategies the pension plans apply to the main financial assets.

Considering this finding, to enhance comprehension of the relationship between board characteristics and sustainable investment policies, we employed CSI as a moderator of the set of variables that describe the features and composition of the boards. More specifically, we moderate each independent variable that characterizes the board for the CSI variable. Tables 9–11 show the models' results with the moderation factor's introduction.

In particular, Table 9 shows the results of the first regression model with ESG_INVEST as a dependent variable. The introduction of moderation extends the set of independent variables that are statistically significant in explaining the explored relationships. In particular, with the introduction of moderation, in addition to the WOMEN, SIZE, AGE, TOTALTIES, and EDU_DIV variables are also significant, with consistently high levels of significance ($p < 0.01$), to explain the relationship between the characteristics of the boards and the choice to integrate ESG factors into investment policies. By testing the moderation effect, results show that when moderated by a governance structure

committed to sustainability criteria, specific board characteristics positively influence the decision to integrate ESG factors into investment policies.

The effects of governance practices oriented towards sustainability are also affirmed for the other two dimensions that proxy the sustainability of investment policies (ESG_RATE_COV and ESG_STRATEGY, respectively). Again, the coverage rate of sustainable investments is affected by the presence of women on the board and by SIZE, AGE, COMM, TOTALTIES, and EDU_DIV variables when CSI moderates these variables. With the moderation of CSI, most independent variables have a high significance. The same can be said for the range of ESG strategies implemented by pension plans, which is also significantly influenced by different board features when moderated by a sustainability-oriented CSI (see results in Table 10). Additional evidence supporting this relationship is reported in Table 11.

4.1 | Robustness Check

A key challenge in governance-related empirical analysis is the issue of endogeneity. Concerning our study, it is possible that governance practices do not causally explain the sustainability of investment choices but that a third variable causes both. However, it is important to note that in our sample, the board composition is generally stable for at least three consecutive years, and therefore the board-related variables used in the analysis precede the available data on sustainability outcomes by construction. This temporal separation helps mitigate reverse causality concerns.

To further address potential endogeneity, as a robustness check, we re-estimated all regressions by lagging at $t-1$ for all the independent variables used for the analyses. Using a one-year lag on independent variables is justified in our analysis for several reasons. First, it helps address potential endogeneity issues by introducing a temporal gap between the cause (independent variable) and effect (dependent variable), thereby reducing the likelihood of simultaneous influence. Second, the lag enables a more realistic portrayal of the causal relationship between variables, as many real-world economic processes involve time delays before the full impact of a change becomes apparent.

The results of the previous models re-estimated with the independent variables anticipated in the previous period are presented in Table 12. Additional evidence supporting the robustness of the baseline analysis and the significance of the previously highlighted relationships is provided in Table 13.

In addition to the lag approach, to address endogeneity and considering the characteristics of the data, which exhibit low or no temporal variability (thereby preventing the use of alternative models such as the generalized method of moments—GMM), we employ a panel data approach and compare fixed effects (FE) and random effects (RE) models. The results (Table 14) from both models are consistent. However, we adopt the FE model, as the Hausman test identifies it as the preferred specification ($\text{Prob} > \chi^2$ is below 0.05 in all three cases). Furthermore, the autocorrelation and multicollinearity tests provide additional support for the validity of the model. The robustness checks further substantiate the

TABLE 8 | Impact of the board of directors structure and composition on the pension plans' sustainable investment decisions with CSI as the independent variable.

Variables	(1)	(2)	(3)
	ESG_INVEST	ESG_RATE_COV	ESG_STRATEGY
CSI	4.90346*** (1.730931)	25.23921*** (5.904379)	13.07833*** (3.291714)
SIZE	−0.0707755 (0.086014)	−0.1358342 (1.050358)	−0.3525585 (0.5855784)
WOMEN	1.341124 (2.598389)	28.30622 (29.40588)	52.76204*** (16.39389)
NATIONALITY	−2.173013 (2.830787)	35.4215 (38.41687)	−19.16075 (21.41755)
AGE	−0.0656944 (0.0765753)	0.5152638 (0.8858576)	−1.049291** (0.493869)
COMM	−1.211435* (0.6634059)	−7.513293 (8.289053)	2.825374 (4.621178)
TOTALTIES	−0.5375056* (0.291415)	−4.874367 (3.300168)	−1.894132 (1.839856)
EDU_DIV	−3.621926* (1.891991)	−13.26206 (19.21512)	−4.047479 (10.7125)
AUM	−7.26e-06 (0.0000978)	0.000865 (0.0011)	0.001099 (0.0006132)
Ms	3.05e-06 (4.39e-06)	4.24e-06 (0.000026)	5.92e-06 (0.0000145)
D_funds	−0.8569659 (0.7756276)	9.770842 (9.160643)	0.5512555 (5.107093)
_cons	8.383829 (5.155926)	17.8038 (55.21799)	77.19008 (30.78424)
	Number of obs = 98	Number of obs = 98	Number of obs = 98
	LR chi2(11) = 20.88	LR chi2(11) = 27.99	LR chi2(11) = 49.96
	Prob > chi2 = 0.0347	Prob > chi2 = 0.0032	Prob > chi2 = 0.0000
	Pseudo R2 = 0.2050	Pseudo R2 = 0.02777	Pseudo R2 = 0.0545

Note: This table reports the results of the three previously estimated models (see previous table), where the dependent variables are ESG_INVEST, ESG_RATE_COV, and ESG_STRATEGY, and the CSI variable is inserted among the independent variables. Model (1) is a logit regression, and Models (2) and (3) are Tobit regressions. Standard errors in parentheses.

