Nijmegen School of Management
Department of Economics and Business Economics
Master's Thesis Economics (MAN-MTHEC)

Green Promises or Greenwashing?

Assessing the Environmental Alignment of Dutch Pension Funds

By Lotte van Wanrooij (s1034911)

Nijmegen, 29 June 2025

Program: Master's Program in Economics
Specialisation: Economics, Behaviour & Policy
Supervisor Radboud University: dr. Jorgo Goossens
Supervisor De Nederlandsche Bank: drs. Vera de Man

Radboud Universiteit

Abstract

As climate risks increasingly affect financial markets, pension funds face a growing need to integrate environmental, social, and governance (ESG) factors into their investment strategies. Yet, the extent to which frequently stated ESG commitments translate into actual greener portfolios remains contested. Therefore, this thesis empirically assesses the “walk-your-talk” gap by drawing on a unique dataset collected through *De Nederlandsche Bank* that links stated ESG commitments to revealed portfolio-level climate metrics for 131 Dutch pensions funds. Using OLS regressions, the study finds that broad stated ESG commitments show limited association with revealed carbon metrics. In contrast, measurable indicators and board-level implementation and preparation are significantly linked to lower portfolio emissions. These findings suggest that ESG capacity without accountability may fail to produce impact, highlighting an institutional time inconsistency in sustainable investing. Addressing this gap is critical if pension funds are to align long-term sustainability goals with short-term investment practices and fulfil both fiduciary and societal responsibilities.

Table of contents

Generative AI tools (e.g., ChatGPT, Copilot) were used to assist in coding, data analysis, and/or refining the language of this thesis. Appendix B of this thesis provides a detailed account of the use of Generative AI tools during the development of this thesis. By submitting this thesis I declare that I am fully responsible for the accuracy and completeness of its content.

1 Introduction

Climate change represents one of the most pressing global challenges, presenting a systemic challenge that requires large scale capital reallocation to align with the Paris Agreement targets of limiting global warming below 2°C (United Nations, 2015). Institutional investors, particularly pension funds, play a vital role in facilitating this transition given their long-term investment horizon and size. In the Netherlands, where pension funds manage a significant share of capital, this role is particularly pronounced (Dyck et al., 2018; Chen, Dong, and Lin., 2019; Krueger et al., 2019). Given the volume of this capital, and the financial risk associated with climate change, these funds cannot afford the consequences of inadequate integration of environmental, social, and governance (ESG) factors. Empirical evidence consistently reveals an implementation gap: although most Dutch pension funds refer to ESG in policy documents, concrete actions are often lacking. This is particularly relevant for climate risk, which is increasingly acknowledged as financially material yet remains difficult to price due to its systemic and uncertain nature. Carbon metrics like Weighted Average Carbon Intensity (WACI) and carbon footprint have thus emerged as key tools for assessing revealed ESG alignment, despite challenges around data availability. Therefore adequate integration from policy to practice becomes increasingly important, facilitating the central research question of this research: to what extent do stated ESG preferences translate into revealed ESG preferences?

The Dutch institutional setting – based largely on the Prudent Person Rule (PPR) – relies primarily on principles rather than strict enforcement. The PPR requires pension funds to act in the best interest of participants. However, its open-ended nature may lead to ambiguity in how ESG factors are interpreted and integrated (Bauer, Broeders, and Van Ool, 2023). This principle-based institutional setting increases the importance of transparency and accountability for the sector. Disclosure obligations exist, but binding requirements remain limited.

This thesis investigates whether Dutch pension funds that express stronger ESG commitments also hold greener portfolios in practice. Drawing on unique data from De Nederlandsche Bank, combining pension funds' self-reported stated ESG commitments with portfolio-level climate metrics (WACI and GHG footprint), this research empirically examines the alignment – or misalignment – between intention and behavior. Specifically, it evaluates which dimensions of stated ESG commitment (e.g., policy articulation, goal-setting, governance structures) are most strongly associated with lower climate metrics and therefore, stronger integration into practice.

The relevance of this study is twofold. Academically, it enriches the "walk your talk" literature by assessing self-reported stated ESG commitment and revealed investment behavior (e.g., De Bakker et al., 2018; Van der Zwan et al., 2019; Bauer, Broeders, and Van Ool, 2023). Practically, this research contributes to the overall field to enhance transparency, credibility and accountability within the Dutch pension sector.

The findings suggests that broad stated ESG commitment show limited association with revealed carbon metrics. In contrast, measurable indicators and board-level implementation and preparation are significantly linked to lower portfolio emissions. These findings suggest that ESG capacity without accountability may fail to produce impact, highlighting an institutional time inconsistency in sustainable investing. Addressing this gap is critical if pension funds are to align long-term sustainability goals with short-term investment practices and fulfil both fiduciary and societal responsibilities.

This thesis is structured as follows: Section 2 presents the literature review and subsequent hypotheses, Section 3 describes the data, Section 4 addresses the methodology used, Section 5 presents the results, Section 6 offers a critical discussion of the findings, Section 7 concludes, and Sections 8 and 9 cover the references and appendix, respectively.

2 Literature review

Institutional investors, particularly long-term investors such as pension funds, are exposed to climate risk and have strong potential influence on environmental, social, and governance (ESG) outcomes due to their scale and investment horizons. The integration of ESG practices into investment strategies therefore becomes increasingly important. However, this integration is not as straightforward as it may seem. Studies reveal a disconnect between what investors say and what they do, otherwise referred to as the "walk your talk". While many pension funds articulate ESG commitments in their policies and disclosures, actual revealed portfolio changes or carbon reductions often lag behind. This literature review contributes to this discussion by critically assessing the extent to which *stated ESG alignment* of Dutch pension funds is reflected in their *revealed ESG alignment*, focusing on carbon-related metrics.

While traditional investment models emphasize risk-return optimization, there is growing awareness of the financial and societal implications of ESG-related risks and opportunities. ESG integration is for one viewed as a means of mitigating long-term risks – such as those related to climate change, social factors, and governance failures. The long-term investment horizon of pension funds makes them particularly sensitive to systemic risks such as climate change, while their fiduciary duties compel them to act in the best interests of their beneficiaries, which arguably increasingly includes sustainability factors.

Empirical research underlines the potential for pension funds and other institutional investors to make a positive impact. Krueger, Sautner, and Starks (2020) emphasize the growing responsibility institutional investors bear in addressing climate risks. Nguyen et al. (2017) show that corporate social responsibility (CSR) can create shareholder value when these firms are monitored by long-term investors such as pension funds. Their survey indicates that investors believe climate change to have significant financial implications with the majority of the respondents believing that these risks are already beginning to materialize.

The impact institutional investors have is dependent on the strength of social norms apparent in a country, as Dyck et al. (2018) demonstrate. They argue that institutional ownership enhances firms' ESG performance, conditional on the investors' country of origin to have strong social norms, such as the Netherlands. This further strengthens the case that the Netherlands is a particularly suitable country to study how institutional investors influence ESG outcomes.

Hong, Karolyi, and Scheinkman (2020) highlight the need for significant public and private capital to make the transition to a low-carbon economy possible. Their findings point to a central role for institutional investors in mobilizing these necessary resources. Chen, Dong, and Lin (2019) further provide evidence of the positive impact institutional investors can have in shaping companies CSR behavior through ownership and active monitoring. Their findings suggest that this influence is not only motivated by financial incentives, but also by client demand, regulatory expectations, and reputational considerations. These studies illustrate the idea that institutional investors are not purely passive capital investors, but active participants in fostering a more sustainable society. Their decisions shape capital markets and corporate behavior, underscoring the relevance of understanding how and why they incorporate ESG considerations into investment strategies. In countries like the Netherlands – where social norms are strong and institutional investors manage a significant amount of capital – these actors are particularly well positioned to influence the transition towards a sustainable economy.

2.1 Value vs. Values: ESG motivation

As touched upon previously, there are multiple motivations behind the integration of ESG consideration into the investment strategy. A critical distinction can be made between *value*-driven ESG investing, emphasizing financial performance and risk mitigation, and *values*-driven investing, which reflects ethical, social, or political preferences - even at the potential expense of returns. Value motivations are more instrumental – important in the way they affect cash flow and portfolio risk - while values motivations are intrinsic, driven by investors' or participants' social preferences or moral imperatives. This distinction is important in understanding the heterogeneity in ESG behavior among institutional investors (Starks, 2023). Degryse et al. (2023) empirically support this distinction by identifying two clusters of sustainable investors within a representative Dutch sample: socially sustainable investors and financially sustainable investors. These different motivations are not necessarily mutually exclusive. Chowdry and Waters (2019) model this dynamic in a joint financing model. Here they show how both types of investors are useful in sustaining and reaching different goals to accommodate both value and values – reasons for ESG investing. This is particularly relevant for pension funds who have to balance fiduciary duties and stakeholder expectations within a heterogeneous participant base.

An important empirical question is whether investors are willing to sacrifice return in exchange for ESG considerations. Differently framed – do they have a *willingness to pay* (WTP) for sustainable considerations? Barber, Morse, and Yasuda (2021) find robust evidence that investors – especially public pensions and mission-driven institutions – are willing to accept lower expected returns for impact funds. This willingness to pay appears to be driven by both nonpecuniary utility and regulatory pressure. Similarly, Riedl, and Smeets (2017) show that investors with strong social preferences are more likely to hold socially responsible mutual funds, despite these funds underperforming compared to conventional funds. Similar results are found in Hartzmark & Sussman (2019). Bauer, Ruof, and Smeets (2021) reinforce these findings in a study where pension participants were given a real vote on ESG strategy. A majority (67%) opted for increased engagement on sustainability, giving the fund a clear mandate to increase its engagement. This study also underscores the importance of studying real-world behavioral data rather than hypothetical choices due to the presence of a potential hypothetical gap between stated preferences and revealed behavior. However, Engler, Gutsche, and Smeets (2023) caution that financial illiteracy among investors can lead to misinterpretations of fees and inefficient ESG allocation.

Although pension participants may accept lower returns for ethical or societal reasons – a consideration relevant when adjusting asset allocation – pension funds must also recognize that ignoring ESG risks may ultimately endanger the financial performance of funds themselves. Climate risk – physical, transition, and systemic – is increasingly recognized as financially material (Krueger et al., 2020; Barnett, Brock & Hansen, 2019). This implies that ESG integration is not merely a normative choice, but a financial necessity. For long-term investors like pension funds, failing to anticipate and mitigate these risks could undermine the potential future returns for their participants. Taken together, ESG integration is driven by both ethical values and financial considerations. For pension funds, addressing these ESG risks not only aligns participants preferences, but ensures a stable and sustainable future pension system. This dual rationale –

normative and financial – forms a key foundation for understanding the degree to which stated ESG is translated into revealed behavior.

2.2 Institutional setting

To evaluate ESG investment behavior, it is important to understand the context in which it operates: the legal and institutional framework of the Dutch pension sector. The Netherlands has an elaborate and mature pension system consisting of three pillars where the second occupational pension pillar plays a central role in retirement schemes.

In the Dutch legal context, the Prudent Person Rule (PPR) is a foundational guideline for pension fund investment behavior. This principle requires all investments to be made in the best interest of the participants. Bauer, Broeders, and Van Ool (2023) indicate the potential ambiguity this opens up for pension funds, and the potential opportunities for sustainability preferences to be effectively integrated in investment strategies.

Beyond the PPR, Article 135 of the Dutch Pension Act requires funds to disclose how ESG criteria are considered in their investment policies. Thereafter, the only hard legal requirement is the prohibition on investments in cluster munition. The Dutch pension legal framework is therefore generally more principle-based towards sustainable investment, relying strongly on transparency and accountability.

This institutional setting enables pension funds to tailor their ESG integration to their own interpretation and participants' preferences, but may also lead to variability in implementation. The extent to which this flexibility supports significant ESG integration – or facilitates symbolic compliance – remains the key question in this research.

2.3 The potential gap

Given the reliance on transparency and accountability in the institutional setting of the Dutch pension sector, this nature leaves room for discretion in how pension funds integrate ESG considerations. As a result, there is growing concern about a gap between stated ESG commitments and revealed investment behavior, commonly referred to as *the implementation gap.*

As Bauer, Broeders, and Van Ool (2023) reveal in their textual analysis of pension fund disclosures, ESG is often referenced in policy documents – as required by law - but does not necessarily translate into concrete implementation. They argue that this gap is exacerbated by the reliance on external asset managers for ESG integration, increasing the gap between policy ambitions and practice.

Empirical studies further reinforce this disconnect. The VBDO benchmark report (De Bakker et al., 2018) found that while all major Dutch pension funds refer to responsible investment in their official policies, only two-thirds provide guidelines on how to implement these beliefs. Even fewer funds set concrete targets for sustainability outcomes. Similar findings emerge from policy analyses such as *Eerlijke Geldwijzer* (Van Loenen et al., 2022), which assesses the sustainability performance of the ten largest Dutch Pension funds. This study reveals wide variation in ESG implementation. While climate policy has seen notable improvements, there remains a disparity in transparency, target-setting, and risk reporting. Most funds now report on their financed CO_2 emissions, yet only a subset of funds report climate risks in line with the Task Force on Climate-Related Financial Disclosures (TCFD)[1]. The study advocates for more transparency about the CO_2 emissions in the investment portfolio and for funds to set concrete CO_2 reduction goals for the entire investment portfolio. These findings illustrate the broader dilemma of the institutional setting that enables but does not enforce. The Dutch framework, with the PPR as guiding force, grants pension funds considerable flexibility. While this also allows for innovation and alignment with participant preferences, it also increases the risk of symbolic compliance or greenwashing.

While much of the literature emphasizes the apparent gap, there is less explicit attention to the internal mechanisms that reduce the apparent gap and the internal mechanisms that drive effective implementation. However, several studies implicitly point to the role of developed governance structures in improving this ESG integration. For instance, Nguyen et al. (2017) and Chen et al., (2019) highlight the need for active monitoring and ownership engagement – functions that depend on strong internal structures that assign clear responsibility and accountability. The empirical studies suggest that the implementation gap is persistent despite

[1] The Task Force on Climate-related Disclosures (TCFD) is an international framework developed by the Financial Stability Board which has developed recommendations on the types of information that companies should disclose to support investors, lenders, and insurance underwriters in appropriately assessing and pricing a specific set of risks – risks related to climate change (TCFD, 2023).

similar regulatory frameworks; this suggests a possible variability in institutional factors – such as developed governance structures – may explain why some funds succeed in translating ESG beliefs into action, while others fall short. This suggests that even under identical regulatory conditions, funds with stronger internal governance may be better equipped to turn stated ESG commitments into tangible results. Therefore, this study includes governance aspects to assess the potential association of governance with a smaller gap.

2.4 Climate risk as a financial risk

Climate change presents an important case where the implementation gap between stated ESG commitment and revealed portfolio behavior can become apparent. Most institutional investors recognize that climate risks can materially affect financial performance (Krueger, Sautner, and Starks, 2020). However, integrating these risks effectively into investment decisions remains complex in practice.

Climate risk can, according to the TNFD (2022), be classified into three major types:

1) Physical risks – direct consequences of climate events such as floods, droughts or wildfires;
2) Transition risks – arising from policy or market shifts necessary for the transition to a more sustainable economy such as policy-, consumer demand-, or technological changes;
3) Systemic risks – relating to breakdown of the entire ecosystem where one physical or transition failure results in cascading failures of other risks.

Among climate indicators, CO_2 emissions have generally become the central metric. Among ESG indicators, CO_2 emissions are not only the most prevalent but also the most consistently measured. The metric is widely used in sustainability reporting, carbon footprint assessments and financial risk analyses. The metric can be easily connected to human activity and industrial processes and is therefore highly useful. The widespread use and centrality of CO_2 is within reason, as reports by the IPCC (2023) confirm that human-induced CO_2 is the primary source of global warming. Therefore CO_2 is the leading metric for assessing climate impact. Consequently, institutions aiming to assess or mitigate climate risks often focus on carbon emissions. This focus is also prevalent in the financial sector, where institutional investors and regulators face growing pressure to monitor, disclose, and reduce their carbon exposure of investment portfolios.

Regulatory initiatives such as the EU SFDR[2] and TNFD have accelerated this. Common indicators include CO_2 emissions, the Weighted Average Carbon Intensity (WACI) and portfolio carbon footprint. The TCFD recommends that asset owners disclose greenhouse gas (GHG) emissions and the WACI for each fund and investment strategy. Each indicator captures a different aspect of climate risk. The WACI captures the carbon emissions per unit of revenue for each company in a portfolio, weighted by portfolio allocation. It allows investors to assess the carbon efficiency of their investments across time and sectors. The portfolio carbon footprint, in contrast, captures the total emissions financed through ownership, providing a broader perspective on a portfolio's environmental impact than only intensity-based metrics. The WACI might underrepresent the impact of high-emitting but profitable firms - like sectors such as the tech sector. As Popescu et al. (2023) argue, combining WACI with more absolute measures like carbon footprint provides a more comprehensive view of portfolio alignment with climate goals.

Understanding the financial relevance of these indicators requires examining how climate risk is (mis)priced in financial markets. Kalkuhl et al. (2019) develop a theoretical model to show how stricter climate policy can trigger the emergence of stranded assets – assets that lose value as regulatory or market conditions shift. Anticipating these changes is therefore crucial for long-term investors. Yet integrating climate risk into valuation models proves difficult. Barnett, Brock, and Hansen (2019) describe climate risk as subject to *triple uncertainty*: not only uncertainty in terms of outcomes (risk), but also in terms of underlying models (ambiguity) and potential model error (misspecification). This complexity reduces investors' ability to incorporate climate-related scenarios effectively into models or allocation decisions. For long-term institutional investors such as pension funds, this indicates that even when ESG intentions are clear, the tools to act on them might be lacking or imprecise.

