Driving factors for sustainable investments by Dutch pension funds

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Abstract

The United Nations developed 17 Sustainable Development Goals in 2015, which led to investments shifting more towards financial, social, and environmental sustainability. Sustainable investments are investments made in industries that adhere to environmental or ethical standards, such as agriculture or healthcare. As sustainable investments are often a long-term commitment, pension funds are very suitable for sustainable investments as they often invest over a longer period. Because the Netherlands has a big and strong pension system, Dutch pension funds can boost sustainability by increasing their percentage of sustainable investments. This research focuses on three factors driving sustainable investments by pension funds: pension fund size, type, and board composition. The goal of this study is to improve sustainable investing practices and determine ways to increase the percentage of sustainable investments. Quantitative research was performed where data from the VBDO's Responsible Investments scores and pension funds' annual reports for 2020 and 2021 were combined. To test our hypotheses, multiple linear regression with a Z-test and robust standard errors was used. We found that larger funds are able to customise investment strategies based on beneficiary preferences, driven by both financial and stakeholder concerns, due to their abundant resources and access to economies of scale. Contrary to worldwide trends that show public pension funds are more committed to sustainability, we found that the type of Dutch pension fund has no impact on the percentage of sustainable investments. When analysing the effect of pension fund boards on the percentage of sustainable investments, we found that the size and diversity of the pension fund board have a positive correlation with the level of sustainable investments. The measurement of board diversity used in this research leads to an increase in the percentage of sustainable investments, even though the measurement deviates from prior literature. To take advantage of the increasing need for sustainable investments, pension funds may improve their sustainable investment strategies by coordinating them with long-term environmental and social goals. To increase the share of sustainable investments, pension funds may consider merging with others to combine their financial resources, possibly leading to a greater contribution to sustainability. Policymakers may encourage sustainable investments among pension funds by providing incentives and guidance while taking into account the specific issues that smaller funds deal with. Furthermore, pension funds may want to reconsider their board structure, since larger and more diverse boards tend to have greater percentages of sustainable investments.

Keywords: sustainable investments, Dutch pension funds, pension fund size, pension fund type, pension fund board, board diversity

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1. Introduction

1.1 Background

The United Nations developed 17 Sustainable Development Goals in 2015, which strive to end poverty and combine this goal with policies to raise health and education standards, decrease inequality, and boost the economy while combating climate change (United Nations, n.d.). Investments are changing in many ways to be financially, socially, and environmentally sustainable. When financial considerations and long-term environmental, social, and governance (ESG) factors are coordinated when making investment decisions, sustainable investment as an investment strategy has the potential to have an impact on sustainable development (Tseng et al., 2019). Ethical and environmentally friendly investments, such as socially responsible investments (SRI), are classified as sustainable investments, which are significantly increasing (Escrig-Olmedo et al., 2017). According to Martí-Ballester (2020), sustainable investments are investments in sectors that adopted environmental or ethical criteria, such as the agricultural sector, energy, and healthcare.

Sustainable investments have both advantages and disadvantages. The first advantage is that sustainable investments can make an impact on the planet. Investing in socially responsible firms implies choosing other firms to invest in than unethical organisations, such as tobacco or oil producers. The more people and funds that do this, the less capital such businesses will become. In the long term, more businesses may follow, leading to a greater impact on the entire world (theimpactinvestor.com, 2021). Second, many investors appreciate sustainable investments and it positively influences its reputation. Hartzmark & Sussman (2019) found that mutual fund investors collectively view sustainability as a favourable fund attribute, allocating more money to funds ranked as highly focused on sustainability and less money to funds ranked as less focused on sustainability. Some investors would argue that a well-managed corporation should care about the environment or that businesses should seek aims other than profit maximisation (Hartzmark & Sussman, 2019). However, there are also disadvantages of sustainable investments. Despite the fact that the highest-rated sustainability funds collected more money than the lowest-rated funds, none of the high-sustainability funds outperformed any of the lowest-rated funds (Hartzmark & Sussman, 2019). Besides this, Flugum & Souther (2023) found evidence that companies may use sustainability to cover bad performance. When managers did not meet profit forecasts, it was noted that they frequently publicly discussed their focus on sustainability. When they exceeded profitability forecasts, however, they made few, if any, public announcements about sustainability. As a result, sustainable fund managers who direct their investments to firms that publicly embrace sustainability principles may be investing in financially underperforming companies (Flugum & Southern, 2023).