*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.1$.

relationship between the variables identified in the baseline model of the study, thereby reinforcing the strength of our conclusions.

Finally, to further address concerns about endogeneity and reinforce causal inference, we implement a Propensity Score Matching (PSM) approach. We define the treatment group as those pension plans with a high level of CSI (≥ 2), while the control group includes those with lower CSI scores.

While CSI is treated as an independent and moderating variable in our main regression models, we acknowledge that non-random factors may influence its adoption. To address potential selection bias, we complement the baseline analysis with a Propensity Score Matching (PSM) approach. This allows us to estimate the average treatment effect of high CSI ($\text{CSI} \geq 2$) on ESG outcomes, comparing matched pension plans with similar observable characteristics. Unlike the regression analysis,

TABLE 9 | Impact of the board of directors structure and composition on the pension plans' sustainable investment decisions with the moderation of CSI (ESG_INVEST as dependent variable).

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SIZE	−0.0778969 (0.0847692)	0.0090063 (0.0803227)	−0.0145983 (0.0765206)	−0.0140763 (0.0837972)	−0.0235305 (0.0769272)	−0.0151892 (0.0801116)	−0.0707755 (0.086014)
SIZE^	0.1377626*** (0.0452089)						
WOMEN	1.999224 (2.57288)	−1.139487 (3.060851)	4.655169 (2.455054)	1.356843 (2.729138)	3.313638 (2.365712)	1.320838 (2.598787)	1.341124 (2.598389)
WOMEN^	5.424198*** (2.383682)						
NATIONALITY	−1.568932 (2.904063)	−0.279556 (2.835465)	−4.8465 (3.106386)	−1.122797 (3.054378)	−1.906436 (2.695781)	−0.516858 (2.879662)	−2.173013 (2.830787)
NATIONALITY^			8.729913 (7.056979)				
AGE	−0.0643721 (0.0723681)	−0.0499985 (0.0675652)	−0.0449985 (0.0651033)	−0.0798703 (0.0753498)	−0.0459089 (0.0626374)	−0.0757332 (0.0722734)	−0.0656944 (0.0765753)
AGE^				0.0288149*** (0.0093095)			
COMM	−1.115024* (0.6451163)	−0.8988855 (0.6058012)	−0.7727845 (0.5913637)	−1.172701* (0.6528754)	−1.163524* (0.70410289)	−1.083875* (0.633125)	−1.211435* (0.6634059)
COMM^					0.0721067 (0.0492826)		
TOTALTIES	−0.5371033* (0.2858425)	−0.5223285* (0.2729666)	−0.3474186 (0.2606393)	−0.5460395* (0.2954334)	−0.4822541* (0.2585396)	−0.8550467*** (0.3103495)	−0.5375056* (0.291415)
TOTALTIES^						0.5226995*** (0.1789195)	
EDU_DIV	−1.689611 (1.605072)	−1.535484 (1.528397)	−1.227572 (1.395899)	−1.318782 (1.595219)	−1.303279 (1.424034)	−1.265527 (1.535174)	−3.621926* (1.891991)

(Continues)

TABLE 9 | (Continued)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
EDU_DIV ^a							4.903461*** (1.730931)
AUM	4.45e-06 (0.0000976)	-0.0000188 (0.000094)	-0.0000184 (0.0000915)	-4.78e-06 (0.0000975)	-0.0000341 (0.000092)	-0.0000177 (0.0000991)	-7.26e-06 (0.0000978)
Ms	2.50e-06 (4.51e-06)	2.72e-06 (4.17e-06)	2.58e-06 (3.79e-06)	2.38e-06 (4.49e-06)	3.09e-06 (4.11e-06)	3.63e-06 (4.60e-06)	3.05e-06 (4.39e-06)
D_funds	-0.518476 (0.7655063)	-0.7732495 (0.7698747)	-0.8113502 (0.754542)	-0.608821 (0.7794613)	-0.5921767 (0.7208461)	-0.5623045 (0.7854081)	-0.8569659 (0.7756276)
_cons	7.318335 (4.719241)	6.193741 (4.481338)	5.300605 (4.167112)	7.558099 (4.929695)	5.798024 (4.144152)	8.097712* (4.829775)	8.383829 (5.155926)
	Number of obs = 98 LR chi ² (10) = 21.81 Prob > chi ² = 0.0259 Pseudo R ² = 0.2141	Number of obs = 98 LR chi ² (11) = 15.97 Prob > chi ² = 0.1424 Pseudo R ² = 0.1568	Number of obs = 98 LR chi ² (11) = 12.81 Prob > chi ² = 0.3056 Pseudo R ² = 0.1258	Number of obs = 98 LR chi ² (11) = 22.65 Prob > chi ² = 0.0198 Pseudo R ² = 0.2224	Number of obs = 98 LR chi ² (11) = 11.94 Prob > chi ² = 0.3680 Pseudo R ² = 0.1173	Number of obs = 98 LR chi ² (11) = 20.11 Prob > chi ² = 0.0438 Pseudo R ² = 0.1975	Number of obs = 98 LR chi ² (11) = 20.88 Prob > chi ² = 0.0347 Pseudo R ² = 0.2050