Empirical evidence confirms that climate risk remains underpriced. Hong, Li, and Xu (2018) show that drought risk is consistently mispriced in food-sector stocks, despite significant relevance. Bolton and Kacperczyk (2021) identify a persistent carbon premium, meaning that high-emission firms offer higher expected returns – suggesting markets either demand a risk

[2] The Sustainable Finance Disclosure Regulation (SFDR) is the EU's transparency framework requiring financial market participants to disclose how sustainability risks and objectives are considered in their investment processes. It aims to help investors make informed choices and to channel private capital towards the EU's transition to a net-zero economy, while also mitigating greenwashing (European Commission, n.d.).

premium or fail to fully price climate liabilities. Choi, Gao, and Jiang (2020) further support this inefficiency hypothesis, finding that investors tend to divest from high climate-risk stocks after extreme weather events – amplifying the stranded asset risk for long-term holders like pension funds. These mispricing patterns reinforce the need for proactive ESG integration and risk analyses. Investors must not only monitor carbon exposure but also understand how climate risk may threaten portfolio value, as evidence suggests that current market prices may not fully reflect long-term climate-related value risks.

Initiatives such as Climate Action 100+ and the Net-Zero Asset Owner Alliance bring together major institutional investors – including Dutch pension funds – to commit to aligning portfolios with net-zero targets. These initiatives rely explicitly on CO_2 metrics to measure progress and foster comparability. More importantly, they create sectoral pressure, giving pension funds both an incentive and a mandate to take measurable action on climate alignment. Yet, while many funds now refer to Paris-aligned or net-zero strategies, their practical implications often remain vague. This again underscores the need to examine the extent to which stated ESG commitments are reflected in revealed ESG behavior.

2.5 Hypotheses

Although existing empirical literature consistently identifies an implementation gap between pension funds' stated ESG commitments and their actual ESG practices (Bauer, Broeders, and Van Ool, 2023; De Bakker et al., 2018), it remains theoretically reasonable to expect a positive, albeit possibly modest, correlation between stated ESG commitment and revealed ESG outcomes. Simply put, pension funds with more extensive ESG policy are likely to exhibit greener portfolios compared to funds with less articulated ESG commitments, even though overall implementation remains incomplete or superficial. Thus, while explicitly recognizing the persistent implementation gap, this study proposes the following first hypothesis:

$H1$: $Increased\ stated\ ESG\ commitment\ will\ present\ increased\ revealed\ ESG\ commitment$

Given the expected modest size of this correlation and the presence of some form of implementation gap, further nuance is necessary to identify which specific stated ESG commitments yield stronger practical implementation. ESG strategies are not uniformly effective; therefore, understanding which particular ESG clusters translate more robustly into tangible ESG outcomes is crucial. Thereby, possibly detecting which stated ESG commitments possibly contribute to the empirically observed implementation gap between stated and revealed ESG commitments. Therefore, hypothesis two takes the form of:

$H2$: $Increased\ stated\ ESG\ commitment\ within\ specific\ ESG\ clusters$
$will\ present\ increased\ revealed\ ESG\ commitment$

Furthermore, despite similar stated commitments, the ability of pension funds to translate ESG policies into concrete outcomes may depend significantly on internal governance structures. Governance determines the accountability, oversight, and capability of pension funds to implement ESG strategies effectively. Strong governance structures, characterized by clearly defined roles, transparent decision-making processes, and effective accountability mechanisms, provide clear incentives and accountability for stakeholders, aligning their behavior more closely with the fund’s stated ESG commitments. Studies consistently underline governance as a potential moderator, highlighting that better-developed governance frameworks possibly narrow the gap between stated and revealed ESG commitments (Nguyen et al., 2017; Chen et al., 2019). Recognizing this potential moderating role, the third hypothesis incorporates governance as a key factor:

$H3$: $The\ effect\ of\ increased\ stated\ ESG\ commitment\ on\ revealed\ ESG\ commitment\ is\ stronger\ when$
$governance\ structures\ are\ more\ developed$

The visual representation of these hypotheses is depicted below.

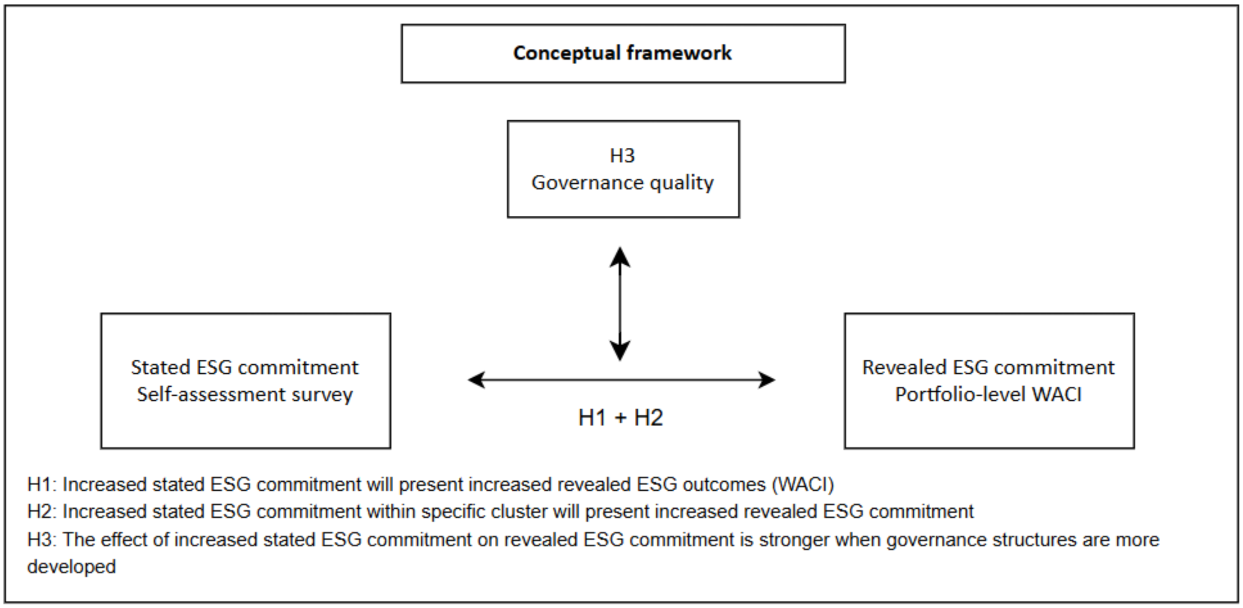

FIGURE 1: CONCEPTUAL FRAMEWORK HYPOTHESES

3 Data

3.1 Introduction data source

This research is based on a unique dataset that was constructed by combining and processing two complementary data sources made available by De Nederlandsche Bank (DNB). These data sources, while separately collected by DNB, had not previously been integrated or used in this way. The first dataset consists of survey-based information on Dutch pension funds' stated ESG commitments, capturing policy commitments, governance structures, and qualitative stances on their funds' ESG integration. The second dataset contains detailed portfolio-level investment data, which were matched to external CO_2 emissions data to derive carbon metrics – such as the WACI and GHG footprint – reflecting revealed ESG commitment. Substantial effort was devoted to cleaning, aggregating, and linking these datasets at the pension fund level. The resulting dataset provides a unique empirical foundation to examine the extent to which pension funds' ESG commitment translate into effective revealed ESG portfolio outcomes. This next section outlines the origin and structure of the underlying datasets provided by DNB and explains the steps taken to construct the relevant proxies for stated and revealed ESG commitment.

3.2 Variables and dataset description

3.2.1 Stated ESG commitment: survey based measures

To capture the stated sustainability commitment of pension funds, this study uses data from a self-assessment survey conducted by De Nederlandsche Bank in April of 2024. This survey targeted all Dutch pension funds and gathered information on their self-perceived progress and ambition regarding ESG integration. The original questionnaire consisted of 24 questions, designed and formulated independently by DNB. Therefore, no further influence was possible on the formulation of the questions. For this study, the author selected five close-ended questions ex-ante based on their direct relevance to the operationalization of ESG integration, so as to constrain the data. From these five questions, 32 variables were constructed, consisting of both binary (dummy) and ordinal measures.

These questions cover five domains:

1. Formalization of ESG instruments – asks whether a fund has policy / goals / indicators for physical climate risk, transition climate risk, biodiversity, social factors and governance factors. Thereby creating 15 binary variables.
2. Use of specific indicators – asks through which indicators a fund steers and monitors the objectives and targets. With answer options: CO_2 reduction targets aligned with Paris goals, investing in climate solutions, positive impact, negative impact, nature degradation.
3. Board level commitment – measured via Likert-scale questions on via which ways a board considers sustainability. Answer options include strategic decision-making, long-term vision communication, belief actions are needed, and preparation of action plans.
4. Expertise building – asks in what ways expertise on sustainability is increased in a fund, such as training board members, hiring experts, or allocating FTEs for sustainability.
5. Frequency of board-level ESG discussions – five-point Likert-scale indicating the number of times sustainability risks are discussed by the board.

An overview of the complete survey questions and the resulting variables is provided in the Appendix, Table A2. The original survey was administered in Dutch; all questions and answer categories have been translated and are provided in the Appendix (Table A2) to ensure transparency and replicability of the variable construction process.

3.2.2 Revealed ESG commitment: climate indicators

Line-by-line data and indicators

To assess the revealed ESG commitment level of the pension fund portfolios, this study uses line-by-line investment data provided by DNB. All Dutch pension funds are legally obligated to report information on their investment data at regular intervals. DNB has internally linked this granular investment data to a set of climate-related ESG indicators to assess the environmental risk profile of portfolios. This linkage is conducted using standardized ESG data providers and internal methodologies. These ESG metrics have been linked at the individual asset level and thereafter aggregated by the author across the assets held within a fund's portfolio. This aggregation process allows for the derivation of fund-level indicators that reflect the overall environmental climate metrics of each pension fund. This allows for comparability with the self-assessment survey.

The analysis is restricted to equities due to data availability constraints. While this represents a subset of total pension fund investments, it still accounts for a substantial share: approximately €525 billion of the total €1,652 billion in assets under management, which is about 31,8%. Of this, around €421 billion has sufficient carbon emission data coverage to be included in the analysis, representing approximately 80% of the total equity holdings. This high level of data coverage within the equity portfolio justifies its individual use, where other asset classes suffer from significant data gaps, rendering them unsuitable for portfolio-level comparison for now. ESG indicators such as emissions and carbon intensity are most consistently reported and reliably measured for equities, whereas comparable coverage for other asset classes (such as bonds or real estate) is currently limited. This restriction should be kept in mind when interpreting the results, as it thus represents a portion of the total portfolio.

Dependent variable

The core environmental link in this dataset is company-level greenhouse gas (GHG) emissions, measured in three Scopes:

- Scope 1 emissions are direct GHG emissions that occur from sources that are controlled or owned by an organization (e.g. emissions associated with fuel combustion in boilers, furnaces, vehicles).
- Scope 2 emissions are indirect GHG emissions associated with the purchase of electricity, steam or cooling.
- Scope 3 emissions are the result of activities not owned or controlled by the reporting organization. These include all sources not within an organizations' Scope 1 and 2 boundary. The Scope 3 emissions for one organization are the Scope 1 and 2 emissions of another organization, also referred to as value chain emissions, often represent the majority of an organization's total GHG emissions.

A foundational step in the construction of carbon exposure metrics is the estimation of ownership-adjusted greenhouse gas (GHG) emissions for each asset in a pension fund's portfolio. These emissions form the input for subsequent measures.

Based on the principle of proportional responsibility, each investor is considered accountable for a share of a company's emissions equal to their financial ownership. That is, if a fund owns 0.5% of a company, it is allocated 0.5% of that company's emissions. This logic allows for the calculation of absolute financed emissions using the formula;

$$Total\ GHG\ emissions\ scope\ x = \sum Issuer's\ scope\ x\ GHG\ emissions * ownership\ \% \tag{1}$$

Where:

$$ownership\ \% = \frac{Market\ value\ of\ investment}{Issuer's\ market\ cap} \tag{2}$$

This formula is applied separately to Scope 1, 2 and 3 emissions.

From this emissions data, the key dependent variable used in this study, the Weighted Average Carbon Intensity (WACI) is constructed. WACI is a portfolio measure of carbon intensity, defined as the total GHG emissions of each investee company per million € in company revenue, weighted by each asset's proportional exposure in the fund. The WACI is one of the primary measures used by DNB and is consistent with reporting standards under the Sustainable Finance Disclosure Regulation (SFDR) and the Taskforce on Nature-related Financial Disclosures (TNFD) (Beeching, 2021; TNFD, 2022). Thereafter, a secondary indicator; the GHG footprint, is included in this study for robustness checks. The complementary use of these indicators is also prevalent in academic literature (Popescu et al. 2023).

This section outlines the methodology used to derive the key environmental variables used in the analysis. These indicators are calculated from company-level GHG emissions data, covering Scopes 1,2, and 3, and are matched to pension fund equity holdings. All metrics are aggregated at the portfolio level. Total GHG emissions include not only CO_2-emissions, but also the emission of other greenhouse gases. These other greenhouse gases, such as methane and nitrogen, are converted into so-called CO_2 equivalents. The total greenhouse gas emissions unit is tCO_2, capped at 50% to avoid distortions from concentrated holdings, and negative values are excluded.

Two metrics are derived from this base data:

1. Weighted Average Carbon Intensity (WACI) – main dependent variable
2. GHG footprint – used for robustness checks

1. Weighted Average Carbon Intensity

The WACI is the primary variable used to capture the carbon intensity of equity portfolios, consistent with methodologies of the SFDR and TNFD (Beeching, 2021; TNFD, 2022). It answers the question: "*How carbon intensive are the companies a pension fund invests in, relative to their revenue?*". The WACI is calculated as a portfolio weighted average of each company's carbon intensity, and is defined as: "*The sum of the product of the portfolio weight of all investments and carbon efficiency of their issuers. The carbon efficiency of an issuer is calculated as their total greenhouse gas emission (GHG), defined relative by their revenue in million euros.*"

Mathematically, the WACI is calculated as the portfolio weighed average of carbon efficiency of each company in the portfolio. Carbon efficiency is defined as total greenhouse gas (GHG) emissions divided by company revenue (in millions of euros).

The relevant formula for the WACI is:

$$WACI_{scope\ x} = \sum_{i}^{n} \left(\frac{current\ value\ of\ investment_i}{current\ portfolio\ value} \right) x \left(\frac{issuer's\ GHG\ emissions_i}{issuer's\ €M\ revenue} \right) \tag{3}$$

Where:

- i indexes each asset in the portfolio (from 1 to n)
- The current value of investment is the fund's exposure to asset i
- Issuer GHG emissions represent total Scope 1, 2 or 3 GHG emissions of the company in tCO_2e
- Issuer's revenue is reported in millions of euros
- The second term is referred to as the carbon efficiency of an issuer

This formulation ensures that companies to which a fund has greater financial exposure - and which have higher carbon intensity - contribute more heavily to the portfolio's overall WACI. To compute the portfolio level WACI, asset-level WACI contributions are summed across all assets. Each asset's contribution is the product of the portfolio weight and carbon efficiency, as described above. This results in a single fund-level score, expressed in tCO_2e per 1M revenue € for an individual Scope. To arrive at a single dependent variable measuring revealed ESG commitment suitable for regression analysis, the three separate portfolio WACI scores have to be combined into a single indicator. Given the generally higher data quality and comparability of Scope 1 and 2 emissions, and the variation and uncertainty in Scope 3 estimates, a reduced weight is applied to Scope 3. The following weighting scheme is used in line with the internal methodology used by DNB:

$$Revealed\ ESG\ alignment_i = WACI_{scope1} + WACI_{scope2} + 0.1 * WACI_{scope3} \tag{4}$$

This approach reflects the view, supported by Busch et al. (2020), that Scope 1 and 2 emissions are more directly linked to a company's core operations, and are typically more reliable, while Scope 3 emissions tend to suffer from greater estimation errors and reporting gaps. Therefore, the use of a discounted weight (10%) for Scope 3 integrates these emissions while reducing the risk of distortion due to data unreliability. The resulting computed WACI score is used as the main dependent variable for revealed ESG commitment in further analyses.

2. GHG footprint (tCO_2e per 1 million € invested)

While WACI provides valuable insights into the portfolio level carbon intensity relative to revenue, it also introduces certain limitations. Specifically, WACI may be biased towards high-revenue sectors and lacks direct correspondence with the financial responsibility of the investor. To address this limitation, this study included the GHG footprint as a complementary metric in robustness checks.

The GHG footprint measures the total ownership-adjusted GHG emissions, normalized by the amount of capital invested. It answers the question: "*How many tons of CO_2 emissions are financed per 1 million € invested?*". Unlike WACI, this measure is not normalized by company revenue but by investor exposure, offering a more direct perspective on carbon responsibility. The GHG footprint is calculated using the following formula:

$$GHG\ footprint = 1{,}000{,}000 * \left(\frac{\sum GHG\ emissions\ scope\ x}{\sum Market\ value\ covered\ assets} \right) \tag{5}$$

Where:

- GHG emissions are the ownership-adjusted emissions (Scope 1, 2, or 3) of asset i

- The denominator reflects the total market value of all assets with available emissions data

This yields a metric expressed in tCO_2e per 1 million € invested. It allows for direct cross-fund comparability by controlling for fund size and focuses on the absolute climate impact per euro invested, rather than operational efficiency.

Again, as the market value of covered assets is used, the denominator may underrepresent the true portfolio size, if some large assets lack CO_2 disclosure. This view will result in a downward bias in the footprint estimate. The GHG footprint provides an important alternative lens to WACI. Its inclusion in the analysis helps to assess the robustness of results to support a more comprehensive understanding of the alignment of Dutch pension funds.

3.2.3 Control variables

To isolate the relationship between stated ESG commitment and the revealed ESG commitment of funds' portfolios, control variables are included to account for structural fund characteristics that could confound the analysis.