Pension funds could support sustainable development by directing investor money to companies that focus on sustainability (Martí-Ballester, 2020). Investment in Corporate Social Performance (CSP) is frequently a long-term commitment (Mahapatra, 1984). Pension funds, according to Gilson and Kraakman (1991), are therefore appropriate for sustainable investments since they frequently invest over a long time horizon due to the long average time between a person starting to work and receiving a pension. The difficulties of selling shares also play a role in this.

Pension funds in the Netherlands had in quarter 3 of 2022 a total size of around 1,400 billion liquid assets (dnb.nl, 2022), which makes the Dutch pension system one of the largest in the world (Ross, 2022). The Dutch pension fund ABP is in the fifth position of the largest pension funds worldwide (Ross, 2022) with 480 billion euros of assets (ABP, 2022). The Mercer Global Pension Index annually compares all pension systems worldwide on various crucial points, such as adequacy, sustainability, and integrity. In 2022, the Netherlands became second out of 44 countries, which means that the Netherlands has a first-rate and strong retirement income system that provides good benefits, is sustainable, and scores high on integrity (Mercer, 2022). Although the Netherlands is a relatively small country, it has a big and strong pension system, so it can really make an impact on sustainability by only slightly increasing its percentage of sustainable investments. Therefore, the focus of this

research will be on the factors influencing the percentage of sustainable investments by Dutch pension funds.

The pension system in the Netherlands is arranged as a three-pillar system (Ponds & Van Riel, 2007). The first is the state pension, which provides all retirees with a basic flat-rate income, which is the General Old Age Pensions Act (AOW) (dnb.nl, n.d.). Financing is available on a pay-as-you-go basis and it corresponds to the minimum wage. The second pillar offers former employees with supplemental income that employees have to build up through the company they worked at (dnb.nl, n.d.). The third category includes personal additional savings, which people do on their own dime (Ponds & Van Riel, 2007). In this research, the focus is on the second pillar pensions. The second pillar of pension funds in the Netherlands is classified into three types (Ponds & Van Riel, 2007). The first type is an *industrial pension fund*, which is set up for a specific industry, for example, construction or healthcare. Participation in an industry pension fund is required by law for all enterprises operating in the sector (Ponds & Van Riel, 2007). A company may withdraw only if it develops a *company pension fund* that provides a superior pension plan to its employees than the industry fund's pension plan, which is the second kind of pension fund (Ponds & Van Riel, 2007). Collective labour agreements govern the participation of employees in these pension funds as this is normally mandatory. The third type of pension fund is an *occupational pension fund*, which is set up for a specific group of specialists, such as doctors (Ponds & Van Riel, 2007).

According to the Dutch Bank, there are multiple guidelines regarding sustainable investments by Dutch pension funds. First of all, if a pension fund has decided to incorporate sustainability into its investment policy, the instruction given to the asset manager must be consistent with this policy (dnb.nl, 2019). Besides this, pension funds are required to report to their stakeholders the manner in which the investment policy takes account of the environment and climate, human rights, and social relations (dnb.nl, 2019). On the European level, the EU Sustainable Finance Action Plan (SFAP) is setting the standard for the financial sector in terms of legislation and regulations (Jesse, 2022). With the adoption of this comprehensive set of regulations, Europe has given the industry a critical role in the transition to a more sustainable economy. The key goals of this plan are to direct capital flows toward sustainable investments, integrate sustainability into risk management, and create transparency in reporting (Jesse, 2022). Unfortunately, the SFAP is now riddled with ambiguities; not everything has been fully solidified. As a result, financial institutions face numerous obstacles in terms of interpretation and implementation (Jesse, 2022). Despite this legislation and regulations, less than 20% of the Dutch pension funds have a climate strategy, according to the Dutch Association of Investors for Sustainable Development (VBDO) which gives ratings to Dutch pension funds for their sustainable performance. Therefore, this research will study which factors can increase the percentage of sustainable investments by Dutch pension funds.

Sievänen et al. (2012) studied the drivers of responsible investments by European pension funds. However, there is no recent study on these drivers and the influence of the composition of the board of pension funds has not been studied before. Besides this, no research has yet focused on the factors influencing sustainable investments by pension funds in the Netherlands. Therefore, the academic purpose of this research is to find out which factors lead to sustainable investments by Dutch pension funds to see how the percentage of sustainable investments by Dutch pension funds can be increased.