Note: This table shows the logit regression results with the dependent variable ESG_INVEST estimated by moderating for CSI. CSI moderates one of the seven independent and descriptive board variables simultaneously. The moderated variable is indicated by ^a. Standard errors in parentheses.

***p < 0.01.

*p < 0.1.

TABLE 10 | Impact of the board of directors structure and composition on the pension plans' sustainable investment decisions with the moderation of CSI (ESG_RATE_COV as dependent variable).

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SIZE	-1.655763 (1.158232)	0.0870085 (1.109169)	-0.2414872 (1.141738)	-0.1502193 (1.055973)	-0.6999235 (1.159172)	-0.2269134 (1.08252)	-0.7588485 (1.098425)
SIZE [^]	1.838336*** (0.5116773)						
WOMEN	42.68475 (29.35733)	-14.54695 (45.22942)	80.32528*** (29.55625)	31.3073 (29.41574)	64.50043** (29.60505)	37.22123 (30.26653)	30.18518 (31.10316)
WOMEN [^]		64.00546*** (24.6192)					
NATIONALITY	24.83068 (39.14396)	49.70439 (42.16632)	-17.87498 (50.82567)	31.7034 (38.54114)	20.09696 (40.78044)	45.42548 (40.21305)	22.95094 (39.35311)
NATIONALITY [^]			60.44652 (51.83539)				
AGE	0.5347917 (0.9074078)	0.7284044 (0.9311417)	0.7016777 (0.958586)	31.7034 (0.9028689)	0.7215575 (0.9438416)	0.3655297 (0.9185697)	0.4390429 (0.915763)
AGE [^]				0.404668*** (0.098016)			
COMM	-6.347637 (8.503069)	-2.594345 (8.599817)	0.1080156 (8.819739)	-6.952577 (8.3149)	-12.89944 (11.39415)	-5.835876 (8.546363)	-5.254119 (8.498092)
COMM [^]					1.372265** (0.6844232)		
TOTALTIES	-5.19485 (3.380632)	-5.699652 (3.493217)	-3.873315 (3.661011)	-5.112138 (3.318459)	-5.575705 (3.543269)	-11.39156 (3.910192)	-4.903505 (3.399153)
TOTALTIES [^]						7.528416*** (2.213106)	
EDU_DIV	-21.60043 (19.6577)	-20.06837 (20.21576)	-18.37782 (20.74655)	-14.35939 (19.3045)	-21.50467 (20.53502)	-16.35392 (19.76472)	-59.68743 (23.18466)

(Continues)

TABLE 10 | (Continued)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
EDU_DIV ^a							61.67508*** (18.1056)
AUM	0.0011243 (0.0011425)	0.0006045 (0.0011568)	0.0003987 (0.001186)	0.0009113 (0.0011079)	0.0004676 (0.0011691)	0.0009114 (0.0011399)	0.0006929 (0.0011307)
Ms	9.60e-06 (0.0000265)	0.0000147 (0.0000272)	0.0000241 (0.0000276)	5.49e-06 (0.0000261)	0.0000246 (0.00002729)	0.0000122 (0.0000265)	0.0000124 (0.0000265)
D_funds	10.19654 (9.422269)	8.18614 (9.658321)	4.554012 (9.839343)	9.755937 (9.213182)	7.189304 (9.769636)	11.0713 (9.536478)	5.230359 (9.363451)
_cons	36.3734 (56.9285)	20.23718 (58.24317)	15.98428 (59.81607)	42.24629 (55.97857)	25.20985 (59.30239)	44.81352 (57.68003)	50.95847 (57.99902)
	Number of obs = 98 LR chi ² (10) = 23.36 Prob > chi ² = 0.0157 Pseudo R ² = 0.0231	Number of obs = 98 LR chi ² (11) = 17.77 Prob > chi ² = 0.0870 Pseudo R ² = 0.0176	Number of obs = 98 LR chi ² (11) = 12.59 Prob > chi ² = 0.3212 Pseudo R ² = 0.125	Number of obs = 98 LR chi ² (11) = 26.95 Prob > chi ² = 0.0047 Pseudo R ² = 0.0267	Number of obs = 98 LR chi ² (11) = 15.18 Prob > chi ² = 0.1746 Pseudo R ² = 0.0150	Number of obs = 98 LR chi ² (11) = 22.17 Prob > chi ² = 0.0231 Pseudo R ² = 0.0220	Number of obs = 98 LR chi ² (11) = 22.20 Prob > chi ² = 0.0228 Pseudo R ² = 0.0220

Note: This table shows the results of the Tobit regression with the dependent variable ESG_RATE_COV estimated by moderating for CSI. CSI moderates one of the seven independent and descriptive board variables simultaneously. The moderated variable is indicated by ^a. Standard errors in parentheses.
***p < 0.01.
**p < 0.05.