A key factor is fund size, which influences the portfolio composition and therefore carbon exposure. Larger funds manage more capital, which inherently increases their absolute emissions even if their portfolios are relatively carbon efficient. Failing to account for this would lead to misinterpretation of the results. As a comprehensive control for fund size and institutional scale, this study includes the i-classification, a supervisory classification developed by DNB to assess the potential impact of a financial institution on the stability and integrity of the financial system. Pension funds are annually categorized into impact classes 1,2 or 3 based on a combination of criteria:

1) size of operations, proxied for pension funds by the scale of their technical provisions;

2) national systemic relevance, indicating the potential for spillover effects in case of solvency or integrity issues; and

3) societal function, assessing how crucial and substitutable the institution's services are and the vulnerability of its beneficiaries.

The i-classification is not based on risk-taking behavior but rather on the impact of failure. Impact class 3 institutions are those where failures are considered almost unacceptable and therefore supervision is stricter as well. Including the i-classification as a control variable allows for controlling on a multidimensional scale of institutional importance. The i-classification is a classification actively used within the Dutch pension sector by DNB to assess and prioritize supervisory intensity. It reflects how critical a pension fund is considered to be for the stability and integrity of the financial system, based on its size, systemic relevance, and societal role. The i-classification is operationalized as a set of categorical dummy variables in the regression model, rather than an ordinal variable, to account for the fact that the difference in institutional importance between classes is not necessarily linear or equidistant.

In addition to the impact classification, several other control variables are included. First, the fund category is accounted for using dummies. These are '*Bedrijfstakpensioenfonds'* (industry-wide pension fund), '*Beroepspensioenfonds'* (profession pension fund), *'Ondernemingspensioenfonds'* (company-specific pension fund). Which are represented in the regressions models as 1, 2, and 3, respectively. These categories reflect possible differences in governance structure, stakeholders, and policies, which could possibly influence ESG integration. Second, the average age of the board is included as a continuous control variable. Age can act as a proxy for generational differences in ESG awareness, willingness to adopt innovation, or risk preferences at the governance level. Including board-age helps control for demographic factors that could influence the translation of stated ESG into revealed ESG commitment. Third and fourth, the number of participants and market value of assets are added as different proxies for the size of a fund. These are included to capture scale effects, as larger funds may face different ESG pressures and exhibit different carbon exposure patterns.

For these five control variables, Variance Inflation Factors (VIFs) were calculated to assess potential multicollinearity. The VIFs remain well below conventional thresholds, indicating no problematic multicollinearity. Although the condition number from the regression output is relatively high, this is attributable to variable scaling (market value in millions versus board age in years), rather than instability in coefficient estimates.

Together, these controls ensure that the estimated relationship between stated and revealed ESG commitment is not spuriously driven by institutional scale, size, structural differences, or demographic effects.

3.2.4 Final sample

The two previously described datasets were merged to construct the final dataset. Excluding observations with missing values, the final sample consists of 131 Dutch pension funds. These funds represent complete matches across the self-assessment survey, carbon-related portfolio data, and relevant controls. Table 1 below presents descriptive statistics for the main variables used in the analyses. It reveals substantial variation in the extent to which funds have adopted and disclosed stated ESG commitment. This heterogeneity is valuable, as it offers meaningful variation in the explanatory variables needed to assess the relationship between stated ESG commitments and revealed ESG commitments.

The key dependent variables include the Weighted Average Carbon Intensity (WACI) and Greenhouse Gas Footprint (GHGFP), both expressed in tons of CO_2 equivalent per million euros (tCO_2e/€mn). These variables are reported separately for emission Scopes 1,2, and 3, which are indicated by the number following each variable. The total WACI score, used as the main outcome variable in regression analysis, reflect a weighted average that combines emissions across all three Scopes. Independent variables marked with (d) are dummy variables equal to 1 if the stated ESG commitment is present, 0 otherwise.

Table 1

Descriptives

	count	mean	median	std	min	25%	50%	75%	max	unique
Market value (€ bn)	131	3.8	0.48	19.12	0.006	1.99	0.48	16.42	2015.33	131
Market value coverage (€ bn)	131	3.01	0.42	13.87	0.006	1.96	0.42	15.43	1481.80	131
WACI 1	131	49.9	48.2	23.6	9.3	31.6	48.2	60.6	175.4	131
WACI 2	131	18.3	17.9	4.4	8.0	15.5	17.9	21.1	29.1	131
WACI 3	131	762.6	748.3	141.4	433.1	678.2	748.3	838.4	1239.6	131
WACI total	131	144.5	143.4	35.4	73.5	119.6	143.4	164.3	274.1	131
GHG FP 1	131	31.2	31.5	13.3	6.8	22.1	31.5	38.5	72.2	131
GHG FP 2	131	9.1	9.1	2.5	3.9	7.2	9.1	10.6	16.9	131
GHG FP 3	131	458.8	454.0	113.9	171.2	396.6	454.0	512.6	806.6	131
GHG FP total	131	86.2	88.7	24.8	29.8	68.9	88.7	98.6	162.0	131
Physical policy	131	0.51	1	0.50	0	0	1	1	1	2
Physical goals	131	0.36	0	0.48	0	0	0	1	1	2
Physical indicators	131	0.37	0	0.49	0	0	0	1	1	2

	count	mean	median	std	min	25%	50%	75%	max	unique
Transition policy	131	0.58	1	0.50	0	0	1	1	1	2
Transition goals	131	0.50	0	0.50	0	0	0	1	1	2
Transition indicators	131	0.53	1	0.50	0	0	1	1	1	2
Nature policy	131	0.25	0	0.44	0	0	0	0.5	1	2
Nature goals	131	0.12	0	0.32	0	0	0	0	1	2
Nature indicators	131	0.13	0	0.34	0	0	0	0	1	2
Social policy	131	0.68	1	0.47	0	0	1	1	1	2
Social goals	131	0.44	0	0.50	0	0	0	1	1	2
Social indicators	131	0.44	0	0.50	0	0	0	1	1	2
Governance policy	131	0.66	1	0.47	0	0	1	1	1	2
Governance goals	131	0.43	0	0.50	0	0	0	1	1	2
Governance indicators	131	0.40	0	0.49	0	0	0	1	1	2
Indicator CO_2	131	0.57	1	0.50	0	0	1	1	1	2
Indicator Climate sol	131	0.34	0	0.47	0	0	0	1	1	2
Indicator postive	131	0.39	0	0.49	0	0	0	1	1	2
Indicator negative	131	0.63	1	0.48	0	0	1	1	1	2
Indicator nature	131	0.25	0	0.44	0	0	0	0.5	1	2
Board decisions	131	3.09	3	1.00	0	3	3	4	4	5
Board long term	131	2.86	3	1.06	0	2.5	3	4	4	5
Board action	131	2.97	3	1.07	0	2	3	4	4	5
Board preperation	131	1.89	2	1.46	0	0	2	3	4	5
Expertise capacities	131	0.55	1	0.50	0	0	1	1	1	2
Expertise level	131	0.79	1	0.41	0	1	1	1	1	2
Expertise experts	131	0.95	1	0.21	0	1	1	1	1	2
Expertise fte	131	0.08	0	0.27	0	0	0	0	1	2
Topic discussed	131	1.95	2	0.89	0	1	2	2	4	5
Impact class	131	1.70	2	0.57	1	1	2	2	3	3
Category pension fund	131	1.89	3	1.40	0	0	3	3	3	4
Average board age	131	59.9	60	4.14	49	58	60	63	72	23
Number of participants	131	97175	8249	326636	451	3774	8249	49936	3074879	108

Source: DNB

Descriptives

Policy, goals, and indicators & monitoring ESG themes

The survey responses reveal moderate uptake of environmental policy instruments. 51% of funds report having a formal policy on physical climate risks, with lower shares reporting related goals (36%) and indicators (37%). Similarly, for transition climate risks, 58% report having policy, 50% have set goals, and 53% use indicators. Nature & biodiversity-related policies are far less common: only 25% report having a formal policy, with even fewer setting goals (12%) or using indicators (13%). These results suggest that biodiversity remains underrepresented in ESG integration compared to climate-related themes. In terms of monitoring and steering ESG integration, funds were asked whether they use five key indicators; CO_2 reduction aligned with Paris goals (57% yes); Investing in climate solution providers (34% yes); Positive impact investments (e.g. SDGs or EU taxonomy) (39% yes); Negative impact exclusions (63% yes); Reducing impact on nature degradation (25%). These findings suggest that while steering and monitoring of climate-related indicators seems relatively widespread, biodiversity monitoring again remains limited.

Governance, expertise increase, and frequency of board engagement

Governance

The survey included several items to assess the role of the board in ESG integration. The general question on board-level engagement with sustainability – '*To what extent does the board consider sustainability important?*' – was further unpacked into four sub-questions capturing concrete behaviors and beliefs. These include whether the board aligns decisions with sustainability goals, communicates a long-term vision, supports climate actions, and prepares implementation plans. Each of these dimensions was measured using a 5-point (ranging from 0 to 4) Likert scale and coded as separate variables. First, decision-making alignment is moderately widespread; 41% of funds report that the board aligns strategic and operational decisions with sustainability goals "to a great extent", while 38% report "to some extent".

Second, in response to the questions whether the board communicates a clear long-term vision on sustainability to all its stakeholders, 27% report doing so "to a great extent", while 48%

indicate “to some extent”. Third, belief in the need for action on climate transition is also pronounced. About 40% of boards scored the maximum of 4, and another 30% selected 3, indicating that a large majority of board express a strong belief in the need for climate-related action. Fourth, implementation readiness varies more: only 13% of boards report being prepared to a great extent to implement sustainability-related action plans, while 32% report to some extent. Strikingly, 30% report no preparedness at all (score 0). Taken together, these findings suggest that while most boards recognize the importance of sustainability and show moderate to high levels of stated alignment, the depth of actual preparation and integration varies. This behavioral heterogeneity will be central to the analysis of whether this stated ESG alignment translates into more revealed ESG alignment in investment portfolios.

Expertise increase

In addition to policy adoption and board-level alignment, the self-assessment included questions on how pension funds enhance their institutional capacity for sustainability integration. This was introduced by the general question “*In what way is expertise on sustainability increased within your institution*”, which was followed by four specific possible strategies.

The most frequently reported strategy was proactive knowledge acquisition through internal and external experts, with 95% of funds reporting “yes”. Similarly, 79% report that the board’s knowledge is regularly updated through training, seminars, or other learning mechanisms. In contrast, only 55% of pension funds report investing in capacities and skills internally, and just 8% assign additional FTE (full-time employees) to sustainability tasks.

Frequency board engagement

Board-level engagement with ESG issues was also assessed via a proxy: “*How often is the topic of sustainability risks discussed by the board?*”. Responses were measured on a five-point frequency (0 to 4) scale with answer options between 0 times to more than 7 times per year. This distribution varied considerably. Approximately 47% of funds reported discussing sustainability risks 3-4 times per year, while 29% discussed them 1-2 times. Only 7% of boards discussed the topic more than seven times per year, and a small minority (2%) reported no discussions at all. These patterns indicate that while most pension fund boards engage with ESG risks to some degree, the intensity and regularity of engagement varies widely across funds – making this a useful variable for assessing board-level prioritization of sustainability.

To sum up, the survey data illustrates significant heterogeneity in how pension funds formulate, govern, and operationalize ESG policies. This variation is useful for the analysis of whether stated ESG ambitions are reflected in actual investment decisions.

4 Method

Correlation and T-test

To explore basic relationships between variables, correlation analyses are conducted among key independent and dependent variables. These analyses also serve to screen for potential multicollinearity among the independent variables. In addition, independent sample t-tests are performed on binary variables to assess whether the presence of a stated ESG commitment is associated with a significant difference in revealed ESG commitment. For each binary survey indicator, the sample is split into two groups: funds that answered “yes” (1), and those that answered “no” (0). The t-test thus compares the average WACI of portfolios between funds that report a given stated ESG commitment and those that do not. To indicate the magnitude of these differences, Cohen’s d is calculated as a measure of effect size.

Regression analyses

To empirically assess the relationship between stated ESG commitment and revealed ESG commitment in the Dutch pension fund sector, a series of Ordinary Least Squares (OLS) regression models are employed. These models estimate the association between survey-based ESG indicators (stated) and portfolio-level climate indicators (revealed), as primarily captured by WACI.

The baseline model takes the form:

$$Revealed_i = \beta_0 + \beta_1 StatedESG_i + \beta_2 Controls_i + \varepsilon_i$$

Where

- $Revealed_i$ represents the WACI level of a portfolio i (or GHG footprint for sensitivity checks)
- $StatedESG_i$ is a vector of stated ESG policy indicators, depending on different clusters detailed below
- $Controls_i$ include the i-classification, fund category, market value, number of participants, and average board age
- ε_i is the error term

The main dependent variable is revealed ESG preferences, proxied by a weighted average of WACI Scope 1, 2, and (10% of) Scope 3. Additional robustness checks use alternative GHG footprint metrics. Survey-based indicators are grouped and aggregated into composite indices or treated as standalone predictors. To test how stated ESG commitment relates to the revealed ESG commitment, the stated ESG indicators derived from survey self-assessment responses are grouped and operationalized at multiple aggregation levels. These will be discussed below:

1. Summed total ESG score

To test Hypothesis 1 - *Increased stated ESG commitment will present increased revealed ESG outcome* - a cumulative indicator is created by summing all binary stated ESG indicators. The stated ESG survey consists of binary and Likert-scale indicators. Therefore, a simple summation of all variables would disproportionately weigh the Likert-scale items due to their broader range (0-4), which would distort the relative contribution of the binary variables. To avoid this, the Likert-scale indicators (questions 21-24 and 29 in Table A1, Appendix) are averaged before being combined with the binary indicators (questions 1-15, 16-20, and 25-28 in Table A1, Appendix). This ensures that each dimension contributes proportionally to the total score, without overstating the influence of one over the other. This approach preserves the interpretability of the cumulative indicator while accounting for differences in measurement scale.

2. Construction of ESG clusters

To test Hypothesis 2 – *Increased stated ESG commitment within specific ESG clusters will present increased revealed ESG commitment* – a series of clustered variables is constructed. Three complementary clustering approaches are employed, each serving a different analytical purpose. The first clustering follows the inherent structure of the original survey and groups questions according to how the instrument was designed. This approach is logically consistent with how the data was collected and provides a straightforward way to operationalize stated ESG dimensions as they were originally conceptualized by the survey designers.

However, relying solely on the pre-structured format risks overlooking meaningful thematic connections across different sections of the survey. To address this, a second clustering is developed based on inherent relevance. Here, variables are grouped according to shared ESG themes- such as physical or transition climate risk – regardless of where they appear in the questionnaire. This allows the analysis to move beyond the design logic of the survey and possibly obtain a deeper understanding of how stated ESG commitment is translated into revealed portfolio commitment. Third, a final set of variables is included as separate binary predictors to identify which specific ESG commitments are most strongly associated with revealed commitment. Rather than testing whether a fund broadly engages more or less in board-level ESG or has more indicators, this approach allows for assessing which types of indicators, or which forms of board involvement stand out. Thereby providing insight into the specific drivers of ESG integration.

In the analysis, each cluster is entered as a separate independent variable in a distinct regression model, with WACI (or GHGFP for sensitivity check) serving as the dependent variable. Below, the two clustering approaches are described.

Table 2

2.1 Inherent survey structure clustering

	Group	Question numbers	Aggregation
2.1a	Presence of policy, goals and indicators on ESG themes	1-15	Binary sum
2.1b	Adoption of impact and performance indicators	16-20	Binary sum
2.1c	Board commitment	21-24	Likert sum
2.1d	Investment in expertise	25-28	Binary sum
2.1e	Frequency of board engagement	29	Likert sum

To construct the five ESG clusters based on the inherent structure of the survey (Table 2) (clusters 2.1a-e) variables are again aggregated according to their measurement scale. For clusters composed of binary indicators – such as the presence of ESG policies, goals, and indicators – a simple sum is used. For the board commitment (2.1c) and frequency of board engagement (2.1e), Likert-scale items (ranging from 0-4) are summed. Because Likert-scale questions are now used independently of binary indicators, no averaging is needed.

Table 3

2.2 Thematic clusters

	Group	Question numbers	Aggregation
2.2a	Having policy (all themes)	1, 4, 7, 10, 13	Binary sum
2.2b	Having goals (all themes)	2, 5, 8, 11, 14	Binary sum
2.2c	Having indicators (all themes)	3, 6, 9, 12, 15	Binary sum
2.2d	Physical climate risk: Policy, goals, indicators	1, 2, 3	Binary sum
2.2e	Transition climate risk: Policy, goals, indicators	4, 5, 6	Binary sum

The second clustering approach (Table 3) groups variables based on thematic relevance. All variables within these clusters are binary and are summed to create composite indicators reflecting the commitment within each theme.

Table 4

2.3 Disaggregated ESG predictors

	Group	Question numbers	Aggregation
2.3a	Impact and performance indicators	16, 17, 18, 19, 20	Separate binary predictors
2.3b	Board commitment	21, 22, 23, 24	Separate Likert scale predictors
2.3c	Investment in expertise	25, 26, 27, 28	Separate binary predictors

The third clustering approach (Table 4) retains individual variables as separate predictors in order to explore which specific ESG commitment practices are most strongly associated with revealed ESG commitment. This disaggregated strategy is applied to three domains. Unlike previous clusters, where variables are aggregated to reflect broader ESG integration, this approach allows for identifying which specific practices have the strongest effect.

3. Moderating effect of governance

To test Hypothesis 3 – *The effect of increased stated ESG commitment on revealed ESG commitment is stronger when governance structures are more developed* – a subgroup analysis is performed. Pension funds are split into two groups based on a governance quality dummy, which differentiates between institutions with relatively strong and weak governance structures. A governance index is calculated by averaging responses to five survey questions that reflect the level of board-level commitment to sustainability.

These include whether:

- the board makes operational and strategic decisions aligned with sustainability goals,
- it communicates a clear long-term sustainability vision to stakeholders,
- it acknowledges the need for action in the context of the climate transition,
- it prepares the implementation of sustainability-related action plans, and
- how frequently sustainability risks are discussed at the board-level.