There is also a clear practical need for this research. To increase the percentage of sustainable investments by Dutch pension funds, it should be identified which factors lead to sustainable investments. For example, making rules and regulations about sustainable investing could maybe increase the percentage of sustainable investments.

1.2 Research question

The previous information leads to the following research question:
Which factors drive Dutch pension funds to make a higher percentage of sustainable investments?

In the previous section, it is already explained when an investment is perceived as a sustainable investment and the Dutch pension system with its guidelines regarding sustainable investments is described. In addition to this, the following sub-questions will be answered to answer the research question:

1. To what extent do Dutch pension funds make sustainable investments?
2. Which factors are leading to sustainable investments by Dutch pension funds?
3. How can the percentage of sustainable investments by Dutch pension funds be increased?

This study describes the existing literature on factors influencing pension funds' investment decisions. After that, the factors leading to sustainable investments by Dutch pension funds are found based on empirical data. Finally, conclusions are drawn to see how the percentage of sustainable investments by Dutch pension funds can be increased.

2. Literature review

The theoretical framework of this research consists of the literature on the characteristics of pension funds influencing investment decisions. The organisational size, types of pension funds, board of pension funds, and the organisation of the pension plan will be described in the following sections.

2.1 Size

According to Hawley and Williams (2007), the holdings of major institutions, despite the fact that there are many of them, are concentrated in the hands of a very small number of the biggest institutional investors. The size of pension funds can influence their investment decisions because their profits, and hence their capacity to fulfil their fiduciary duties to their beneficiaries, are significantly dependent on the prosperity of the whole economy (Hawley and Williams, 2007). The success of the economy as a whole should therefore be of natural and compelling economic interest to them. This should, in theory, make them enthusiastic about changes that enhance the efficiency of the economy as a whole (Hawley and Williams, 2007). This is also confirmed by Sethi (2005), who mentioned that pension funds must attempt to increase their returns in line with factors that affect the state of the economy as a whole. The very huge pools of money that the pension funds must invest significantly limit their ability to move in and out of particular stocks without running the danger of destabilising the price of the impacted securities (Sethi, 2005). Sievänen et al. (2012) found that responsible investing seems to be far more prevalent with larger pension funds than with smaller ones. This actually holds true for all the variables relating to the size tested by them. This is in line with the literature in which it is argued that larger firms emphasize the importance of the environment in financial considerations more than smaller firms (Hawley and Williams, 2000).

This also aligns with the agency theory. The agency theory examines the interaction between the principals and the agents. The principals distribute tasks to the agents, who are subsequently expected to complete the tasks (Eisenhardt, 1989). In pension funds, the principals are the beneficiaries and the agents the fund managers who are expected to act in the best interests of the beneficiaries. Agency theory is about solving two problems that can occur in agency relationships. First, the agency problem that arises when there are conflicts of interest between principals and agents and it is hard or costly to monitor the agent because of information asymmetry. The second problem is the risk-sharing dilemma, which arises when the principal and agent have opposite opinions regarding risk, leading to different behaviours (Eisenhardt, 1989). The theory suggests that larger pension funds may have better resources to overcome these problems due to economies of scale, which makes sure they can align their investment strategies with the preferences of their beneficiaries (Schnatterly et al., 2008). Because larger pension funds often have more financial resources available, they are frequently more flexible in dedicating a percentage of their portfolio to sustainable investments without threatening their overall financial performance (Della Croce et al., 2011).

Another theory that applies to this is stakeholder theory, which refers to the manager's responsibility to defend all stakeholders' rights (Freeman, 1983). According to Freeman (1983), a stakeholder is any individual or group who can influence or is influenced by the attainment of the organisation's objectives. Freeman and Dmytriyev (2017) argued that there is some overlap between stakeholder theory and corporate social responsibility (CSR). The key point is that both stakeholder theory and CSR emphasise the need of incorporating societal concerns into operations. At the same time, the two concepts differ because stakeholder theory posits the key responsibilities of the business overall, where responsibility to society is one of the important components. CSR, on the other hand, prioritises a firm's orientation towards society as a whole over the other components. According to stakeholder theory, the core of a business is largely about developing relationships and producing value for all stakeholders (Freeman and Dmtriyev, 2017). As larger pension funds often have relatively more stakeholders who may demand for sustainable investments, larger pension funds are more likely to make a higher percentage of sustainable investments. Cordeiro and Tewari (2015) discovered that larger enterprises benefit from a considerably stronger investor reaction to their sustainable investments, most likely due to their greater visibility. Aside from that, given their higher visibility, stakeholders such as regulators and investors are likely to be more aware of larger enterprises' environmental performance. As a result, it is expected that bigger corporations will overcome their resistance to become more environmentally conscious (Cordeiro and Tewari, 2015). In this case, larger pension funds are thus expected to be more likely to make a higher percentage of sustainable investments.