TABLE 11 | Impact of the board of directors structure and composition on the pension plans' sustainable investment decisions with the moderation of CSI (ESG_ STRATEGY as dependent variable).

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SIZE	-1.230483* (0.6348408)	-0.2016325 (0.5989449)	-0.4370119 (0.6260549)	-0.35969 (0.5896706)	-0.7864348 (0.6274956)	-0.4041187 (0.5964727)	-0.7556546 (0.5929152)
SIZE^	1.060069*** (0.2804565)						
WOMEN	58.23376 (16.09111)	14.23202 (24.42363)	80.58001*** (16.20673)	54.68706*** (16.42617)	68.62638*** (16.02613)	55.90393*** (16.67698)	47.99576*** (16.78906)
WOMEN^	44.63851*** (13.29423)						
NATIONALITY	-24.17273 (21.45528)	-5.842356 (22.76957)	-54.63453 (27.86949)	-21.21018 (21.52193)	-26.28307 (22.07572)	-12.89675 (22.15755)	-24.84737 (21.24228)
NATIONALITY^			45.06136 (28.42316)				
AGE	-1.053881* (0.4973612)	-0.9492327* (0.5028111)	-0.9719414* (0.5256262)	-1.24912* (0.5041751)	-0.957965* (0.5109308)	-1.142699** (0.5061355)	-1.131803** (0.4943165)
AGE^				0.2063785*** (0.0547335)			
COMM	2.923224 (4.660635)	4.495352 (4.643852)	6.274247 (4.836171)	3.191689 (4.643161)	-3.620489 (6.168008)	3.388385 (4.709079)	3.059275 (4.587155)
COMM^					1.040855*** (0.37049959)		
TOTALTIES	-2.082151 (1.852965)	-2.479553 (1.886317)	-1.160367 (2.00746)	-2.014944 (1.853076)	-2.439303 (1.918082)	-5.518242** (2.154531)	-1.919648 (1.834817)
TOTALTIES^						4.184047*** (1.21943)	
EDU_DIV	-8.558886 (10.77463)	-7.884232 (10.91639)	-6.707057 (11.37606)	-4.648644 (10.77991)	-9.079252 (11.11625)	-5.574964 (10.89044)	-33.22514*** (12.51476)

(Continues)

TABLE 11 | (Continued)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
EDU_DIV ^a							39.59732*** (9.773155)
AUM	0.0012839* (0.0006262)	0.0010257 (0.0006247)	0.0008888 (0.0006503)	0.0011177* (0.0006187)	0.0009429 (0.0006329)	0.0011475* (0.0006281)	0.0010634* (0.0006103)
Ms	7.74e-06 (0.0000145)	9.31e-06 (0.0000147)	0.0000158 (0.0000151)	6.73e-06 (0.0000146)	0.0000162 (0.0000147)	9.53e-06 (0.0000146)	8.47e-06 (0.0000143)
D_funds	1.079393 (5.16446)	0.3125529 (5.215437)	-2.238943 (5.395256)	0.5041073 (5.144775)	-0.2450705 (5.288607)	1.455737 (5.254637)	-1.765128 (5.054264)
_cons	88.24226** (31.2032)	79.942* (31.45097)	77.17133* (32.79925)	89.60748*** (31.25925)	84.2218 (32.10223)	92.42243*** (31.78192)	99.2053*** (31.30709)
	Number of obs = 98 LR chi²(10) = 48.66 Prob > chi² = 0.0000 Pseudo R² = 0.0531	Number of obs = 98 LR chi²(11) = 45.99 Prob > chi² = 0.0000 Pseudo R² = 0.0502	Number of obs = 98 LR chi²(11) = 37.80 Prob > chi² = 0.0001 Pseudo R² = 0.0412	Number of obs = 98 LR chi²(11) = 48.60 Prob > chi² = 0.0000 Pseudo R² = 0.0530	Number of obs = 98 LR chi²(11) = 42.91 Prob > chi² = 0.0000 Pseudo R² = 0.0468	Number of obs = 98 LR chi²(11) = 46.44 Prob > chi² = 0.0000 Pseudo R² = 0.0507	Number of obs = 98 LR chi²(11) = 50.50 Prob > chi² = 0.0000 Pseudo R² = 0.0551

Note: This table shows the results of the Tobit regression with the dependent variable ESG_STRATEGY estimated by moderating for CSI. CSI moderates one of the seven independent and descriptive board variables simultaneously. The moderated variable is indicated by ^. Standard errors in parentheses.
 ***p < 0.01.
 **p < 0.05.
 *p < 0.1.