The first four items are measured on a Likert scale ranging from “Not at all” to “To a great extent”, while the final item uses a frequency scale (from “0x” to “more than 7x”). The internal consistency of this governance index is acceptable, with a Cronbach’s alpha of 0.78, suggesting a reliable measure of board engagement with sustainability. Based on the median value of this index, the sample of 131 pension funds is split into two subgroups:

- Low governance (index below median, n = 60)
- High governance (index above median, n = 71)

OLS regression models are then estimated separately for each subgroup: one for funds with low governance scores, and one for those with high governance scores. The models include the total stated ESG score as the main independent variable, and WACI as the dependent variable, controlling for impact class, fund category, market value, number of participants, and average board age. By comparing the strength and significance of these models, this approach assesses whether stronger governance enhances the translation of stated ESG into revealed ESG commitment.

5 Results

5.1 Correlation analysis

To explore the relationship between stated and revealed ESG commitment in the Dutch pension sector, Pearson correlations, including their significance levels, were calculated (Appendix, Table A3). The analysis includes six indicators: WACI and GHG footprint (GHGFP), each across three Scopes (indicated by the number following WACI or GHGFP). Significant negative correlations were found between several stated ESG indicators and WACI, suggesting that strongest ESG commitments are associated with lower carbon exposure – a closer alignment between policy and practice.

This relationship is strongest for Scope 1 emissions and weakest for Scope 3, likely due to lower data quality. Indicators related to climate and nature, especially those involving measurable goals or board-level practices, show the most pronounced associations. For example, board preparation and climate solution monitoring are significantly correlated with lower WACI1 and GHGFP1, as are policies on physical and transition risks. Nature-related indicators are also linked to lower Scope 1 emissions.

In contrast, having policy on governance show no meaningful correlation with WACI or GHG, likely reflecting limitations in the carbon indicators rather than the irrelevance of governance. ESG expertise shows weak, non-significant correlations, suggesting that expertise alone is insufficient without stronger integration mechanisms.

The lower statistical significance of Scope 3-based metrics supports their down-weighting in the composite total WACI and GHG Footprint measures. Overall, these results find support for Hypothesis 1: that greater stated ESG commitment, is associated with greater revealed ESG commitment.

To prepare for regression analyses, a second Pearson matrix (Appendix, Table A4) assessed multicollinearity among stated ESG variables. While a few pairs show correlations above 0.7, most remain below 0.5, suggesting limited overlap. Variables will be grouped in regression models to avoid including highly correlated indicators together.

5.2 T-test analysis

To further assess whether the presence of specific stated ESG practices is associated with significant differences in the sustainability of pension fund portfolios, a series of independent samples t-tests are conducted of which the significant results are presented in the Appendix (Appendix, Table A5). The t-test results support the broader finding from the correlation analysis: pension funds that report stated ESG-related policies, goals, and indicators exhibit lower levels of revealed WACI, particularly with respect to Scope 1 based emissions metrics. Therefore, funds with increased stated ESG commitment are associated with an increase in revealed ESG commitment.

Several ESG practices are associated with large or medium effect sizes (Cohen's $d > 0.5$), suggesting meaningful differences in portfolio carbon indicators between funds that have adopted these practices, and those that have not. Nature goals & indicators, transition climate risk goals, physical climate risk indicators and monitoring climate solutions in particular present significant effect sizes. Indicating that the adoption of these goals and indicators correlates strongly with a lower carbon exposure. Possibly these practices stand out because they force funds to quantify and internalize ESG integration to a greater extent and therefore improve the translation of stated to revealed ESG commitment. Making funds embed ESG objectives more directly into investment decisions rather than treating them as aspirational add-ons.

Several stated ESG variables show moderate but consistent effect sizes (Cohen's $d \approx 0.3$ to 0.45) with significant results ($p<0.05$). These findings suggest that ESG actions across multiple dimensions – formulating policies, setting measurable goals, and actively monitoring outcomes – each play a distinct role in driving lower carbon exposure, underscoring the value of a complementary approach. Scope 3 metrics are again, less consistently significant, due to data quality limitations.

Taken as a whole, these t-tests show that pension funds with increased stated ESG practices – specifically those that include climate physical and transition risk and nature-related goals and indicators – have significantly lower levels of WACI – indicating an increased level of revealed ESG alignment.

5.3 Regression analysis

This section presents the core findings from the regression analyses conducted to examine the relationship between pension funds' stated ESG commitments and their revealed ESG commitment, measured through WACI. The hypotheses are tested using a series of Ordinary Least Squares (OLS) regression. Since the dataset contains only one observation per pension fund, standard errors are corrected for heteroskedasticity using robust standard errors. First, the analysis explores whether a higher level of overall stated ESG commitment is associated with lower WACI scores (H1). Second, it investigates which specific components of stated ESG components are most strongly linked to revealed ESG commitment (H2). Third, it assesses whether governance quality moderates the relationship between stated and revealed ESG commitment (H3). The results are presented in Tables 5 through 9 and discussed in detail in the following subsections.

5.3.1 Hypothesis 1

To test Hypothesis 1 – which posits that greater stated ESG commitment is associated with improved revealed ESG commitment – this section examines the relationship between a composite Total ESG score and the WACI.

The total ESG score was constructed from two distinct categories of survey variables. These reflect both the presence of ESG-related practices and the level of governance attention reported by the pension fund.

The first category includes a set of 24 binary variables, capturing whether funds report the existence of specific ESG-related commitments, indicators, as well as governance structures and resources. A simple unweighted sum was calculated to reflect the total number of ESG-related indicators present for each fund. This binary sum ranges from 0 to 24. The second category comprises the remaining five Likert-scale variables (ranging from 0 to 4), which capture the fund's ESG integration at the board decision-making level. Because they share a common scale, they were averaged to produce a single Likert score per fund, capturing an average addition to the binary sum.

The final total ESG scores is computed as the sum of the binary policy score and the Likert average. This results in a continuous score that ranges from 0 (no reported ESG commitment and lowest possible Likert average) to 28 (all policies present and highest Likert average) across the sample. No weighting or standardization was applied, reflecting the assumption that each additional reported policy and each additional point on the Likert scale contributes equally to the overall stated ESG commitment score.

The results of the regression analysis are presented in Table 5. The estimated coefficient for the total ESG score is -0.834 and is statistically significant at the 10% level ($p = 0.084$). This indicates a negative association between increased stated ESG commitment and the WACI of a pension fund. Substantively, a one-point increase in the total ESG score is associated with a reduction of approximately 0.86 tCO_2e per €1 million, or 0.6% relative to the sample mean of 144.5 tCO_2e per €1 million.

To contextualize the magnitude of this effect, Janssen et al. (2022) show that the inflation- and exchange-rate-adjusted WACI of Dutch pension funds fell by 24.1% between 2012 and 2019, i.e. roughly 3.4% per year. Therefore, a fund with a total ESG score 5 point higher than another fund is estimated to have a 3% lower WACI. While modest in size, this suggests that variation in stated ESG commitment can account for part of the observed differences in carbon intensity.

This result provides modest empirical support for H1, suggesting that overall funds with more comprehensive stated ESG commitment tend to have less carbon-intensive portfolios. The model explains a limited proportion of the variation in WACI scores ($R^2 = 0.073$), and the overall F-statistics (1.19, $p = 0.31$) does not indicate joint statistical significance of the full model. In sum, the analysis provides tentative support for Hypothesis 1. The negative coefficient with moderate statistical significance is consistent with theoretical expectations. However, the limited explanatory power underscores that this relationship captures only part of the picture. This suggests that there is more to the “walk your talk” from policy to practice – it may depend on more specific mechanisms and demand further analyses. These issues are explored in greater detail in the following sections.

Table 5

Regression results composite ESG score

	Dependent variable: WACI total
	(1)
Total ESG score	-0.834*
	(0.479)
Impact class 2	4.864
	(7.441)
Impact class 3	6.126
	(19.416)
Fund category 2	8.909
	(13.360)
Fund category 3	7.898
	(7.505)
Intercept	210.435***
	(46.082)
Age	-1.054
	(0.750)
Market value (€mln)	0.000
	(0.000)
No. participants (per thousand)	-0.019
Observations	131
R^2	0.073
Adjusted R^2	0.012
F Statistic	1.196 (df=8; 122)

5.3.2 Hypothesis 2

Inherent survey structure clustering

Table 6 presents the results of five separate OLS regressions that assess the relationship between different stated ESG commitment clusters and the WACI of pension fund portfolios. Each model includes one of the five clusters derived from the inherent structure of the self-assessment:

(1) the presence of policies, goals, and indicators (for all domains);

(2) the adoption of specific impact and performance indicators;

(3) board commitment;

(4) investment in ESG expertise; and

(5) frequency of board engagement.

All models control for the pension fund's impact class, fund category, average board age, market value of portfolio, and number of participants.

The first cluster captures the extent of stated ESG commitment across four different ESG domains (climate, nature, social, and governance). For each domain, a pension fund indicates the presence of policy, goals, and/or indicators, resulting in a maximum possible score ranging from 0 to 12. The coefficient is negative, but insignificant ($\beta = -0.91$, $p = 0.244$). This indicates that, although broader ESG commitment may relate to lower WACI, the relationship is not statistically supported in this specification.

The second model – focused on the presence of specific impact and steering indicators, such as CO_2 targets aligned with the Paris Benchmark or companies investing in climate solutions – reveals a statistically significant negative effect. The summed indicator has a negative and significant association with WACI ($\beta = -3.81$, $p = 0.039$). This suggests that pension funds which adopt more explicit performance indicators tend to have lower WACI portfolios, indicating greater alignment between stated and revealed ESG commitment. The explanatory power of the model remains modest (0.080), but the effect is economically meaningful: each one-unit increase in the adoption of specific indicators is associated with an average decrease of 3.81 tons CO_2 per €1 million revenue in the portfolio's WACI, or relative to the sample average WACI of 144.5 tCO_2/ €1 mln. revenue as an average 2.7% decrease, holding other factors constant. While modest, this effect is of a similar magnitude to the annual pace of decarbonization observed in the sector over seven years, as discussed earlier (Janssen et al., 2022). Therefore, suggesting adopting more explicit indicators can account for meaningful variation in carbon intensity.

The third model tests the role of board commitment by summing four Likert-scale variables that reflect the board's stated commitment toward ESG integration. The resulting index is significantly negatively associated with WACI (β= -1.91, p= 0.04). This result suggests that stronger board-level ESG commitment is linked to a lower WACI and therefore a greater alignment. A one-point increase in board commitment is linked to a decrease of 1.91 tons CO_2e per €1 million revenue, or relative to the sample average WACI of 144.5, a 1.36% decrease in WACI. This finding provides evidence that board-level commitment could prove essential for aligning stated ESG commitment with revealed commitment.

The fourth model explored the relationship between internal ESG expertise investment– by hiring extra FTE, internal training, external training, and portfolio-level WACI. This result did not present statistically significant results (β= -3.0, p= 0.50), suggesting no robust evidence that such investments are directly associated with lower WACI.

This may reflect a temporal or structural disconnect between capability investments and revealed outcomes. It potentially reveals that internal capability building does not necessarily consistently translate into revealed portfolio change, or that this relationship takes longer to materialize. Increasing the knowledge within the institution, often done by experts or dedicated teams, potentially does not automatically lead to effective integration at the portfolio level. Experts are often positioned in an isolated team and not necessarily integrated into the core of the business, possibly limiting or delaying the influence this expertise has. The R^2 of this model was modest (0.055), further underscoring the limited power of this model.

Finally, the fifth model considers how often the topic of sustainability is discussed by the board over the course of a year. The results show a statistically significant effect at the 10% level. The coefficient is relatively large (β= -6.1, p= 0.075), which indicates that each additional increase in board discussion frequency is associated with a 6.1 on CO_2 per €1 million revenue reduction in WACI. Relative to the sample average WACI of 144.5, this reflects an approximate 4.2% decrease in WACI per unit increase. This result indicates that frequent board engagement with sustainability may play a meaningful role in driving the alignment and that board-level attention is not merely symbolic. While the model's explanatory power remains limited, ($R^2 = 0.069$), the effect size suggests that regular discussion at the board level may enhance the translation of stated ESG commitment into revealed ESG commitment.

Among the five grouped clusters, several regressions show interesting significant results. Most notably, the presence of concrete impact and steering indicators (second model) exhibited the strongest effect, indicating that funds with concrete indicators have a greater alignment between stated and revealed ESG commitment. Similarly, board-level commitment (third model), and the frequency with which sustainability is discussed at the board level (fifth model), are both significantly associated with lower WACI, highlighting the importance of adequate governance at the highest level in driving ESG integration.

In contrast, broader ESG policy presence across domains (first model), and internal investment in ESG expertise (fourth model) do not demonstrate significant results with WACI. Overall, the findings point to the importance of actionable, embedded, and governance-driven ESG integration in translating stated commitment to revealed commitment.

Table 6

Regression results inherent survey structure clustering

	Dependent variable: WACI total				
	(1)	(2)	(3)	(4)	(5)
Policy goals & indicators	-0.911				
	(0.778)				
Impact & performance indicators		-3.812^{**}			
		(1.829)			
Board commitment			-1.907^{**}		
			(0.928)		
Investment in expertise				-3.023	
				(4.493)	
Frequency of board engagement					-6.054^{*}
					(3.371)
Impact class 2	2.942	5.022	4.032	1.505	2.084
	(8.307)	(7.574)	(7.272)	(7.708)	(7.221)
Impact class 3	2.085	7.137	6.770	1.649	6.333

	(13.560)	(13.237)	(13.055)	(14.728)	(13.786)
Fund category 2	9.362	9.175	9.200	12.408	11.948
	(8.521)	(8.774)	(8.820)	(8.232)	(9.040)
Fund category 3	8.383	7.283	8.411	9.813	8.600
	(6.585)	(6.411)	(6.470)	(6.585)	(6.412)
Intercept	204.718***	203.773***	217.015***	207.938***	213.007***
	(43.700)	(45.112)	(45.107)	(45.451)	(44.444)
Average board age	-1.032	-0.989	-1.006	-1.065	-1.065
	(0.724)	(0.738)	(0.729)	(0.731)	(0.719)
Market value (€mln)	0.000**	0.000***	0.000***	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No. of participants (in 1,000s)	-0.019*	-0.020*	-0.019*	-0.020*	-0.023**
	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)
Observations	131	131	131	131	131
R^2	0.063	0.080	0.080	0.055	0.069
Adjusted R^2	0.001	0.020	0.020	-0.007	0.008
F Statistic	2.455** (df=8; 122)	3.969*** (df=8; 122)	3.367*** (df=8; 122)	2.155** (df=8; 122)	2.142** (df=8; 122)
Note:	*p<0.1; **p<0.05; ***p<0.01. This table presents the results of five OLS regression models estimating the effect of different clusters of stated ESG commitment on the Weighted Average Carbon Intensity (WACI) of Dutch pension funds' portfolios. Each model includes one stated ESG commitment cluster as the main independent variable. All models control for impact class, fund category, average board age, portfolio market value, and number of participants. Robust standard errors are shown in parentheses.				

Thematic clustering

Next, in order to broaden the analysis, a second clustering approached was employed, grouping questions based on thematic relevance instead of inherent survey structure. The results of these regressions are shown in Table 7 below and will be discussed next.

As said, funds could indicate whether they have policies, goals, and/or indicators on different domains. Now instead of dividing them among the domains, they are divided among having either policies, goals, or indicators. The first regression looked at the effect of funds stated they had policies for climate risk, nature, social, and, governance factors. This regression did not posit statistically significant results (β= -2.57, p= 0.17), indicating that merely having policies in place regarding different ESG themes does not appear to be significantly associated with lower WACI.

The second model tested the association between the presence of stated goals regarding ESG integration and the WACI. This output showed similar results to the first regressions, with modest explanatory power and statistically insignificant results (β= -1.1, p= 0.59). This suggests that merely formulating goals for ESG integration, does not translate into effective revealed integration. These findings reinforce the notion that intention alone may not be sufficient to drive translation into portfolio indicators.

The third model, testing the presence of stated indicators regarding ESG integration on WACI, neither showed statistically insignificant results (β= -2.6, p= 0.21), indicating that simply identifying the stated commitment of ESG indicators does not show a robust link with lower WACI.

The fourth and fifth models offer nuanced insights by distinguishing integration among different types of climate risks. Specifically, related to physical- and transition climate risk. Therefore, allowing for a comparison of how the Scope of climate risk integration influences portfolio outcomes. The fourth model tested the presence of policies, goals, and indicators regarding physical climate risk and showed statistically significant effect (β= -5.8, p= 0.047), whereas the fifth model, regarding the presence of policies, goals, and indicators for transition climate risk did not show statistical significant results (β= -3.0, p= 0.28). For the physical climate risk model, this would practically imply that a unit increase in integration physical climate risk corresponds to an economically sizable 4% reduction in WACI, or roughly twice the annual rate of decarbonization in the Dutch pension sector between 2012 and 2019. These results indicate that funds integrating physical climate risk are more likely to exhibit lower WACI scores, then those integrating (only) transition risk. This may indicate that addressing physical risks – such as extreme weather events - requires a higher level of portfolio-level insight, integration, and adaptation and thus results in a greener portfolio. Alternatively, it may imply that integrating transition risk – like policy shifts or market demand changes – does not automatically lead to a lower WACI, or that such integration is more indirect. Another possible explanation is that physical climate risks are more tangible and geographically observable, making them easier to incorporate into investment decision-making. In contrast, transition risks may be harder to translate into concrete portfolio actions.

Overall, the results from this model suggest that the translation from stated to revealed ESG commitment, or, “walk your talk” is not consistently measured across this model. Stated commitments such as policies, goals, and indicators consistently do not exhibit a strong association with a lower WACI. The lack of significant findings in the first three models suggests that broadly stated ESG commitments may not suffice to drive tangible outcomes, underscoring the implementation gap between stated and revealed commitment. However, when disaggregating climate risk into physical and transition components, a more nuanced picture emerges. The statistically significant effect of physical climate risk integration highlights that this integration is possibly more concrete and demanding which translates more effectively into lower WACI scores and therefore, greener alignment.