This leads to null *hypothesis 1 (H_0^1): Larger pension funds make a higher percentage of sustainable investments than smaller pension funds*

2.2 Types of pension funds

According to the international literature on pension fund types, there are different types of pension funds, such as public, corporate and other types of pension funds. Managers of public pension funds may keep a close eye on management and push for necessary changes because they are unable to exit by selling large numbers of stock (Johnson and Greening, 1999). Proxy contests, shareholder amendments, floor motions delivered at shareholder meetings, and direct communication with management are all examples of ways for shareholders to express their opinions (Johnson and Greening, 1999). According to Sethi (2005), sustainable investments are the best option for public pension funds since they may significantly raise the standard of corporate behaviour in society. Furthermore, Sethi (2005) notes that public pension funds widen their investing approach by considering businesses' long-term risks including sustainability and environmental protection. This may be because public pension funds are more visible to the public and less impacted by conflicts of interest, such as those between the sponsor firm of the pension fund and moral principles (Juravle and Lewis, 2009). Corporate Social Performance (CSP) investment is often a long-term commitment (Mahapatra, 1984). According to Graves and Waddock (1994), the time horizon of a pension fund and the amount of time required to realise the rewards of investing in CSP must be compatible. According to Gilson and Kraakman (1991), pension funds are suitable for this because they often invest over a long time horizon because of the long average time between people starting to work and receiving a pension. These results support the claim made by Hill and Snell (1988) that a long-term perspective may be favourably related to improved corporate accounting and social performance. According to Sievänen et al. (2012), in terms of pension fund ownership, public pension funds are the most likely to make sustainable investments.

However, in the Netherlands, we do not have a relevant distinction between public, corporate and other types of pension funds. As described before, in the Netherlands there are three types of pension funds: industry pension funds, company pension funds, and occupational pension funds (Ponds & Van Riel, 2007). Company pension funds are most common in the Netherlands as 72.2 percent of Dutch pension funds are company pension funds in 2016, followed by industry pension funds at 21.6 percent

and only 3.8 percent of the pension funds are occupational pension funds (Maatman & Groffen, 2017). Besides this, 2.4 percent of Dutch pension funds are general pension funds in 2016 (Maatman & Groffen, 2017). As this is such a small percentage of pension funds, general pension funds will not be included in this research. However, no research has yet been done on the number of sustainable investments by different types of pension funds in the Netherlands, so this research will contribute to the literature on the types of Dutch pension funds regarding sustainability. Because we do not know what to expect regarding the influence of the types of Dutch pension funds on the percentage of sustainable investments, the following hypothesis we chose is somewhat arbitrary.

Null hypothesis 2 (H_0^2) is: the type of pension fund does not make a difference in the percentage of sustainable investments

2.3 Board of pension funds

Trustees are individually and collectively subject to the principle of fiduciary duty under common law and statute. They must make judgements in the best interests of the beneficiaries and act together with regard to long-term objectives in the face of short-term market imperatives. Governance is the fundamental tool for reconciling and managing these imperatives, thus pension funds need a convincing account of collective decision-making (Ambachtsheer et al., 2008). Pension fund governance may be defined as the monitoring, transparency, accountability, and decision-making rules that support a pension plan's operations and investments (Monk, 2009). The investment style and strategy of a pension fund should be compatible with its governance budgets: the formal allocation of scarce resources for improving decision-making (Clark and Urwin, 2008a). Decision-makers in pension funds rely on three types of resources: time, knowledge, and group commitment. There is no organisation that possesses a limitless supply of these commodities. Time, expertise, and collective devotion are all finite resources that can restrict the breadth of decision-making and, as a result, an institution's success in contrast to its peers (Clark and Urwin, 2008b).