TABLE 12 | Models estimates (Table 8)—robustness checks.

Variables	(1)	(2)	(3)
	ESG_INVEST	ESG_RATE_COV	ESG_STRATEGY
SIZE _{t-1}	0.0340825 (0.0899772)	−0.0103621 (0.0478951)	−0.0886795 (0.5848381)
WOMEN _{t-1}	3.544808 (2.316004)	2.998704* (1.185441)	54.8894*** (15.12063)
NATIONALITY _{t-1}	0.8362687 (2.790547)	1.217911 (1.634983)	−4.826227 (21.25122)
AGE _{t-1}	0.0693757 (0.0715233)	0.0552537 (0.0387014)	−0.5446581 (0.4919867)
COMM _{t-1}	0.077272 (0.6460645)	0.2656701 (0.3489425)	7.43884* (4.434526)
TOTALTIES _{t-1}	−0.5752399* (0.32782)	−0.1746903 (0.1585334)	−0.6933413 (1.837545)
EDU_DIV _{t-1}	1.827742 (1.885334)	−0.0980755 (1.002701)	4.189029 (10.67867)
AUM _{t-1}	0.0000669 (0.0002032)	0.0000495 (0.0000478)	0.0007708 (0.0006074)
Ms _{t-1}	7.78e-06 (6.87e-06)	1.99e-06 (1.07e-06)	0.0000144 (0.0000142)
D_funds _{t-1}	0.5160608 (0.7471517)	4.936622 (9.901864)	7.645001 (5.061698)
_cons	−3.867714 (4.546274)	1.191883 (60.12726)	37.08811 (30.73624)
	Number of obs = 89	Number of obs = 89	Number of obs = 98
	LR chi ² (10) = 11.58	LR chi ² (10) = 15.61	LR chi ² (11) = 23.57
	Prob > chi ² = 0.3142	Prob > chi ² = 0.1115	Prob > chi ² = 0.0088
	Pseudo R ² = 0.1292	Pseudo R ² = 0.0458	Pseudo R ² = 0.0265

Note: This table reports the results of the three models estimated, where the dependent variable is ESG_INVEST, ESG_RATE_COV, and ESG_STRATEGY respectively. Model (1) is a logit regression, and models (2) and (3) are Tobit regressions. Standard errors are in parentheses. One, two, or three asterisks represent the significance of the coefficients, with a probability level of 10%, 5%, and 1%, respectively: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

which explores associations and interaction effects, PSM isolates the impact of CSI by balancing covariates across groups.

Using a logistic regression model, we estimate the propensity to exhibit high CSI based on a rich set of observable characteristics, including board features (size, gender diversity, age, educational diversity, presence of committees, and external ties), fund size (AUM, number of members), and fund category (through dummy variables). We apply nearest-neighbor matching with replacement on the estimated propensity scores.

The results (Table 15) confirm a positive and statistically significant average treatment effect on the adoption of ESG strategies: pension plans with high CSI implement, on average, 29.76

percentage points more ESG strategies than comparable plans ($p < 0.001$; $t = 7.22$; standard error = 4.13). Effects on other indicators, such as ESG integration (ATT = −0.071; $p = 0.161$) and ESG coverage relative to AUM (ATT = −0.321; $p = 0.119$), are not statistically significant.

This robustness check strengthens the causal interpretation of CSI's role in shaping the depth and variety of ESG implementation, rather than its mere formal adoption.

The results suggest that CSI plays a more substantive role in shaping the strategic depth of ESG integration, rather than merely its adoption or coverage. This aligns with the theoretical lens of Upper Echelons Theory and the complementary governance perspective,

TABLE 13 | Models estimates (Table 9)—robustness checks.

Variables	(1)	(2)	(3)
	ESG_INVEST	ESG_RATE_COV	ESG_STRATEGY
CSI _{t-1}	1.433513*** (0.5220577)	0.7559071*** (0.2150073)	13.7134*** (2.520331)
SIZE _{t-1}	0.0653196 (0.0994572)	−0.0033433 (0.0449243)	0.0736131 (0.5133906)
WOMEN _{t-1}	0.7563696 (2.600956)	1.563485 (1.532232)	25.16648** (14.3328)
NATIONALITY _{t-1}	2.643145 (3.537514)	1.13596 (1.532232)	−10.10851 (18.64881)
AGE _{t-1}	0.0774807 (0.0874615)	0.0552303 (0.036265)	−0.529568 (0.4311619)
COMM _{t-1}	−0.038839 (0.7556721)	0.0970107 (0.3304345)	4.583056 (3.921483)
TOTALTIES _{t-1}	−0.5221732 (0.370984)	−0.0960557 (0.1502274)	−0.0206668 (−0.0206668)
EDU_DIV _{t-1}	2.708366 (2.139674)	0.9398031 (0.9398031)	8.426074 (9.390601)
AUM _{t-1}	0.000072 (0.0001977)	0.0000576 (0.0000449)	0.0007062 (0.0005324)
Ms _{t-1}	8.69e-06 (7.41e-06)	1.54e-06 (1.01e-06)	5.42e-06 (0.0000125)
D_funds _{t-11}	1.195093 (0.8959126)	0.442086 (0.3872275)	9.401418 (4.447554)
_cons	−6.102813 (5.593688)	−2.065172 (2.337416)	26.79189 (27.00212)
	Number of obs = 89	Number of obs = 89	Number of obs = 98
	LR chi ² (11) = 21.59	LR chi ² (11) = 27.18	LR chi ² (11) = 49.44
	Prob > chi ² = 0.0277	Prob > chi ² = 0.0043	Prob > chi ² = 0.0000
	Pseudo R ² = 0.2409	Pseudo R ² = 0.0797	Pseudo R ² = 0.0555