Table 7

Regression results thematic clustering

	Dependent variable: WACI total				
	(1)	(2)	(3)	(4)	(5)
Policy (all ESG themes)	-2.570				
	(1.874)				
Goals (all ESG themes)		-1.049			
		(1.933)			
Indicators (all ESG themes)			-2.639		
			(2.081)		
Physical climate (P+G+I)				-5.787**	
				(2.883)	
Transition climate (P+G+I)					-2.975
					(2.733)
Impact class 2	2.728	0.611	3.421	3.187	2.835
	(7.883)	(7.910)	(8.289)	(7.784)	(8.173)
Impact class 3	2.464	-1.777	3.498	-3.629	2.539
	(13.732)	(13.186)	(13.347)	(11.873)	(14.130)
Fund category 2	8.194	11.158	10.142	7.997	10.244

	(8.669)	(7.910)	(8.223)	(8.899)	(8.217)
Fund category 3	8.264	9.040	8.876	7.136	8.948
	(6.570)	(6.622)	(6.459)	(6.559)	(6.467)
Intercept	207.784***	202.853***	194.588***	205.880***	203.186***
	(43.003)	(43.119)	(46.884)	(43.727)	(44.245)
Average board age	-1.061	-1.048	-0.888	-1.011	-1.030
	(0.709)	(0.707)	(0.773)	(0.731)	(0.726)
Market value (€mln)	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No. of participants (in 1,000s)	-0.019*	-0.020*	-0.019	-0.019*	-0.020*
	(0.011)	(0.011)	(0.012)	(0.010)	(0.011)
Observations	131	131	131	131	131
R^2	0.065	0.052	0.065	0.089	0.060
Adjusted R^2	0.004	-0.010	0.004	0.029	-0.001
F Statistic	2.682*** (df=8; 122)	2.086** (df=8; 122)	2.417** (df=8; 122)	3.166*** (df=8; 122)	2.747*** (df=8; 122)
Note:	*p<0.1; **p<0.05; ***p<0.01. This table presents result from five OLS regressions estimating the effect of thematically grouped ESG commitments on the Weighted Average Carbon Intensity (WACI) of Dutch pension fund portfolios. All models control for impact class, fund category, average board age, portfolio market value, and number of participants. Robust standard errors are shown in parentheses				

Disaggregated binary indicators

Lastly, for Hypothesis 2, this analysis disaggregates broader stated ESG questions into more specific components, allowing for a closer examination of which particular elements within board commitment, internal expertise, and impact indicators may be driving forces in WACI.

The first model incorporated five separate binary indicators reflecting the use of specific ESG performance indicators: CO_2 emissions Paris aligned, companies who invest in climate solutions, nature & biodiversity, excluding negative impacts and including positive impacts. The R^2 for this model is the highest among all model specifications (R^2= 0.133).

Among the five separate indicators, four provided insignificant results, whereas one stood out. The presence of steering on companies who invest in climate solutions showed a strong and statistically significant negative association with WACI (β= -25.25, p= 0.007). This result suggests that pension funds that actively monitor and steer their portfolios towards companies that invest in climate solutions, on average, portray a WACI of 25.25 metric tons of CO_2/million lower than those that do not. Economically, this result is particularly meaningful: adopting a steering indicator that prioritizes companies investing in climate solutions is associated with an 18% lower WACI. To contextualize, this is roughly equivalent to five years' worth of average annual decarbonization in the Dutch pension sector. Such a reduction would remove a substantial volume of financed emissions, underscoring the importance of targeted, outcome-oriented indicators.

The second model incorporated the board commitment question as four specific Likert-scale indicators, each capturing a different specific dimension of the board's commitment towards ESG. For example, *to what extent does the board communicate a clear long-term vision on sustainability to all its stakeholders*? Responses were measured on a scale from *Not at all* to *A great extent.* Among the indicators, one stood out as statistically significant at a 10% interval. Specifically, the coefficient for *"The board prepares the implementation of the action plans within the context of the sustainability transition"* showed a moderate statistical negative effect (β= -6.0, p= 0.07). This finding indicates that boards with proactive, concrete implementation processes are more likely to translate stated ESG commitment into measurable outcomes. A one-unit increase corresponds to an estimated 4% decrease in portfolio WACI, for the average portfolio.

The last model among this specification disaggregated the various forms of internal ESG expertise improvement. Four binary indicators were separately included to assess the individual effects. Neither the model nor any of the individual indicators yielded statistically significant results. These findings are in line with the earlier regression which aggregated the question and restates the idea that investments in ESG expertise alone, do not necessarily translate into greater revealed ESG commitment. This reinforces the notion that internal investments in ESG alone do not automatically translate into increased revealed ESG commitments. Possibly due to structural or temporal barriers. The lack of significance overall suggests that building knowledge alone is insufficient without corresponding governance to embed that expertise into investment practices.

Table 8

Regression model disaggregated clustering

	Dependent variable: WACI total		
	(1)	(2)	(3)
Impact: CO_2	7.707		
	(10.108)		
Impact: Climate solutions	-25.248***		
	(9.207)		
Impact: Nature	-8.787		
	(7.841)		
Impact: Negative	-10.093		
	(9.085)		
Impact: Positive	11.826		
	(9.239)		
Board: Decision-making		-3.277	
		(4.406)	
Board: Long-term focus		-2.280	
		(3.424)	
Board: Considerations		4.720	
		(3.381)	
Board: Preparation		-5.974*	
		(3.240)	

Expertise: Capacity			2.542
			(6.712)
Expertise: Continuity			-4.460
			(8.857)
Expertise: Knowledge			-10.962
			(22.904)
Expertise: FTEs			-12.461
			(11.150)
Impact class 2	7.643	5.249	1.250
	(7.140)	(7.703)	(7.909)
Impact class 3	7.744	9.558	5.287
	(11.620)	(13.328)	(15.346)
Fund category 2	6.198	4.052	11.514
	(9.310)	(9.485)	(8.195)
Fund category 3	6.477	7.140	9.285
	(6.325)	(6.488)	(6.568)
Intercept	207.483***	197.866***	214.769***
	(42.065)	(47.055)	(50.919)
Average board age	-1.072	-0.793	-1.066
	(0.692)	(0.791)	(0.776)
Market value (€mln)	0.000***	0.000***	0.000*
	(0.000)	(0.000)	(0.000)
No. of participants (in 1,000s)	-0.019*	-0.020*	-0.019
	(0.011)	(0.011)	(0.013)
Observations	131	131	131
R^2	0.133	0.109	0.065
Adjusted R^2	0.045	0.026	-0.022
F Statistic	4.579*** (df=12; 118)	2.478*** (df=11; 119)	1.510 (df=11; 119)
Note:	This table presents results from OLS regressions estimating the effect of disaggregated ESG governance, expertise, and impact indicators on the Weighted Average Carbon Intensity (WACI) of Dutch pension fund portfolios. Each model controls for impact class, fund category, average board age, portfolio market value, and number of participants. Robust standard errors are reported in parentheses. *p<0.1; **p<0.05; ***p<0.01		

Overall, the results for Hypothesis 2 offer a layered perspective on the translation of stated ESG commitments into revealed ESG climate commitment, as measured by WACI. While broad, generic ESG statements and internal investments in expertise did not demonstrate statistically significant effects, several more specific and governance-anchored indicators revealed meaningful associations. The findings underscore that the presence of concrete, actionable ESG performance indicators – particularly those steering companies investing in climate solutions – are most strongly associated with a greener portfolio. Likewise, governance-related variables, such as adequate preparation and frequent sustainability discussion by the board, also display statistically significant negative relationships with WACI. These results suggest that it is not merely the presence of ESG intentions that matter, but rather how deeply they are embedded in measurable targets and high-level decision-making processes. Together, these insights highlight a crucial distinction between symbolic and substantive ESG commitment.

5.3.3 Hypothesis 3

To explore whether the effectiveness of stated ESG commitment on revealed ESG commitment depends on governance quality, the sample was split based on the median of a governance index constructed from five Likert-scale responses. Separate OLS regressions were then estimated for pension funds classified as either low (n=60), or high (n=71) governance quality. In both regressions, the total stated ESG composite score (as seen in H1) was used as the main explanatory variable, controlling for impact classification, fund category, average board age, and market value (Table 9).

For the low governance group, the coefficient for the total stated ESG score was negative but statistically insignificant (β= -0.043, p= 0.98), with a modest explanatory power (R^2= 0.075). In the high governance group, the coefficient for the total stated ESG score remained negative, but also statistically insignificant (β = -1.47, p= 0.11), though the model's explanatory power was slightly better (R^2= 0.130). Notably, none of the stated ESG scores coefficients reached statistical significance in either group.

Taken together, these results do not provide support for Hypothesis 3: governance quality does not significantly moderate the relationship between stated and revealed ESG commitment in this sample. Although the coefficient for the high-governance group approaches 10% significance level and potentially hints that stronger governance might enhance the "walk your talk", the evidence is far from conclusive.

Table 9

Regressions ESG policy effect on WACI by governance level

	Dependent variable: WACI total	
	(1)	(2)
Total ESG score	-0.043	-1.466
	(1.373)	(0.909)
Impact class 2	-2.467	14.178
	(10.610)	(12.286)
Impact class 3		17.307
		(16.689)
Fund category 2	-12.345	26.202***
	(12.811)	(9.351)
Fund category 3	4.693	4.628
	(10.964)	(9.163)
Intercept	228.177***	169.913**
	(46.213)	(83.814)
Average board age	-1.321	-0.330
	(0.867)	(1.317)
Market value (€mln)	0.007*	0.000**
	(0.004)	(0.000)
No. of participants (in 1,000s)	-0.223	-0.015
	(0.207)	(0.010)
Observations	60	71
R^2	0.075	0.130
Adjusted R^2	-0.049	0.018
F Statistic	3.373*** (df=7; 52)	3.105*** (df=8; 62)
Note:	*p<0.1; **p<0.05; ***p<0.0. This table presents results from OLS regressions estimating the effect of total stated ESG commitment on the Weighted Average Carbon Intensity (WACI) split by governance quality (based on the median of a governance index). Each model controls for impact5 class, fund category, number of participants, average board age and portfolio market value. Robust standard errors are reported in parentheses	

5.4 Sensitivity analyses

To assess the sensitivity of the main findings, the core regression models were re-estimated using an alternative dependent variable: "GHG footprint". While the primary analysis focused on WACI, which reflects the carbon intensity of portfolios per euro invested, GHG footprint captures absolute financed emissions. This alternative operationalization allows for testing whether results hold for different operationalization of revealed ESG. Overall, signs are stable, but significance and effect sizes shift. The detailed output of these regressions can be found in the Appendix (Table A6-10).

Hypothesis 1

The composite total stated ESG variable retained a negative and marginally significant relationship with GHG footprint (β= -0.57, p=0.081), consistent with the WACI-based model. This supports the broader conclusion that stronger stated ESG is associated with stronger revealed ESG integration, across multiple climate metrics. This effect is economically minor and may have limited real-world impact unless scaled across large investment portfolios.

Hypothesis 2

The clustering approach based on the inherent survey structure was similarly re-estimated using the GHG footprint for all clusters. The first group, which aggregated policies, goals, and indicators across all domains remained consistently insignificant. The second group, focusing on indicators and monitoring, lost significance when the GHG footprint is used. This represents a reversal of significance compared to the WACI model, where this group had shown a statistically significant effect. The third cluster, focusing on board commitment, remains significant, with an even more precise estimation of GHG footprint (β= -1.87, p= 0.003). This reinforces the conclusion that increased governance involvement is associated with lower carbon exposure in portfolios. Interestingly, the fourth regression regarding internal investment in expertise becomes marginally significant under the GHG footprint metric (β= -4.45, p= 0.092), whereas the fifth regression regarding the frequency of ESG board discussions loses its significance.

Then the clustering approach regarding thematic relevance was also re-estimated using GHG footprint. This re-estimation yields a single robust indicator: integration on physical climate risk (β= -3.1, p= 0.092). Embedding policies, goals, and indicators that explicitly target physical climate risk is associated with 3.1 tonnes of CO_2e per €1 million reduction. No other thematic clustering receives significance under the GHG footprint, which is in line with earlier findings. Regarding the re-estimation of the disaggregated indicators, three regressions are particularly interesting. First, the monitoring of firms who invest in climate solutions lost its significance in the GHG footprint regression. Second, the board preparation indicator remains statistically significant in both regressions. Third, whether the board communicates a long-term vision to its stakeholders gains significance in the GHG footprint model. No indicator of ESG expertise investment produced significant results, in line with earlier findings.

Hypothesis 3

The governance split analysis was also repeated using the GHG footprint. In the low governance group, the coefficient remained insignificantly associated with the GHG footprint. In the high governance group, the coefficient remained negative and comparatively larger; in both cases, the estimates remained statistically insignificant. Hence, governance quality does not significantly moderate the link between stated ESG and revealed ESG in this model.

Overall, these robustness checks indicate that the core patterns observed in the main analysis persist under different operationalizations of the dependent variable. Although statistical significance levels vary within some models, the direction and structure of results remain mostly stable. In particular, ESG performance indicators and board-level commitment consistently show the strongest and most robust associations with more sustainable portfolios.

6 Discussion

6.1 Summary of Main findings

This study investigated to what extent the stated ESG commitment of Dutch pension funds are reflected in their revealed sustainability commitment of their investment portfolios. The findings indicate a partial alignment between stated and revealed ESG commitment, with particularly strong associations for board-level commitment and the presence of ESG performance indicators. The central hypothesis (H1) of this study posits that pension funds with stronger stated ESG commitments would exhibit lower WACI scores in their investment portfolios, a reflection of greater translation of stated to revealed ESG commitment. The results provide moderate support for this hypothesis. Hypothesis 1 tested the overall alignment. The composite ESG score showed a statistically significant negative association with the portfolio's Weighted Average Carbon Intensity (WACI), after controlling for impact classification, fund category, market value, number of participants, and average board age. This suggests that higher overall stated ESG commitment is associated with lower WACI scores and therefore, does moderately translate into a greener portfolio. This finding is robust across different operationalizations of revealed ESG alignment, suggesting that this relationship between stated and revealed ESG integration holds whether emissions are measured as WACI or GHG footprint. At the same time, the size of the effect and the explained variance remain modest, implying that while stated ESG matters, they are not the sole drivers of revealed portfolio sustainability. The evidence points to a broader conclusion: the effective translation from stated to revealed ESG alignment likely depends not only on intention but also on the presence of internal structures that enable effective integration.

Therefore, to examine which components matter the most, explicit clusters were tested (H2). The analysis reveals that not all elements of stated ESG commitment are equally influential. The most substantive associations with greener investment portfolios were found for actionable indicators and governance-anchored practices. Pension funds that report specific performance metrics – such as companies that invest in climate solutions – are more likely to show stronger alignment. In addition, board-level engagement plays a crucial role. Both specific board-level commitment and frequency with which sustainability is discussed at the board level were consistently associated with better portfolio outcomes. These findings underscore that funds with active governance involvement – rather than passive policy presence – tend to exhibit a better "walk your talk" across their portfolio. In contrast, generic ESG policies, formulation of high-level goals, and internal investments in expertise showed more limited explanatory power. This suggests that the mere presence of stated ESG commitment – in the form of policy or goal articulation – does not consistently translate into measurable differences in revealed portfolio alignment. Even where statistical significance was marginal or reversed in sensitivity analyses, the direction and magnitude of these effects remained relatively stable, pointing to increased relevance of specific indicators.

This contrast reinforces the idea that measurable targets and monitoring structures, play a more decisive role in shaping revealed investment behavior than ESG intentions alone. From a behavioral perspective, specific indicators likely function as internal accountability mechanisms that bridge the potential gap between stated and revealed commitment. These findings resonate with literature on stated and revealed ESG adoption, suggesting that policies and goals may serve reputational or compliance functions, whereas indicators might reflect a deeper organizational commitment to effective ESG integration. A closer look at individual indicators revealed one particularly strong signal: pension funds that steer their portfolios toward companies investing in climate solutions appear to achieve markedly lower WACI scores. Furthermore, distinguishing between types of climate risks showed that funds addressing physical climate risks – such as extreme weather events – were more likely to exhibit greener portfolios than those focusing only or solely on transition risks.

When exploring whether the main relationship between overall stated and revealed ESG commitment is specifically moderated by governance quality (H3), the findings were less conclusive. While the regressions hinted at a supporting role of governance in the "walk your talk", the differences were not statistically significant in this model.

In short, translation from stated to revealed ESG commitment hinges on specific, measurable indicators and active board engagement, not on the mere existence of policies or isolated expertise programs. Governance quality does not moderate the overall relationship, but targeted governance actions (commitment, discussion frequency) matter directly.

The robustness of these findings was further tested by additional sensitivity analyses; by replicating the regression models using an alternative operationalization of the dependent variable. Instead of using WACI, measuring the carbon intensity per euro invested, GHG footprint was used, reflecting a more absolute measure of emissions financed by a fund. This alternative operationalization allows for assessing whether the observed relationships hold across different climate metrics. Broadly, the results based on the GHG footprint confirmed the patterns observed in the WACI models: actionable indicators and board engagement remain significant, generic policies do not. These findings underscore the importance of employing multiple measures in ESG analysis, as different metrics may capture distinct dimensions of sustainability performance.

Although the estimated economic effects in this study are modest in magnitude, their cumulative significance over time should not be underestimated. If such relationships persist longitudinally, they may compound into meaningful reductions in portfolio emissions. This could be particularly relevant for pension funds, whose long-term investment horizons imply that even small shifts in steering, governance, or indicator use today may yield substantial benefits over time.

6.2 Limitations

This study too, has its limitations. This study relies on a self-assessment survey to measure the stated ESG commitment of pension funds. As such, the data reflect self-perceived levels of ESG integration, which may differ from actual internal practices. There is a risk that some responses represent for example aspirational commitments rather than accurate depictions of stated ESG implementation, particularly where ESG is framed in broad or normative terms.