Decision ecologies are the structures of interconnections between individual units and how these linkages combine with the behaviour of these units to produce systemic traits that cannot be attributed to individual behaviour alone (March, 1997). According to the literature, the decision ecologies of pension funds have three components. The first component is collegiality and fiduciary duty. Collegiality and fiduciary duty are widely defined by common law and/or statute. Fund boards are groups that work together. Board members are personally and collectively accountable for acts taken in conformity with a comprehensive fiduciary standard (Clark and Urwin, 2008b). The sense that Board members are regarded to represent beneficiaries and stakeholders, representativeness is another key component in the ecology of Pension Fund Boards (Clark, 2007). At one level, this implies that Board members should act in the best interests of others, which is in line with the previously discussed stakeholder theory. At a higher level, this might imply that stakeholders such as plan sponsors, employee unions, and retirees have a genuine right to be heard during Board debates. As a result, the competence of Board members is more diverse than that of Management Boards in the individual investment management business. Board members might have quite diverse perspectives on fundamental principles such as the importance of time, risk, the meaning and relevance of probability, and the importance of information (Clark et al., 2006). The final component is collective commitment. Trustees accept assignments in order to safeguard the interests of beneficiaries. They do it on significantly different terms than their counterparts at financial service providers' organisations. Many authorities and industrial sectors limit compensation to token attendance fees, missed wages, and reimbursement for meeting costs. It is debatable whether this should or should not be the case. It is a common ethic that guides how Board members view correct behaviour, either openly or implicitly (Clark and Urwin, 2008b). There are two significant consequences to this ethic. In contrast to corporate organisations, the relationship between remuneration and performance in Board deliberation is weak and frequently undermined by claims of conflicting and highly compensated tasks. Collective commitment, on the other hand, is a strong tool for mitigating the potential costs of representation and

reconciling widely divergent views on decision priorities (Clark and Urwin, 2008b). Effective leadership in pension fund governance comprises the following characteristics (Clark and Urwin, 2008b):

1. High personal regard based on industry reputation and dedication to the institution.
2. The capacity to arrange decision-making, particularly in terms of determining priorities and allocating time to make critical judgements.
3. The capacity to communicate and arbitrate between the Board's varied decision-making processes.
4. Sensitivity to managing stakeholder expectations, taking into account both soft and hard factors.
5. Experience with internal staffing of the fund as well as the creation and implementation of outside delegations.
6. Commitment to a culture and practise of accountability and measurement, both in board operations and executive team performance.
7. The capacity to shape the organization's culture and promote it to others.

Thus to optimise the governance of pension funds multiple important factors should be considered. First, time, expertise, and group commitment are all important factors that influence the type and quality of collaborative decision-making. The governance budget of an institution is defined by these aspects. Furthermore, while developing asset allocation strategies and goal rates of return, the availability of these resources should be taken into account (Clark and Urwin, 2008b). Besides this, leadership, defined as the equal use of talents and knowledge in ways that foster a group sense of commitment and responsibility, is a crucial component of best practice pension fund governance (Clark and Urwin, 2008b).

There is not much literature that expressly discusses governance in the context of sustainable investing or, more broadly, the need for a more sustainable economy (Woods and Urwin, 2010). However, one of Clark and Urwin's (2008a) key best-practice governance considerations for pension funds is mission clarity; it is critical that pension funds using a sustainable investment strategy make sure their objective is correctly adjusted. The great majority of pension funds have a typical objective. A sustainable investing objective would prioritise long-term value generation while simultaneously aiming to reduce risk by including ESG in investment selection. In addition to this, it would also involve a commitment to long-term planning and social equality (Clark and Urwin, 2008a). According to Aguilera et al. (2006), inconsistencies in corporate governance systems translate into variances in the priority assigned to a company's CSR programme. However, there are different views on the effect of governance on a pension fund's CSR programme. According to David et al. (2007), shareholder activism actually undermines corporate social performance: activism causes managers to divert resources away from CSR and onto political efforts in order to fight external pressures and preserve discretion. Prior et al. (2008) discover that a portion of CSR investments is utilised for managerial entrenchment in order to win support from stakeholders after employing techniques that harm shareholders' interests, such as earnings management. Dam and Scholtens (2012), on the other hand, demonstrate that institutional investor ownership has no effect on the CSR performance of the investment object. The majority of responsible investing is conducted by institutional investors; individual investors account for just a small portion of total responsible investment (Eurosif, 2010). In the Netherlands, governments encouraged pension funds to strengthen their governance, communication, and interaction with stakeholders. Therefore, stakeholders are now usually included in the decision-making processes of pension funds in the Netherlands (De Kruijf and De Vries, 2014). Clark (2000) argued that the size of a pension plan is an essential consideration in pension fund governance. In many ways, economies of scale affect the price of service supply both within and outside of pension funds. Furthermore, the more advanced the financial control systems, member services, and investment management products and services are, the larger the fund or co-operating