Note: This table reports the results of the three previously estimated models (see previous table), where the dependent variables are ESG_INVEST, ESG_RATE_COV, and ESG_STRATEGY, and the CSI variable is inserted among the independent variables. Model (1) is a logit regression, and models (2) and (3) are Tobit regressions. Standard errors in parentheses.

*** $p < 0.01$.

** $p < 0.05$.

which emphasize how internal governance identity and board-level values influence not just whether, but how, sustainability is embedded in investment choices. In line with the Italian regulatory context, where ESG compliance is increasingly widespread, only plans with a strong CSI appear to go beyond formal integration to adopt a more articulated and diversified ESG strategy.

In conclusion, the robustness checks confirm that our empirical findings are stable across alternative model specifications and estimation methods. The evidence consistently supports the

central role of board governance and CSI in shaping the sustainable investment behavior of pension plans.

5 | Discussion and Conclusion

Can a strong CSI incentivize the integration of ESG factors into pension plans' financial portfolios? The study seeks to uncover strategic choices suitable for an actual sustainable transition, pushed not only by external factors, such as regulatory

TABLE 14 | Models estimates (Table 7)—fixed effects (FE)—robustness checks.

Variables	(1)	(2)	(3)
	ESG_INVEST	ESG_RATE_COV	ESG_STRATEGY
CSI	2.459095*** (0.344354)	0.3989237*** (0.5885425)	1.465208*** (1.472767)
SIZE	−0.0004748 (0.0287039)	−0.0300801 (0.0275645)	0.0715023 (0.073858)
WOMEN	1.847548*** (0.6366091)	1.427983 (0.8609609)	3.89861** (1.736675)
NATIONALITY	−0.6409835 (1.218148)	0.4114393 (1.042495)	1.931996 (2.075661)
AGE	−0.0143035 (0.0088461)	0.0190437 (0.0115716)	−0.0168864 (0.0301084)
COMM	−0.29425 (0.1777633)	0.0964839 (0.2021378)	−0.0501097 (0.5108801)
TOTALTIES	0.0529677 (0.087823)	−0.1148872 (0.0932847)	−0.3491305 (0.2111899)
EDU_DIV	−0.6460608 (0.7154677)	−1.194973 (0.6073313)	0.6242966 (1.698141)
AUM	0.0001129* (0.0000481)	0.0000354 (0.0000454)	0.0000883 (0.0001125)
Ms	0.0000133* (4.96e-06)	1.22e-06 (3.45e-06)	3.05e-06 (3.31e-06)
D_funds	0.7455117 (0.513262)	0.6357018 (1.006204)	0.2223776 (0.27551)
_cons	1.200487 (1.399173)	0.2572051 (2.792716)	3.965757 (0.8500437)
	Number of obs = 283	Number of obs = 283	Number of obs = 283
	Number of groups = 108	Number of groups = 108	Number of groups = 108
	R ² within = 0.3053	R ² within = 0.1586	R ² within = 0.0821
	R ² between = 0.1077	R ² between = 0.0003	R ² between = 0.3487
	R ² overall = 0.1886	R ² overall = 0.0034	R ² overall = 0.2627
	F-test (p value: 0.0000)	F-test (p value: 0.0000)	F-test (p value: 0.0000)
	Rho = 30.4%	Rho = 86.9%%	Rho = 72.5%

Note: This table reports the results of the three previously estimated models (see previous table), where the dependent variables are ESG_INVEST, ESG_RATE_COV, and ESG_STRATEGY, and the CSI variable is inserted among the independent variables. We employ a panel data approach and compare fixed effects (FE). Standard errors in parentheses.

*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.1$.

requirements and investor expectations, but also internally and strategically driven.

Our paper shows that pension plans' boards of directors characterized by a high level of diversity can promote sustainable

investment choices. A governance structure attuned to the needs and perspectives of a diverse range of members, significantly those already familiar with a sustainability-oriented approach, enhances the probability that the investment policies of the pension plan will shift towards sustainable choices.

TABLE 15 | Propensity score matching estimates: effect of high CSI on ESG investments policies—robustness checks.