Thereafter, the explanatory power of the regression models was modest across specifications, suggesting that stated ESG commitment alone is not the only predictor of revealed sustainability outcomes. While significant associations were found, these results should be interpreted with caution in terms of causality.

Importantly, the cross-sectional nature of the data precludes causal inference too. While the findings are consistent that stronger stated ESG commitments lead to lower portfolio-level WACI, reverse causality cannot be ruled out. It is possible that pension funds with already relatively “green” portfolios are more inclined to report ambitious ESG commitments ex-post. In that case, the observed alignment would reflect ex-post rationalization rather than deliberate implementation. Future longitudinal or quasi-experimental designs would be well suited to address these causality questions.

Moreover, the analysis is based exclusively on one asset class, namely equities, as quality carbon data was only available for this asset class. As a result, other asset classes – such as real estate, sovereign bonds, or private equity – were excluded from measurement. This narrows the scope and potentially underrepresents total financed emissions. Nevertheless, equity serves as a relevant and relatively data-rich starting point for assessing the stated and revealed alignment of Dutch pension funds.

At the same time, the exclusive focus on CO_2-based indicators, while methodologically justified and widely adopted, should be viewed as a first step rather than a complete representation of environmental alignment. CO_2 is the most salient and measurable environmental indicator in the context of climate-related financial risk. However, a narrow focus on carbon metrics risks overlooking other material sustainability dimensions, such as biodiversity loss.

Thereafter, this study does not account for whether pension funds rely on external asset managers. This could affect ESG integration outcomes and the degree of board-level influence. Future research could investigate how internal versus outsourced asset management moderates the implementation of stated ESG commitment.

Finally, while the data used in this study represent a significant step toward better understanding ESG practices in the Dutch pension sector, ESG data continues to evolve. Methodologies for measuring financed emissions, integrating Scope 3 data, and ESG standardization are still under development. These limitations should not prevent empirical analysis, but highlight the importance and potential opportunities for future research. Continued improvements in data availability, and comparability will enable a deeper and more nuanced understanding of how stated ESG commitments translate into real-world investment portfolios. As the regulatory and societal demand for sustainable finance grows, future research will play a vital role in shaping transparent, accountable, and evidence-based ESG integration across asset classes and environmental dimensions.

6.3 Policy implications under the Future Pensions Act (FPA)

The Future Pensions Act (FPA) introduces a fundamental shift in the Dutch pension system, moving from a defined benefit (DB) to a defined contribution (DC) pension scheme. This transition places greater emphasis on individual participants' preferences, risk profiles, and the need for transparency. In this new context, the findings of this study yield relevant and actionable insights for pension funds seeking to adapt and transition responsibly into the new system. Under the FPA, the ability to reflect participants' preferences into investment outcomes becomes a legal imperative.

Sustainability considerations rise to the top of the agenda of pension funds, as the EU introduces new directives and guidelines on sustainability of pension funds, primarily through the SFDR and CSRD[3]. These measures aim to improve transparency, encourage sustainable investments, and combat greenwashing. Consequently, effectively translating the participant preferences into investment practices becomes increasingly important. The findings of this study highlight the importance of strong governance and decision-making processes. Pension funds should not limit themselves to drafting ESG policies or appointing sustainability experts. According to this thesis, what truly matters is the operationalization of ESG ambitions through concrete steering indicators and well-embedded governance structures. Moreover, the results underline the need to consider both transition and physical climate risk when assessing portfolio performance. The emphasis must shift from symbolic compliance to substantive action.

By embedding these principles into investment mandates – not limited to sustainability domains – pension funds can begin to address the implementation gap that often exists between stated and revealed commitment. In doing so, they not only align more closely with participants' values and regulatory expectations but also reinforce the credibility and long-term legitimacy of their strategies.

[3] The Corporate Sustainability Reporting Directive (CSRD) requires large companies to disclose how their activities impact people and environment, using the European Sustainability Reporting Standards (ESRS) (European Commission, n.d.).

7 Conclusion

This research set out to empirically investigate the alignment between Dutch pension funds' stated ESG commitments and their revealed portfolio-level climate commitments. Drawing on a unique dataset that combines a self-assessment survey with portfolio-level emission data (WACI and GHG footprint), the study contributes to the body of literature that seeks to understand the "walk your talk" phenomenon between stated and revealed commitment for institutional investing.

The findings suggest that not all revealed ESG commitments are created equal: while policies and goals alone showed limited explanatory power, mechanisms that promote internal accountability and decision-making suggest a closer alignment between policy and practice. These results reinforce the importance of moving beyond symbolic ESG integration towards substantive and accountable integration that is actively governed and monitored.

A central insight from this analysis is the asymmetry in ESG integration: although regulatory and societal pressures may encourage pension funds to articulate ESG commitment, the translation of those ambitions to the portfolio level depends on more than rhetoric. The absence of significant effects for increasing internal expertise further suggests that capacity without accountability does not suffice.

This disconnect between ESG policy and practice may be understood as a form of institutional time inconsistency, where long-term sustainability goals are acknowledged but not acted upon in the short term. This misalignment could be driven by uncertainty, cognitive overload, or organizational barriers – factors that often paralyze decision-making under complexity (Barnett, Brock, and Hansen 2019). Understanding and addressing this ESG implementation gap is not merely academic. As the Dutch pension sector transitions to the Future Pensions Act the ability to reflect participants' preferences in investment outcomes becomes a legal imperative. The findings in this thesis suggest that concrete, governance-anchored mechanisms – not policy checklists – are the most effective tools for aligning portfolios with stated ESG commitment. This alignment is essential if pension funds are to fulfil both their societal and fiduciary responsibilities and to help ensure the long-term stability of the pension system of our future.

8 References

Alok, S., Kumar, N., & Wermers, R. (2020). Do fund managers misestimate climatic disaster risk? The Review of Financial Studies, 33(3), 1146–1183. https://www.jstor.org/stable/48574182

Barnett, M., Brock, W., & Hansen, L. P. (2019). Pricing uncertainty induced by climate change. The Review of Financial Studies, 33(3), 1024–1066. https://doi.org/10.1093/rfs/hhz144

Barber, B. M., Morse, A., & Yasuda, A. (2020). Impact investing. Journal Of Financial Economics, 139(1), 162–185. https://doi.org/10.1016/j.jfineco.2020.07.008

Bauer, R., Broeders, D., & Van Ool, A. (2023). Walk the green talk? A textual analysis of pension funds' disclosures of sustainable investing. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.4391708

Bauer, R., Ruof, T., & Smeets, P. (2021). Get real! Individuals prefer more sustainable investments. The Review of Financial Studies, 34(8), 3976–4043. https://doi.org/10.1093/rfs/hhab037

Beeching, A. (2021). SFDR and the New ESG Regulatory Framework. In Muzinich. https://static.muzinich.com/docs/SFDR-and-the-New-Regulatory-Framework-QA_-10.21-FINAL.pdf

Bolton, P., Kacperczyk, M., & National Bureau of Economic Research. (2020). Do Investors Care about Carbon Risk? In NBER Working Paper Series (Nr. 26968). https://www.nber.org/system/files/working_papers/w26968/w26968.pdf

Busch, T., Johnson, M., & Pioch, T. (2020). Corporate carbon performance data: Quo vadis? Journal Of Industrial Ecology, 26(1), 350–363. https://doi.org/10.1111/jiec.13008

Chen, T., Dong, H., & Lin, C. (2019). Institutional shareholders and corporate social responsibility. Journal of Financial Economics, 135(2), 483–504. https://doi.org/10.1016/j.jfineco.2019.06.007

Cheng, B., Ioannou, I., & Serafeim, G. (2014). Corporate social responsibility and access to finance. Strategic Management Journal, 35(1), 1–23. https://doi.org/10.1002/smj.2131

Choi, D., Gao, Z., & Jiang, W. (2020). Attention to global warming. The Review of Financial Studies, 33(3), 1112–1145. https://www.jstor.org/stable/48574181

Chowdhry, B., Davies, S. W., & Waters, B. (2019). Investing for impact. The Review of Financial Studies, 32(3), 864–904. https://www.jstor.org/stable/48616814

De Bakker, L., Eekhof, S., Duiker, J., & VBDO. (2018). Benchmark Responsible Investment by Pension Funds in the Netherlands 2018. Dutch Association of Investors for Sustainable Development. https://www.vbdo.nl/wp-content/uploads/2018/10/VBDOBenchmarkPensioenfondsen_102018.pdf

Degryse, H., Di Giuli, A., Sekerci, N., & Stradi, F. (2023). Sustainable investments: One for the money, two for the show. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.4411343

Dyck, A., Lins, K. V., Roth, L., & Wagner, H. F. (2018). Do institutional investors drive corporate social responsibility? International evidence. Journal of Financial Economics, 131(3), 693–714. https://doi.org/10.1016/j.jfineco.2018.08.013

Eckeveld, M. van, Zomeren, M. van, Vermaak, L., & Van Riet, C. (2024). De impact van de Wtp op de finance-functie. PwC. https://www.pwc.nl/nl/actueel-publicaties/assets/pdfs/wtp-finance-functie-survey.pdf

Engler, D., Gutsche, G., & Smeets, P. (2024). Why Do Investors Pay Higher Fees for Sustainable Investments? An Experiment in Five European Countries. In Institute

Of Economics, University Of Kassel [Journal-article]. https://www.netspar.nl/wp-content/uploads/P20230515_DP019_Bauer.pdf

European Commission. (n.d.). Sustainability-related disclosure in the financial services sector. Finance. Retrieved from https://finance.ec.europa.eu/sustainable-finance/disclosures/sustainability-related-disclosure-financial-services-sector_en

European Commission. (n.d.). Corporate sustainability reporting. Finance. Retrieved from https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en#:~:text=This%20helps%20investors%2C%20civil%20society,companies%20in%20their%20value%20chains.

Hartzmark, S. M., & Sussman, A. B. (2019). Do investors value sustainability? A natural experiment examining ranking and fund flows. The Journal of Finance, 74(6), 2789–2837. https://dx.doi.org/10.2139/ssrn.3016092

Heeb, F., Kölbel, J. F., Paetzold, F., & Zeisberger, S. (2022). Do investors care about impact? The Review of Financial Studies, 36(5), 1737–1787. https://doi.org/10.1093/rfs/hhac066

Hong, H., Karolyi, G. A., & Scheinkman, J. A. (2020). Climate finance. The Review of Financial Studies, 33(3), 1011–1023. https://www.jstor.org/stable/48574178

Hong, H., Li, F. W., & Xu, J. (2018). Climate risks and market efficiency. Journal of Econometrics, 208(1), 265–281. https://doi.org/10.1016/j.jeconom.2018.09.015

IPCC. (2023). IPCC, 2023: Climate Change 2023: Synthesis Report, Summary for Policymakers. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland. IPCC, 1–34. https://doi.org/10.59327/ipcc/ar6-9789291691647.001

Janssen, A., Botzen, W., Dijk, J., & Duijm, P. (2022). Overcoming misleading carbon footprints in the financial sector. Climate Policy, 22(6), 817–822. https://doi.org/10.1080/14693062.2022.2083548

Kalkuhl, M., Steckel, J. C., & Edenhofer, O. (2019). All or nothing: Climate policy when assets can become stranded. Journal of Environmental Economics and Management, 100, 102214. https://doi.org/10.1016/j.jeem.2019.01.012

Krueger, P., Sautner, Z., & Starks, L. T. (2020). The importance of climate risks for institutional investors. The Review of Financial Studies, 33(3), 1067–1111. https://doi.org/10.1093/rfs/hhz137

Nguyen, P., Kecskés, A., & Mansi, S. A. (2017). Does corporate social responsibility create shareholder value? The importance of long-term investors. Journal of Banking & Finance, 112, 105217. https://doi.org/10.1016/j.jbankfin.2017.09.013

Popescu, I., Gibon, T., Hitaj, C., Rubin, M., & Benetto, E. (2023). Are SRI funds financing carbon emissions? An input-output life cycle assessment of investment funds. Ecological Economics, 212, 107918. https://doi.org/10.1016/j.ecolecon.2023.107918

Raghunandan, A., & Rajgopal, S. (2022). Do ESG funds make stakeholder-friendly investments? Review of Accounting Studies. https://doi.org/10.2139/ssrn.3826357

Riedl, A., & Smeets, P. (2017). Why do investors hold socially responsible mutual funds? The Journal of Finance, 72(6), 2505–2550. https://doi.org/10.1111/jofi.12547

Starks, L. T. (2023). Presidential address: Sustainable finance and ESG issues—Value versus values. The Journal of Finance, 78(4), 1837–1872. https://doi.org/10.1111/jofi.13255

Task Force on Climate-related Financial Disclosures. (2023). About TCFD. https://www.fsb-tcfd.org/about/

TNFD. (2022). The TNFD Nature-related Risk & Opportunity Management and Disclosure Framework Beta v0.1 Release. https://tnfd.global/wp-content/uploads/2022/03/220321-TNFD-framework-beta-v0.1-FINAL.pdf

United Nations. (2015). The Paris Agreement. United Nations. https://www.un.org/en/climatechange/paris-agreement

Van Der Zwan, N., Anderson, K., & Wiß, T. (2019). Pension funds and sustainable investment: Comparing regulation in the Netherlands, Denmark, and Germany. Netspar Discussion Paper. https://www.netspar.nl/wp-content/uploads/P20190506_DP023_Zwan.pdf

Van Loenen, L., Riemersma, M., & Werkman, M. (2022). Beoordeling van het duurzaamheidsbeleid van tien pensioenfondsen: Tweede actualisering. Eerlijke Geldwijzer / Profundo. https://eerlijkegeldwijzer.nl/media/rf2nvp3m/2022-02-beleidsupdate-pensioenen.pdf

9 Appendix A

Table A1

Survey variables self-assessment (translated from Dutch to English)

Nr	Question	Answer	Variable name
1	Does your institution have policy on climate change - physical risk ?	Yes / No	Physical policy
2	Does your institution have goals on climate change - physical risk?	Yes / No	Physical goals
3	Does your institution have indicators on climate change - physical risk?	Yes / No	Physical indicators
4	Does your institution have policy on climate change - transition risk?	Yes / No	Transition policy
5	Does your institutions have goals on climate change - transition risk?	Yes / No	Transition goals
6	Does your institution have indicators on climate change - transition risk?	Yes / No	Transition indicators
7	Does your institution have policy on nature/biodiversity loss?	Yes / No	Nature policy
8	Does your institution have goals on nature/biodiversity loss?	Yes / No	Nature goals
9	Does your institution have indicators on nature/biodiversity loss?	Yes / No	Nature indicators
10	Does your institution have policy on social factor risk?	Yes / No	Social policy
11	Does your institution have goals on social factor risk?	Yes / No	Social goals
12	Does your institution have indicators on social factors risk?	Yes / No	Social indicators
13	Does your institution have policy on governance factor risk?	Yes / No	Governance policy
14	Does your institution have goals on governance factor risk?	Yes / No	Governance goals
15	Does your institution have indicators on governance factor risk?	Yes / No	Governance indicators
	Through which indicators do you steer and monitor the objectives and targets?		
16	Indicators on CO_2 reduction aligned with Paris goals	Yes / No	Indicator CO_2
17	Investing in companies providing climate solutions	Yes / No	Indicator Climate sol
18	Investments with positive impact (aligned with SDGs or EU taxonomy)	Yes / No	Indicator positive

19	Excluding investments with negative impact	Yes / No	Indicator negative
20	Reducing negative impact on nature degradation	Yes / No	Indicator nature
	To what extent does the board consider sustainability important?		
21	The board makes (operational and strategic) decisions aligned with the sustainability goals it has set	Not at all / Hardly / Neutral / To some extent / To a great extent	Board decisions
22	The board communicates a clear long-term vision on sustainability to all its stakeholders	Not at all / Hardly / Neutral / To some extent / To a great extent	Board long term
23	The board believes that actions are needed in the climate transition	Not at all / Hardly / Neutral / To some extent / To a great extent	Board action
24	The board prepares the implementation of the action plans within the context of the sustainability transition	Not at all / Hardly / Neutral / To some extent / To a great extent	Board preperation
	In what way is expertise on sustainability increased within your institution?		
25	By investing in required capacities and skills	Yes / No	Expertise capacities
26	By keeping the board's knowledge level up to date (trainings, seminars)	Yes / No	Expertise level
27	By proactively obtaining knowledge and information from internal & external experts	Yes / No	Expertise experts
28	By assigning extra fte	Yes / No	Expertise FTE
29	How often is the topic of sustainability risks discussed by the board?	0x / 1-2x / 3-4x / 5-6x / >7x	Topic discussed

Table A2

Variables line-by-line dataset

nr	Variable name	Abbreviation	Description
1	Greenhouse gas emissions Scope 1	GHG1	Scope 1 CO_2 emmissions and other greenhouse gas emissions converted into CO_2 equivalents. Expressed in tCO_2.
2	Greenhouse gas emissions Scope 2	GHG2	Scope 2 CO_2 emmissions and other greenhouse gas emissions converted into CO_2 equivalents. Expressed in tCO_2.
3	Greenhouse gas emissions Scope 3	GHG3	Scope 3 CO_2 emmissions and other greenhouse gas emissions converted into CO_2 equivalents. Expressed in tCO_2.
4	WACI Scope 1	WACI1	Sum of the product of the portfolio weight of all investments and carbon efficiency of their issuers. Carbon efficiency is Scope 1 GHG emissions divided by revenue in million euros.
5	WACI Scope 2	WACI2	Sum of the product of the portfolio weight of all investments and carbon efficiency of their issuers. Carbon efficiency is Scope 2 GHG emissions divided by revenue in million euros.
6	WACI Scope 3	WACI3	Sum of the product of the portfolio weight of all investments and carbon efficiency of their issuers. Carbon efficiency is Scope 3 GHG emissions divided by revenue in million euros.
7	GHG footprint Scope 1	GHGFP1	Amount of Scope 1 greenhouse gas emissions, in tons of CO_2, associated with every 1 million eu invested in a portfolio
8	GHG footprint Scope 2	GHGFP2	Amount of Scope 2 greenhouse gas emissions, in tons of CO_2, associated with every 1 million eu invested in a portfolio
9	GHG footprint Scope 3	GHGFP3	Amount of Scope 3 greenhouse gas emissions, in tons of CO_2, associated with every 1 million eu invested in a portfolio
10	Market value	MV	The market value of an individiual assets within the portfolio
11	Market value covered assets	MVCA	Total monetary value of portfolio assets for which GHG emissions data is available
13	Institution ID		Unique identifier assigned to each institution
14	Impact classification		Categorial variable that classifies pension funds based on their impact, classification from i1-3 from smallest to largest.