funds (Greenwich Associates, 1999). This assumes that the larger the pension fund board, the higher the percentage of sustainable investments. Besides this, Clark (2007) described representativeness as a key component of pension fund boards. The seven effective leadership characteristics by Clark and Urwin (2008b) also confirm this because it states that the capacity should be there to make decisions and stakeholders' opinions should be taken into account highly. This is in accordance with stakeholder theory, that was discussed before, where the firm should take into account the rights of all stakeholders (Freeman, 1983).

As previously discussed, agency theory examines the interaction between principals (beneficiaries) and agents (board members) in pension funds (Eisenhardt, 1989). This theory focuses on the alignment of interests between board members and beneficiaries. A larger and more diverse board can assist in minimising conflicts of interest as diverse board members are more likely to represent the interests of multiple stakeholders, including those calling for sustainable investments. Besides this, diverse viewpoints can help to question beliefs, generate interactions, and lead to more robust decisions about sustainable investments.

This is also in line with the resource dependency theory where organisations, including pension funds, rely on external resources and connections to exist and develop (Pfeffer & Salancik, 2003). According to Pfeffer & Salancik (2003), one feature of resource dependency theory is that the board serves as a resource supplier for the businesses. A board with strong ties to the outside world is intended to facilitate the firm's access to numerous resources (Nicholson & Kiel, 2007). According to Zahra & Pearce (1989), a larger board might bring in more experience and resources. Resource dependency theory also emphasises the relevance of different viewpoints, knowledge, and experiences represented on the board, resulting in more in-depth conversations about sustainable investments, which may result in a higher percentage of sustainable investments. This leads to the following hypothesis.

Null hypothesis 3 (H_0^3) is: the larger and more diverse the pension fund board, the higher the percentage of sustainable investments.

2.4 Organisation of the pension plan

The funding type of a pension plan lends itself well to a pension fund study since it is a fundamental concern in many pension debates (OECD, 2009). Sievänen et al. (2012) studied the effect of the pension plan funding type of defined benefit, defined contribution, hybrid or other on the numbers of responsible investments. The benefits system, often known as a defined benefit (DB) scheme, is the most prevalent. The number of years worked and the number of contributions made determines the pension amount under this plan. The pension rights of both working people and retirees will, in theory, be modified each year in line with inflation or the sector's wage growth if the fund's financial situation allows for it (Pensioenfederatie.nl, n.d.). Contribution plans also referred to as defined contribution (DC) plans, are also an option. In these plans, the pension amount is determined by the accrual phase contributions made and the return on those contributions. In theory, the employee is responsible for both the interest rate risk and the investment risk. A pension plan might also combine the aforementioned two frameworks (Pensioenfederatie.nl, n.d.). In addition to DB and DC schemes, the Netherlands has hybrid systems known as Collective Defined Contribution (CDC) pension schemes. As with a DB scheme, the amount of the pension is determined by pay and service years. However, the contribution is fixed for a long period of time. CDC programmes combine the benefits of a collective pension system with the low risk of variable pension liabilities for the employer (Pensioenfederatie.nl, n.d.). However, in the Netherlands, 95% of the second-pillar pensions are defined benefit (DB) and only 5% are defined contribution (DC) pensions (Bovenberg & Gradus, 2015). In addition to this, the Dutch pension system will be completely overhauled in the near future and all DB schemes will be converted into DC schemes, so there will be no distinction between these schemes in the Netherlands anymore (Van Meerten & Van Zanden, 2021). Besides this, Sievänen et al. (2012) found that the pension plan funding type does not significantly influence the percentage of

sustainable investments. Therefore, the organisation of the pension plan is considered not relevant to study as a driver for sustainable investments by Dutch pension funds.