ESG outcome	ATT (high CSI ≥ 2)	Std. error	t-stat	p	N (matched pairs)
ESG_INVEST	−0.071	0.050	−1.41	0.161	54
ESG_RATE_COV	−0.321	0.202	−1.58	0.119	54
ESG_STRATEGY	+29.76	4.13	7.22	<0.001	54

Note: This table reports the Average Treatment Effect on the Treated (ATT) estimated via propensity score matching (PSM). The treatment group includes pension plans with high *Corporate Social Identity* (CSI ≥ 2). Matching is performed using nearest-neighbor matching (1:1) with replacement, based on a logit model including board composition variables, fund size, and institutional controls. Standard errors are calculated based on the differences between matched pairs. All ESG investments policies refer to the latest available year (2023).

This is consistent with Upper Echelons Theory, which proposes that the board of directors' characteristics (i.e., gender, education, age, connections, etc.) may be used as indicators for cognitive filters and a value basis for decision making. Upper Echelon Theory also postulates that the experience, values, and personality of directors influence the vision, perception, interpretation, strategy selection, and outcome of organisations (Hambrick and Mason 1984; Finkelstein and Hambrick 1996). Hence, directors implement their personality, experience, and values into their behavior, which affects the selection of institutions' strategy. It can be concluded that an organization reflects the characteristics of its directors (Hambrick and Mason 1984; Hambrick 2007).

Board diversity, particularly gender diversity, is crucial in this process. This finding confirms the literature according to which the presence of female directors positively impacts sustainability-related issues (Al-Jaifi 2020; Eagly et al. 2003; Galletta et al. 2022; Matuszak et al. 2019; Nadeem et al. 2019; Samara et al. 2019).

Moreover, our main findings show that a larger and more diversified board, particularly one with a high representation of younger individuals and members with external connections and a variety of educational backgrounds, tends to result in a more comprehensive incorporation of sustainability considerations into the investment choices, especially when the pension plan is characterised by a consistent CSI.

The impact of governance choices also varies according to the implementation of specific sustainability-linked governance practices, such as the presence of ESG committees and remuneration policies for top managers related to sustainability goals. CSI acts as a multiplier of corporate governance determinants in pushing pension funds' choices towards sustainability. Indeed, in the case of a strong CSI, new factors become relevant in affecting investment choices, such as boards' diversity in terms of nationality, age, education, composition, as well as the different directors' external connections.

From a theoretical standpoint, our findings confirm the central assumption of the Upper Echelons Theory (Hambrick and Mason 1984): Directors' demographic and cognitive traits significantly shape the strategic orientation of organisations, in this case, the sustainability profile of pension funds. However, our results also reveal that these effects are reinforced when boards develop a strong CSI. This complementary governance perspective adds theoretical value to the traditional Upper

Echelons framework by integrating an organisational-level dimension of governance that reflects shared identity, values, and collective purpose.

In this sense, the CSI acts as a bridging mechanism between individual and collective factors: It translates directors' personal attributes (as predicted by the Upper Echelons Theory) into cohesive and sustainability-oriented strategic behaviors. This interaction between individual- and group-level governance mechanisms extends the explanatory power of the Upper Echelons Theory and aligns with recent research highlighting the synergies among multiple governance levers (e.g., Aguilera et al. 2008; Cucari et al. 2018; Khairiddine et al. 2024).

Building on this theoretical integration, our study contributes to governance scholarship in several ways.

First, it extends the empirical domain of the Upper Echelons Theory to pension funds, a sector where it has been scarcely applied. Some previous studies related to this theory (Carpenter et al. 2004; Baker et al. 2020; Neely et al. 2020) have underlined the need for further research to understand industry-specific dynamics, given that contextual factors such as regulation may moderate the relationship between directors' attributes and organisational strategies. This call for research is particularly relevant for the financial sector, and for pension funds in particular, where governance plays a pivotal role in strategic supervision and in steering institutions towards the sustainable transition.

Second, by adopting a holistic perspective that considers a comprehensive set of board characteristics rather than isolated traits, this study strengthens the Upper Echelons framework as an integrative theoretical model for analyzing how overall board composition influences organisational outcomes (Hertrampf et al. 2025).

Third, the inclusion of CSI introduces an original contribution to the literature, as it highlights the virtuous interplay between individual attributes and collective governance mechanisms in shaping sustainability-oriented decisions. The construction of a composite indicator for CSI further advances this perspective, demonstrating its moderating role in the relationship between governance structures and investment choices. It provides empirical support for the view that specific governance mechanisms produce meaningful sustainability effects only when embedded within a broader identity-driven governance culture.

Our findings produce several relevant implications for pension fund managers and practitioners. They emphasize the need to design governance structures that explicitly support sustainability-oriented investment choices. A governance model attuned to the diverse needs, experiences, and perspectives of board members enhances the likelihood that investment policies will incorporate ESG principles. In particular, diversity—in gender, age, education, and nationality—contributes to broadening the cognitive base and strategic vision of the board, thereby fostering more innovative and responsible decision-making.