15	Category pension fund	Type of pension fund (sectoral, profession, etc)
16	Average board age	Mean age of board members within the pension fund
17	Nr of participants	Total number of active and passive participants affiliated with the fund

Table A3

Correlation table

	WACI	WACI2	WACI3	GHGFP1	GHGFP2	GHGFP3
Physical policy	-0.18**	-0.16*	-0.14	-0.19**	-0.19**	-0.10
Physical goals	-0.15*	-0.20**	-0.09	-0.20**	-0.18**	-0.08
Physical indicators	-0.22**	-0.27***	-0.15*	-0.17**	-0.13	-0.02
Transition policy	-0.17**	-0.03	-0.07	-0.22**	-0.08	-0.02
Transition goals	-0.14*	0.02	-0.00	-0.27***	-0.11	-0.06
Transition indicators	-0.16*	0.03	-0.03	-0.20**	-0.03	0.04
Nature policy	-0.14	-0.07	0.16*	-0.22**	-0.13	0.05
Nature goals	-0.12	-0.03	0.14	-0.26***	-0.12	0.03
Nature indicators	-0.20**	-0.11	0.03	-0.17**	-0.03	0.09
Social policy	-0.14	0.02	-0.06	-0.13	-0.02	0.01
Social goals	-0.04	0.06	0.05	-0.14	-0.01	0.01
Social indicators	-0.13	0.04	0.00	-0.10	0.06	0.10
Governance policy	-0.11	0.03	-0.03	-0.12	0.01	0.01
Governance goals	-0.05	0.06	0.12	-0.09	0.05	0.11
Governance indicators	-0.13	-0.02	0.03	-0.11	0.04	0.10
Indicators CO_2	-0.13	0.04	-0.06	-0.20**	-0.02	0.02
Indicators climate sol	-0.26***	-0.13	-0.16*	-0.23***	-0.08	-0.05
Indicators positive	-0.13	-0.01	-0.03	-0.18**	-0.04	0.01
Indicators negative	-0.18**	-0.00	-0.06	-0.22**	-0.04	-0.00
Indicators nature	-0.19**	-0.04	-0.02	-0.19**	-0.03	-0.01
Board decisions	-0.12	-0.04	-0.17*	-0.23***	-0.09	-0.12
Board long term	-0.17*	0.03	-0.11	-0.29***	-0.13	-0.18**
Board action	-0.14	0.02	0.09	-0.20**	-0.06	0.02
Boar prep	-0.31***	0.00	-0.05	-0.36***	-0.11	-0.13
Expertise capacities	-0.04	0.10	0.01	-0.17*	-0.07	-0.06
Expertise level	-0.05	0.01	0.01	-0.07	-0.03	0.05
Expertise experts	-0.08	-0.02	-0.07	-0.12	-0.06	-0.09
Expertise fte	-0.12	-0.04	-0.10	-0.13	-0.12	-0.10
Topic discussed	-0.20**	-0.10	0.01	-0.20**	-0.06	0.08

<0.01***, <0.05**, <0.1*

Table A4

T-test (significant outcomes)

Revealed	Stated	T-statistic	P-value	Cohen's d	N (Yes)	N (No)	abs_d
WACI2	Physical indi	-3,356	0,0011	-0,586	50	83	0,586
WACI1	Indi climate sol	-3,298	0,0013	-0,561	45	88	0,561
GHGFP1	Nature goals	-3,62	0,0017	-0,852	15	118	0,852
WACItotal	Indi climate sol	-3,192	0,0018	-0,542	45	88	0,542
GHGFP1	Transition goals	-3,189	0,0018	-0,553	67	66	0,553
GHGFP1	Nature policy	-2,843	0,0059	-0,511	34	99	0,511
GHGFP1	Indi climate sol	-2,808	0,0061	-0,504	45	88	0,504
WACItotal	Physical indi	-2,768	0,0067	-0,503	50	83	0,503
WACI1	Nature indi	-2,791	0,01	-0,599	17	116	0,599
GHGFP1	Transition policy	-2,572	0,0114	-0,457	78	55	0,457
WACI1	Indi nature	-2,514	0,0142	-0,441	33	100	0,441
GHGFP1	Indi negative	-2,489	0,0147	-0,464	85	48	0,464
WACI1	Physical indi	-2,4	0,0186	-0,456	50	83	0,456
WACI2	Physical goals	-2,368	0,0198	-0,426	48	85	0,426
GHGFP1	Transition indi	-2,3	0,0231	-0,4	72	61	0,4
GHGFP1	Indi CO_2	-2,293	0,0236	-0,402	77	56	0,402
GHGFP1	Physical policy	-2,274	0,0246	-0,393	69	64	0,393
WACItotal	Physical policy	-2,271	0,0248	-0,393	69	64	0,393
GHGFP1	Indi nature	-2,209	0,0313	-0,442	33	100	0,442
GHGFP2	Physical policy	-2,16	0,0326	-0,374	69	64	0,374
GHGFP1	Indi positive	-2,145	0,0341	-0,377	52	81	0,377
GHGFP1	Physical goals	-2,155	0,0341	-0,414	48	85	0,414
GHGFPtotal	Transition goals	-2,118	0,0361	-0,367	67	66	0,367
WACI1	Physical policy	-2,108	0,037	-0,363	69	64	0,363
WACI1	Transition policy	-2,058	0,0417	-0,355	78	55	0,355
WACI1	Indi negative	-2,049	0,0431	-0,369	85	48	0,369
GHGFP2	Physical goals	-2,002	0,0484	-0,373	48	85	0,373
WACI3	Nature policy	1,993	0,0503	0,364	34	99	0,364
GHGFP1	Physical indi	-1,965	0,0523	-0,36	50	83	0,36
GHGFP1	Exp capacities	-1,951	0,0533	-0,341	74	59	0,341
GHGFPtotal	Physical policy	-1,946	0,0538	-0,336	69	64	0,336
WACI3	Indi climate sol	-1,931	0,0561	-0,33	45	88	0,33
WACI1	Exp fte	-2,056	0,0572	-0,432	11	122	0,432
WACI1	Transition indi	-1,855	0,0658	-0,317	72	61	0,317
WACI2	Physical policy	-1,851	0,0665	-0,321	69	64	0,321
WACItotal	Exp fte	-1,969	0,0686	-0,446	11	122	0,446
GHGFPtotal	Nature goals	-1,892	0,0731	-0,443	15	118	0,443
GHGFPtotal	Indi climate sol	-1,802	0,075	-0,333	45	88	0,333
WACItotal	Indi nature	-1,802	0,076	-0,325	33	100	0,325
WACI3	Physical indi	-1,779	0,0779	-0,308	50	83	0,308

WACI1	Nature policy	-1,778	0,0799	-0,324	34	99	0,324
WACItotal	Physical goals	-1,768	0,0811	-0,345	48	85	0,345
GHGFPtotal	Physical goals	-1,746	0,0846	-0,334	48	85	0,334
GHGFP2	Exp fte	-1,854	0,0848	-0,431	11	122	0,431
GHGFP2	Nature policy	-1,742	0,0857	-0,307	34	99	0,307
GHGFP2	Nature goals	-1,801	0,086	-0,39	15	118	0,39
WACItotal	Transition policy	-1,702	0,0916	-0,303	78	55	0,303
WACItotal	Nature indi	-1,735	0,096	-0,395	17	116	0,395
WACI1	Transition goals	-1,67	0,0974	-0,289	67	66	0,289
GHGFP1	Nature indi	-1,732	0,0991	-0,519	17	116	0,519
GHGFP1	Social goals	-1,639	0,1039	-0,288	58	75	0,288
WACI1	Physical goals	-1,626	0,1081	-0,323	48	85	0,323
WACI3	Nature goals	1,674	0,111	0,431	15	118	0,431

Table A5

Sensitivity check Hypothesis 1

	Dependent variable: GHG footprint total
	(1)
Total ESG score	-0.567*
	(0.322)
Impact class 2	7.569
	(4.935)
Impact class 3	10.555
	(8.756)
Fund category 2	16.709*
	(10.137)
Fund category 3	4.563
	(4.842)
Intercept	86.972***
	(29.282)
Age	-0.017
	(0.486)
Market value (€mln)	0.000
	(0.000)
No. of participants (in 1,000s)	-0.017*
	(0.009)
Observations	131
R^2	0.093
Adjusted R^2	0.033
F Statistic	2.960*** (df=8; 122)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table A6

Sensitivity check Hypothesis 2 – inherent survey structure

	Dependent variable: GHG footprint total				
	(1)	(2)	(3)	(4)	(5)
Policy, goals & indicators (all themes)	-0.548				
	(0.472)				
Impact & performance indicators		-2.064			
		(1.307)			
Board commitment			-1.870^{***}		
			(0.623)		
Investment in expertise				-4.446^{*}	
				(2.614)	
Frequency of board engagement					-3.039
					(2.410)
Impact class 2	5.996	6.917	8.356^{*}	6.845	5.226
	(4.968)	(4.779)	(4.393)	(4.779)	(4.616)
Impact class 3	7.431	9.878	13.849^{*}	10.972	9.084
	(8.621)	(8.348)	(7.718)	(9.126)	(9.068)
Fund category 2	17.213^{*}	17.261^{*}	16.110	19.526^{**}	18.759^{*}
	(10.017)	(10.172)	(10.225)	(9.851)	(10.071)
Fund category 3	4.989	4.468	4.550	6.022	5.221
	(4.870)	(4.651)	(4.746)	(4.774)	(4.793)
Intercept	82.530^{***}	81.593^{***}	97.278^{***}	93.433^{***}	85.984^{***}
	(29.533)	(29.618)	(29.464)	(29.382)	(30.380)
Age	0.002	0.028	0.010	-0.086	-0.010
	(0.489)	(0.492)	(0.483)	(0.482)	(0.493)
Market value (€mln)	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No. of participants (in 1,000s)	-0.017^{*}	-0.018^{**}	-0.017^{*}	-0.018^{*}	-0.020^{**}
	(0.009)	(0.008)	(0.009)	(0.009)	(0.010)
Observations	131	131	131	131	131
R^2	0.080	0.089	0.131	0.094	0.081
Adjusted R^2	0.020	0.029	0.074	0.034	0.021
Residual Std. Error	24.571 (df=122)	24.455 (df=122)	23.882 (df=122)	24.393 (df=122)	24.563 (df=122)
F Statistic	2.464^{**} (df=8; 122)	3.013^{***} (df=8; 122)	3.741^{***} (df=8; 122)	2.539^{**} (df=8; 122)	2.376^{**} (df=8; 122)
Note:	*p<0.1; **p<0.05; ***p<0.01				

Table A7

Sensitivity check Hypothesis 2 – Thematic clusters

	Dependent variable: GHG footprint total				
	(1)	(2)	(3)	(4)	(5)
Policy (all themes)	-1.377				
	(1.224)				
Goals (all themes)		-1.619			
		(1.228)			
Indicators (all themes)			-0.750		
			(1.350)		
Physical-risk: P+G+I				-3.075*	
				(1.811)	
Transition-risk: P+G+I					-2.630
					(1.675)
Impact class 2	5.658	5.609	5.051	5.887	6.865
	(4.948)	(4.937)	(4.816)	(4.930)	(4.642)
Impact class 3	7.319	6.004	6.306	4.058	9.193
	(8.542)	(8.604)	(8.735)	(8.200)	(8.355)
Fund category 2	16.751*	17.637*	18.225*	16.662	17.288*
	(10.149)	(9.922)	(9.821)	(10.375)	(9.960)
Fund category 3	5.007	4.844	5.520	4.413	5.141
	(4.920)	(4.741)	(4.796)	(4.867)	(4.758)
Intercept	83.707***	86.339***	77.400***	82.651***	83.182***
	(29.258)	(30.063)	(29.765)	(29.035)	(29.760)
Age	-0.011	-0.065	0.057	0.016	-0.009
	(0.485)	(0.496)	(0.496)	(0.487)	(0.491)
Market value (€mln)	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No. of participants (in 1,000s)	-0.018*	-0.017*	-0.018*	-0.017*	-0.017*
	(0.009)	(0.009)	(0.010)	(0.009)	(0.009)
Observations	131	131	131	131	131
R^2	0.080	0.083	0.074	0.093	0.088
Adjusted R^2	0.020	0.023	0.013	0.034	0.028
F Statistic	2.478** (df=8; 122)	2.472** (df=8; 122)	2.131** (df=8; 122)	2.910*** (df=8; 122)	3.016*** (df=8; 122)
Note:	*p<0.1; **p<0.05; ***p<0.01				

Table A8

Sensitivity check Hypothesis 2 – Disaggregated clusters

	Dependent variable: GHG footprint total		
	(1)	(2)	(3)
Impact: CO_2	2.500		
	(6.802)		
Impact: Climate solutions	-7.171		
	(5.995)		
Impact: Nature	-4.702		
	(5.815)		
Impact: Negative	-6.279		
	(6.051)		
Impact: Positive	3.449		
	(5.881)		
Board: Decision-making		-1.403	
		(2.705)	
Board: Long-term focus		-4.226*	
		(2.373)	
Board: Considerations		2.868	
		(2.427)	
Board: Preparation		-4.039**	
		(1.990)	
Expertise: Capacity			-6.536
			(4.606)
Expertise: Continuity			2.003
			(5.552)
Expertise: Knowledge			-11.352
			(10.990)
Expertise: FTEs			-8.992
			(9.519)
Impact class 2	7.857*	8.572*	7.083
	(4.705)	(4.491)	(4.943)
Impact class 3	10.062	15.221*	12.802
	(7.617)	(7.962)	(9.601)
Fund category 2	16.685	13.193	19.079*
	(10.779)	(9.415)	(10.012)
Fund category 3	4.536	3.711	6.049
	(4.851)	(4.880)	(4.859)
Intercept	82.241***	89.029***	89.784***
	(29.443)	(28.532)	(30.610)
Age	0.012	0.079	0.019
	(0.492)	(0.479)	(0.476)

Market value (€mln)	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
No. of participants (in 1,000s)	-0.018**	-0.018*	-0.014
	(0.009)	(0.010)	(0.010)
Observations	131	131	131
R^2	0.101	0.160	0.105
Adjusted R^2	0.009	0.082	0.022
F Statistic	2.300** (df=12; 118)	3.124*** (df=11; 119)	2.124** (df=11; 119)
Note:	*p<0.1; **p<0.05; ***p<0.01		

Table A9

Sensitivity check Hypothesis 3

	Dependent variable: GHG footprint total	
	Low governance	High governance
	(1)	(2)
Total ESG score	-0.585	-0.257
	(0.757)	(0.522)
Impact class 2	6.197	14.449**
	(5.932)	(6.993)
Impact class 3		13.656
		(9.868)
Fund category 2	16.324	22.168
	(14.426)	(14.522)
Fund category 3	16.373**	-2.110
	(6.529)	(6.677)
Intercept	87.865**	70.434
	(37.816)	(49.370)
Age	-0.181	0.095
	(0.637)	(0.767)
Market value (€mln)	0.003	0.000
	(0.003)	(0.000)
No. of participants (in 1,000s)	0.157	-0.016*
	(0.161)	(0.010)
Observations	60	71
R^2	0.088	0.149
Adjusted R^2	-0.035	0.040
F Statistic	1.665 (df=7; 52)	1.630 (df=8; 62)
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table A10