Moreover, our results highlight the importance of establishing sustainability-linked governance mechanisms, such as ESG committees and remuneration policies tied to environmental and social performance goals. These structures not only formalize sustainability priorities but also create internal incentives that align managerial actions with long-term strategic objectives. The presence of younger directors and members with multiple external connections further supports the integration of ESG considerations by injecting fresh perspectives and external accountability into decision processes.

In managerial terms, the results suggest that the effectiveness of governance mechanisms depends on the existence of a strong CSI. Pension funds whose boards share a clear, collective commitment to sustainability are better equipped to translate individual competencies and diversity into coherent strategic actions. Therefore, financial institutions aiming to accelerate their sustainable transition should invest in cultivating a shared organisational identity that embeds sustainability into their governance culture. This holistic approach enhances strategic consistency and the credibility of sustainability commitments toward stakeholders.

The results of this study also provide meaningful insights for policymakers and regulators seeking to steer institutional investment towards sustainability. Pension funds operate in a highly regulated environment, where supervisory authorities can influence not only products but also internal governance practices. Our evidence suggests that regulation focused on the governance entity, rather than solely on investment products, can effectively promote sustainable finance outcomes.

Specifically, policymakers could encourage pension funds to adopt ESG-oriented governance mechanisms, such as assigning explicit sustainability responsibilities to board members or establishing dedicated ESG committees. By fostering governance structures that strengthen CSI, regulators can indirectly enhance the sustainability performance of financial portfolios.

In this perspective, entity-focused regulation can generate a direct and significant effect on pension plans' sustainable strategies, increasing the diffusion of portfolios with higher ESG integration. Encouraging diversity in board composition and aligning remuneration with sustainability targets can further reinforce this process.

Ultimately, our findings support the idea that effective sustainability regulation should not rely solely on disclosure or compliance-based instruments but also promote the internal

cultural and governance conditions that enable financial institutions to commit genuinely to the sustainable transition.

This study's limitations open avenues for future research in the growing field of sustainable finance for pension plans. Our study focuses on Italian pension plans; future studies may replicate the investigation in other countries to verify whether national conditions affect the results. A comparative cross-country analysis applying a similar methodology would be of particular interest.

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Appendix A

TABLE A1 | Descriptive statistics for dependent, independent, control, and moderator variables.

Variable	Obs.	Mean	St. dev	Min	Max
ESG_INVEST	108	0.7722772	0.4214543	0	1
ESG_RATE_COV	108	61.63366	42.36218	0	100
ESG_STRATEGY	108	29.40594	26.10689	0	88.88889
SIZE	101	11.19192	3.93487	4	20
COMM	108	0.3663366	3.93487	0	1
WOMEN	107	0.1953104	0.1438422	0	0.6666667
NATIONALITY	101	0.035635	0.1040421	0	0.5
AGE	101	58.74878	4.641521	48	70
EDU_DIV	108	0.2890064	0.2165999	0	1
TOTALTIES	108	2.346535	1.161341	0	4
AUM	108	2489.003	4031.168	12,012,903	27,673
Ms	108	93088.62	159382.6	833	1,183,091
D_FUND	108	0.6534653	0.4782393	0	1
CSI	108	0.7227723	0.736462	0	2

TABLE A2 | Correlation between dependent, independent, control, and moderator variables.

	ESG_INVEST	ESG_RATE_COV	ESG_STRATEGY	SIZE	COMM	WOMEN	NATIONALITY	AGE	EDU_DIV	TOTALTIES	AUM	Ms	D_FUND	CSI
ESG_INVEST	1.0000													
ESG_RATE_COV	0.7330	1.0000												
ESG_STRATEGY	0.5629	0.6927	1.0000											
SIZE	-0.0607	-0.0491	-0.1283	1.0000										
COMM	-0.0663	0.0749	0.1752	-0.0155	1.0000									
WOMEN	0.1716	0.2527	0.4626	-0.1667	0.1533	1.0000								
NATIONALITY	-0.0278	0.0303	-0.0181	-0.2108	0.1573	0.0999	1.0000							
AGE	-0.0872	0.0197	-0.1943	0.1926	0.1358	-0.1699	-0.2219	1.0000						
EDU_DIV	-0.0540	-0.1121	-0.0174	-0.0302	0.0318	-0.0571	0.0196	-0.0236	1.0000					
TOTALTIES	-0.1533	-0.1154	-0.0979	0.1925	0.0075	-0.0055	0.0289	0.0811	-0.0877	1.0000				
AUM	-0.0073	-0.0013	0.1118	0.1865	0.0582	-0.1108	-0.0832	0.0392	0.2990	-0.0098	1.0000			
Ms	0.0819	0.0903	0.1522	0.0184	-0.0436	-0.0117	-0.0652	-0.0199	-0.0176	0.0639	0.4045	1.0000		
D_FUND	-0.0455	0.0389	-0.0717	0.2452	-0.0562	-0.0957	-0.1903	-0.0720	-0.3553	-0.0364	-0.1893	0.0739	1.0000	
CSI	0.3612	0.4449	0.4899	-0.0742	0.2942	0.4139	-0.0229	0.0640	-0.0757	0.0296	-0.0649	0.1348	-0.1236	1.0000