Pearson correlation table survey questions

	Physical policy	Physical goals	Physical indicators	Transition policy	Transition goals	Transition indicators	Nature policy	Nature goals	Nature indicators	Social policy	Social goals	Social indicators	Governance policy	Governance goals	Governance indicators	Indicator CO_2	Indicator Climate sol	Indicator postive	Indicator negative	Indicator nature	Board decisions	Board long term	Board action	Board preperation	Expertise capcities	Expertise level	Expertise experts	Expertise fte	Topic discussed
Physical policy	1.00***	0.69***	0.59***	0.69***	0.49***	0.50***	0.32***	0.25***	0.19**	0.58***	0.48***	0.45***	0.58***	0.43***	0.40***	0.52***	0.50***	0.46***	0.44***	0.34***	0.37***	0.35***	0.40***	0.34***	0.20**	0.06	0.15*	0.13	0.21**
Physical goals	0.69***	1.00***	0.61***	0.44***	0.53***	0.38***	0.06	0.28***	0.13	0.38***	0.54***	0.35***	0.41***	0.53***	0.39***	0.39***	0.39***	0.33***	0.30***	0.18**	0.33***	0.33***	0.25***	0.19**	0.10	0.04	0.16*	-0.06	0.19**
Physical indicators	0.59***	0.61***	1.00***	0.53***	0.40***	0.59***	0.15*	0.12	0.31***	0.43***	0.29***	0.54***	0.42***	0.34***	0.59***	0.54***	0.46***	0.40***	0.49***	0.34***	0.32***	0.32***	0.35***	0.27***	0.10	0.06	0.17*	-0.06	0.22***
Transition policy	0.69***	0.44***	0.53***	1.00***	0.82***	0.82***	0.46***	0.25***	0.28***	0.64***	0.52***	0.55***	0.66***	0.50***	0.55***	0.77***	0.57***	0.67***	0.67***	0.48***	0.46***	0.49***	0.51***	0.54***	0.33***	0.20**	0.19**	0.25***	0.29***
Transition goals	0.49***	0.53***	0.40***	0.82***	1.00***	0.78***	0.34***	0.31***	0.20**	0.52***	0.63***	0.51***	0.56***	0.60***	0.52***	0.68***	0.49***	0.61***	0.63***	0.43***	0.47***	0.53***	0.48***	0.54***	0.32***	0.23***	0.15*	0.24***	0.28***
Transition indicators	0.50***	0.38***	0.59***	0.82***	0.78***	1.00***	0.37***	0.23***	0.35***	0.58***	0.51***	0.66***	0.55***	0.48***	0.61***	0.77***	0.56***	0.64***	0.69***	0.53***	0.41***	0.44***	0.48***	0.43***	0.27***	0.23***	0.16*	0.22**	0.26***
Nature policy	0.32***	0.06	0.15*	0.46***	0.34***	0.37***	1.00***	0.61***	0.50***	0.36***	0.25***	0.21**	0.42***	0.23***	0.24***	0.29***	0.35***	0.48***	0.33***	0.42***	0.23***	0.24***	0.28***	0.34***	0.11	0.05	0.13	0.20**	0.29***
Nature goals	0.25***	0.28***	0.12	0.25***	0.31***	0.23***	0.61***	1.00***	0.58***	0.24***	0.41***	0.21**	0.25***	0.42***	0.20**	0.26***	0.20**	0.25***	0.22**	0.35***	0.18**	0.25***	0.16*	0.22**	0.03	0.07	0.08	0.07	0.28***
Nature indicators	0.19**	0.13	0.31***	0.28***	0.20**	0.35***	0.50***	0.58***	1.00***	0.26***	0.12	0.39***	0.27***	0.22**	0.39***	0.28***	0.30***	0.29***	0.24***	0.46***	0.16*	0.22**	0.24***	0.27***	0.07	0.14	0.08	0.05	0.29***
Social policy	0.58***	0.38***	0.43***	0.64***	0.52***	0.58***	0.36***	0.24***	0.26***	1.00***	0.56***	0.60***	0.88***	0.55***	0.48***	0.50***	0.38***	0.44***	0.60***	0.32***	0.36***	0.40***	0.39***	0.47***	0.27***	0.28***	0.24***	0.15*	0.22***
Social goals	0.48***	0.54***	0.29***	0.52***	0.63***	0.51***	0.25***	0.41***	0.12	0.56***	1.00***	0.60***	0.56***	0.85***	0.51***	0.47***	0.43***	0.48***	0.44***	0.34***	0.36***	0.39***	0.31***	0.34***	0.21**	0.19**	0.12	0.07	0.21**
Social indicators	0.45***	0.35***	0.54***	0.55***	0.51***	0.66***	0.21**	0.21**	0.39***	0.60***	0.60***	1.00***	0.50***	0.54***	0.82***	0.57***	0.49***	0.45***	0.53***	0.41***	0.33***	0.29***	0.36***	0.35***	0.33***	0.23***	0.12	0.12	0.26***
Governance policy	0.58***	0.41***	0.42***	0.66***	0.56***	0.55***	0.42***	0.25***	0.27***	0.88***	0.56***	0.50***	1.00***	0.58***	0.54***	0.48***	0.44***	0.54***	0.55***	0.37***	0.35***	0.42***	0.39***	0.45***	0.23***	0.25***	0.23***	0.10	0.20**
Governance goals	0.43***	0.53***	0.34***	0.50***	0.60***	0.48***	0.23***	0.42***	0.22**	0.55***	0.85***	0.54***	0.58***	1.00***	0.60***	0.45***	0.36***	0.44***	0.45***	0.29***	0.31***	0.34***	0.30***	0.32***	0.21**	0.18**	0.11	0.08	0.21**
Governance	0.40***	0.39***	0.59***	0.55***	0.52***	0.61***	0.24***	0.20**	0.39***	0.48***	0.51***	0.82***	0.54***	0.60***	1.00***	0.53***	0.47***	0.46***	0.51***	0.40***	0.24***	0.28***	0.33***	0.31***	0.25***	0.19**	0.10	0.10	0.19**

indicators																													
Indicator CO_2	0.52***	0.39***	0.54***	0.77***	0.68***	0.77***	0.29***	0.26***	0.28***	0.50***	0.47***	0.57***	0.48***	0.45***	0.53***	1.00***	0.55***	0.59***	0.69***	0.42***	0.43***	0.47***	0.52***	0.52***	0.31***	0.16*	0.18**	0.26***	0.30***
Indicator Climate sol	0.50***	0.39***	0.46***	0.57***	0.49***	0.56***	0.35***	0.20**	0.30***	0.38***	0.43***	0.49***	0.44***	0.36***	0.47***	0.55***	1.00***	0.66***	0.47***	0.44***	0.31***	0.26***	0.38***	0.41***	0.29***	0.14	0.08	0.13	0.21**
Indicator postive	0.46***	0.33***	0.40***	0.67***	0.61***	0.64***	0.48***	0.25***	0.29***	0.44***	0.48***	0.45***	0.54***	0.44***	0.46***	0.59***	0.66***	1.00***	0.57***	0.54***	0.42***	0.41***	0.46***	0.41***	0.34***	0.22***	0.17**	0.26***	0.27***
Indicator negative	0.44***	0.30***	0.49***	0.67***	0.63***	0.69***	0.33***	0.22**	0.24***	0.60***	0.44***	0.53***	0.55***	0.45***	0.51***	0.69***	0.47***	0.57***	1.00***	0.43***	0.38***	0.41***	0.37***	0.48***	0.21**	0.15*	0.21**	0.23***	0.25***
Indicator nature	0.34***	0.18**	0.34***	0.48***	0.43***	0.53***	0.42***	0.35***	0.46***	0.32***	0.34***	0.41***	0.37***	0.29***	0.40***	0.42***	0.44***	0.54***	0.43***	1.00***	0.27***	0.32***	0.29***	0.25***	0.13	0.17*	0.12	0.02	0.26***
Board decisions	0.37***	0.33***	0.32***	0.46***	0.47***	0.41***	0.23***	0.18**	0.16*	0.36***	0.36***	0.33***	0.35***	0.31***	0.24***	0.43***	0.31***	0.42***	0.38***	0.27***	1.00***	0.69***	0.50***	0.38***	0.32***	0.20**	0.35***	0.19**	0.24***
Board long term	0.35***	0.33***	0.32***	0.49***	0.53***	0.44***	0.24***	0.25***	0.22**	0.40***	0.39***	0.29***	0.42***	0.34***	0.28***	0.47***	0.26***	0.41***	0.41***	0.32***	0.69***	1.00***	0.54***	0.49***	0.35***	0.27***	0.38***	0.09	0.25***
Board action	0.40***	0.25***	0.35***	0.51***	0.48***	0.48***	0.28***	0.16*	0.24***	0.39***	0.31***	0.36***	0.39***	0.30***	0.33***	0.52***	0.38***	0.46***	0.37***	0.29***	0.50***	0.54***	1.00***	0.54***	0.39***	0.25***	0.24***	0.18**	0.29***
Board preperation	0.34***	0.19**	0.27***	0.54***	0.54***	0.43***	0.34***	0.22**	0.27***	0.47***	0.34***	0.35***	0.45***	0.32***	0.31***	0.52***	0.41***	0.41***	0.48***	0.25***	0.38***	0.49***	0.54***	1.00***	0.45***	0.27***	0.21**	0.20**	0.22**
Expertise capcities	0.20**	0.10	0.10	0.33***	0.32***	0.27***	0.11	0.03	0.07	0.27***	0.21**	0.33***	0.23***	0.21**	0.25***	0.31***	0.29***	0.34***	0.21**	0.13	0.32***	0.35***	0.39***	0.45***	1.00***	0.39***	0.17**	0.21**	0.25***
Expertise level	0.06	0.04	0.06	0.20**	0.23***	0.23***	0.05	0.07	0.14	0.28***	0.19**	0.23***	0.25***	0.18**	0.19**	0.16*	0.14	0.22***	0.15*	0.17*	0.20**	0.27***	0.25***	0.27***	0.39***	1.00***	0.24***	0.09	0.29***
Expertise experts	0.15*	0.16*	0.17*	0.19**	0.15*	0.16*	0.13	0.08	0.08	0.24***	0.12	0.12	0.23***	0.11	0.10	0.18**	0.08	0.17**	0.21**	0.12	0.35***	0.38***	0.24***	0.21**	0.17**	0.24***	1.00***	0.07	0.23***
Expertise fte	0.13	-0.06	-0.06	0.25***	0.24***	0.22**	0.20**	0.07	0.05	0.15*	0.07	0.12	0.10	0.08	0.10	0.26***	0.13	0.26***	0.23***	0.02	0.19**	0.09	0.18**	0.20**	0.21**	0.09	0.07	1.00***	0.16*
Topic discussed	0.21**	0.19**	0.22***	0.29***	0.28***	0.26***	0.29***	0.28***	0.29***	0.22***	0.21**	0.26***	0.20**	0.21**	0.19**	0.30***	0.21**	0.27***	0.25***	0.26***	0.24***	0.25***	0.29***	0.22**	0.25***	0.29***	0.23***	0.16*	1.00***

10 Appendix B

1. Statement of Purpose

This appendix provides a detailed account of the use of Generative AI tools during the development and writing of this thesis. These tools were used to assist in writing and debugging python code and the refinement of language in order to improve the quality and understanding of the writing and output. All outputs generated were critically examined by myself in order to maintain academic integrity and ensure quality, and I therefore recognize that I am responsible for all output. Thereafter, as the pension fund data used in this thesis is sensitive and confidential, no data was ever input into AI tools and therefore never used to analyze any output.

1. Tools used

- ChatGPT

2. Scope of Use

2.1 Coding and debugging

- Tool: ChatGPT
- Purpose: help identify and fix bugs in Python script used for analysis of this thesis. Thereafter, it could help me generate the script to format regression tables which can be exported to Word.
- My role: The prompting of the issue was done by me and I reviewed the suggestions of the tool. I implemented revised code based on my own understanding.
- Reflection: ChatGPT saved me time when resolving script errors, helped me learn and write code better, and saved me a lot of time when formatting tables.
- Applied in Sections 4 in order to perform the method detailed on.

2.2 Writing

Description

- Tool: ChatGPT
- Purpose: Helped rephrase awkward or overly complex sentences to improve clarity and fluency in English.

- I ensured that all ideas were my own, and to critically review the AI's suggestions. Thereafter to never bluntly paste AI's response directly into the thesis. Every sentence in this thesis has been formulated and typed by myself.
- Reflection: ChatGPT supported me improving the overall readability of the text.
- Applied in: Sections 1 – 7 and 9 in varying degrees.

3. Log of AI interaction

Throughout the thesis process, I used AI to assist with grammar refinement and coding questions. These interactions were integrated into my regular workflow. Therefore, this appendix includes examples that illustrate how the tool was used. No content was copy-pasted and I recognize my full responsibility of the accuracy and originality of this thesis.

1: Coding aid

- Prompt: " *Python does not want to merge the values of df_equities and df_controls, what could be the problem*"
- Response AI: 4 systemic steps to solve the problem: 1) Use of indicator = True in pd.merge() to check whether rows from both datasets were actually matching or only present in one. 2) Comparison of institution_id values in both datasets using .astype(str).str.strip() to remove whitespace and unify data types. 3) Preview of mismatching IDs, and checking whether problematic IDs existed in both data frames. 4) Forcing both ID columns to string format and cleaning them before performing the merge again.
- How it was used: I applied this process to resolve the issue. The problem was caused by subtle difference in the institution_id values. After inspecting and cleaning both columns, the merge worked correctly.

2: Writing

- Prompt: *“Please help me formulate this sentence better: “biodiversity related policies are far less common where only 26% report having a formal policy, and fewer still have goals (11%) or indicators (13%)””.*
- Response AI: “Compared to broader ESG policies, biodiversity-related policies are significantly less common. Only 26% of funds report having a formal policy, with even fewer report setting goals (11%) or using indicators (13%)”
- Final text: “Nature & biodiversity-related policies are far less common: only 25% report having a formal policy, with even fewer setting goals (12%) or using indicators (13%)”

3: Writing

- Prompt: “*While the above suggests that pension participants may be willing to accept lower returns for ethical or societal reasons, which is important for a pension fund’s mandate to adjust their allocation, it is important to emphasize that ignoring ESG risks may ultimately endanger the financial performance of pension funds themselves.*
  This sentence is a bit too long, how can I effectively slice it up?”
- Response AI: “Yes, you're right — the sentence is a bit long and could be clearer with a slight restructure. Here's a more concise and readable version:
  "While the above suggests that pension participants may be willing to accept lower returns for ethical or societal reasons — which is important for pension funds when adjusting their allocations — it is equally important to emphasize that ignoring ESG risks may ultimately endanger the financial performance of the funds themselves."
  Alternatively, for even more clarity, you could break it into two sentences: "The above suggests that pension participants may be willing to accept lower returns for ethical or societal reasons. This is relevant for pension funds when adjusting their allocations. However, it is equally important to emphasize that ignoring ESG risks may ultimately endanger the financial performance of the funds themselves."
- Final text: Although pension participants may accept lower returns for ethical or societal reasons – a consideration relevant when adjusting asset allocation – pension funds must

- also recognize that ignoring ESG risks may ultimately endanger the financial performance of funds themselves.

4: Coding tables

- Prompt: "*I am having a hard time exporting all the regression tables so that I can paste them effectively in my word document. I have found online, you can use the Stargazer package to export regression output?*"
- Response AI: Yes, you can use the stargazer package in Python to export your regression output, in either: HTML format (for e.g. Jupyter or webpages), LaTeX format (for use in academic papers or Overleaf).

  1. Export as HTML file

     ```
     html_output = stargazer.render_html()
     # Write to file
     with open("regression_output.html", "w", encoding="utf-8") as f:
         f.write(html_output).
     ```

     You can then open regression_output.html in a browser or embed it in a report

  2. Export as LaTeX file

  ```
  latex_output = stargazer.render_latex()
  # Write to file
  with open("regression_output.tex", "w", encoding="utf-8") as f:
      f.write(latex_output)
  ```

  This creates a clean LaTeX regression table, which you can paste into your thesis or Overlaef document.

  So Yes, stargazer is perfect for exporting regression tables – especially if you're aiming for polished outputs for academic use or reports.
- How it was used: I used stargazer to refine and polish the tables present in this thesis.

5: Help with understanding data descriptives

- Prompt: "*I need to check what kind of variables are within bfr_esg_13 in python*".

- Response AI: To check what kind of values or variables type are in BFR_ESG_13, use the following quick code snippet in Python:

```
#Check the data type
Print(df[“BFR_ESG_13”].dtype)
#Check unique values
Print(df[“BFR_ESG_13”].unique())
```

This tells you if the dtype is int64 or float64, it’s numeric – possibly an ordinal Likert scale. The .unique() will show you the actual answer categories and help you interpret the scale.

- How it was used: I followed this process with right corresponding dataset and inspected the variables more precisely.

6: Formatting assistance Word

- Prompt: “*I need to number the pages by hand, but even though I turned off ‘Link to previous’, the sections are still linked and the numbering won’t change. I need to manually adjust page number but Word keeps them connected*”
- Response AI:

Step by step checklist to solve your problem:

1. Insert a Section Break (next page) at the point where numbering should restart.
2. Double click the header or footer in the new section and disable link to previous.
3. Repeat this step in both the header and footer if needed.
4. Delete de old page number in that section .
5. Go to insert > page number > format page numbers, select “start at 1”.
6. Verify that numbering is correct.
7. Use show formatting marks to check whether section breaks were correctly inserted

- How it was used: using the formatting marks made it visible where the section breaks and revealed the mistake. This helped me resolve the formatting issue.

7: Coding aid

- Prompt: *"In order to check for the consistency of the governance index, I want to compute Cronbach's alpha."*
- Response AI: "You can check the reliability of your index using Cronbach's alpha. This checks whether the variables are reasonably correlated:

  ```
  from sklearn.preprocessing import StandardScaler
  from pingouin import cronbach_alpha  # pip install pingouin
  # Select governance variables
  gov_items = df[gov_vars].dropna()
  # Calculate Cronbach's alpha
  alpha, _ = cronbach_alpha(gov_items)
  print(f"Cronbach's alpha: {round(alpha, 2)}")"
  ```
- How it was used: I ran this code with after including the governance variables and the relevant dataframe as to calculate Cronbach's alpha and check consistency and reliability.

8: Writing

- Prompt: *"Please restructure the next sentence for better flow; They argue that institutional ownership enhances firms' ESG performance, conditional on the investors country of origin to have strong social norms. Such as Netherlands"*
- Response AI: They are that institutional ownership enhances firms' ESG performance – particularly when the investors originate from countries with strong social norms, such as the Netherlands.
- Final text: They argue that institutional ownership enhances firms' ESG performance, conditional on the investors' country of origin to have strong social norms, such as the Netherlands.

9: Coding troubleshooting

- Prompt: Can you please troubleshoot this error message?

  IndexError Traceback (most recent call last)

```
Cell In[44], line 37
    35     row_cells = table.add_row().cells
    36     for i, cell in enumerate(cells):
---> 37         row_cells[i].text = cell
    39 # 6. Save document
    40 doc.save('Group3_Regression_Results.docx')
IndexError: tuple index out of range
```

- Response AI: The error you're seeing (IndexError: tuple index out of range) typically happens when the number of values in a row does not match the number of cells in the word table, often due to formatting issues or inconsistent row lengths.

  The suggested fix included; 1. Dynamically counting the numbers of columns (max_cols) 2. Padding or truncating each row to match the expected column count. 3. Skipping malformed lines.

  Updated code:

```
for row in split_lines[1:]:
row_cells = table.add_row().cells
for i in range(max_cols):
text = row[i] if i < len(row) else ""
row_cells[i].text = text
```

- How it was used: After implementing this revised loop to ensure the number of values matched the number of table columns the fix resolved the IndexError and allowed me to generate the word document with properly formatted regression output.