3. Data

3.1 Data collection

To study the driving factors for sustainable investments, quantitative research is performed using publicly available data from Dutch pension funds and the VBDO. The VBDO gave scores to fifty pension funds, so this is the sample size of this research. The scores from the VBDO on Responsible Investments by Pension Funds from 2020 and 2021 are used together with the annual reports of 2020 and 2021 and the information on the website of each pension fund. This sample period allowed us to study the recent sustainable performance of Dutch Pension funds and gave us the opportunity to identify the driving factors for sustainable investments. The scores of the VBDO are distinguished in the overall scores of each pension fund's responsible investments and scores on the governance, policy, implementation and accountability of responsible investments. For this research, the relationship between the driving factors for sustainable investments and the overall sustainability scores the VBDO gave to each pension fund is assessed.

3.2 Variables

In Table 1 below you can see an overview of the dependent and independent variables and the corresponding data types.

Variable	Variable name and description	Data type
Dependent variable (Y)	**VBDO scores (Y)** **VBDO**: Overall score **VBDOGov**: Governance score **VBDOPol**: Policy score **VBDOImp**: Implementation score **VBDOAcc**: Accountability score	Continuous data (continuous in the range 0-5)
Independent variables (X)	**Size (X1)** **EmpCov**: Number of employees covered by pension fund **RecNow**: number of people receiving pension right now **PortSize**: portfolio financial size	Continuous data
	Type (X2) **TypeIn**: Industry pension fund **TypeCom:** Company pension fund **TypeOcc:** Occupational pension fund	Binary data
	Board (X3) **SizeB:** Total number of board members **ChairP**: Percentage of chairmen on board **EmplP**: Percentage of board members on behalf of the employers **WorkfP**: Percentage of board members on behalf of the employees **RetirP**: Percentage of board members on behalf of the pensioners **ExpP**: Percentage of independent experts on board	Continuous data

Table 1: Overview of variables

First, the dependent variable (Y) is the sustainability score the VBDO gave to pension funds. The VBDO gave each pension fund an overall sustainability score (VBDO), and a score on governance (VBDOGov), policy (VBDOPol), implementation (VBDOImp) and accountability (VBDOAcc). The data is continuous with zero being the lowest and five being the highest possible score. As stated before, due to time limitations, only the relationship between the driving factors and the overall score of the VBDO is studied.

Because for this research a relatively small sample is used, the effect of three independent variables on the dependent variable are tested. The first independent variable is the size of pension funds (X1). To test the effect of the size of pension funds on the percentage of sustainable investments, multiple measures of size are used: the number of employees the pension scheme covers (EmpCov), the number of persons receiving pension right now (RecNow), and the portfolio financial size (PortSize). Because we do not have a very large sample, several linear regressions are run to see if we got the same results for the different measures of size.

The second independent variable is the type of pension fund (X2). As described before, in the Netherlands, the relevant distinction is between industry, company and occupational pension funds. To test the effect of the type of pension fund on the percentage of sustainable investments, dummies are used and multiple regressions are run. The dummy variables for each type of pension fund are Industry, Company, Occupational. To avoid the occurrence of a dummy trap where the independent variables become multicollinear, one of the dummy variables will be left out (Liaquat, 2020). SPSS automatically leaves out one of the dummy variables so it can function as a comparison group.

The third and last independent variable in this study is the board of Dutch pension funds (X3). In this case, multiple linear regressions are run to assess the effect of the governance of Dutch pension funds, the percentage of board members represented by employers (EmplP), employees (WorkfP), pensioners (RetirP), independent experts (ExpP) and individual chairmen (ChairP) on the percentage of sustainable investments. This allows us to study whether the total number of board members (SizeB) influences the percentage of sustainable investments and/or which representatives influence this. It should be noted that in the literature board diversity often refers to the age and gender of board members. However, this data is not available for all Dutch pension funds in our sample, so we study the effect of another measure of board diversity as given above.

Last, we have a control variable which is the year. As stated before, the pension funds' data and VBDO scores for both 2020 and 2021 are analysed. With this sample period, we are able to study the recent sustainable performance of Dutch Pension funds and can find out if the percentage of sustainable investments increased in 2021 compared to 2020. The dummy variable Year is used for this where 1 = 2021 and 0 = 2020.

3.3 Summary statistics

For each variable, some sample statistics are provided. First, the mean, median, mode, minimum and maximum are important sample statistics because it gives insight into the range and center of the dataset regarding the size, board, and VBDO scores and identifies whether a pension fund and its board are small or large compared to other pension funds and whether their VBDO score is relatively high or low. In addition to this, it is important to find out if there are any outliers because their presence can lead to misleading interpretations. To identify if the variance is relatively high and if there are any outliers in the dataset, we look at the boxplot, histogram, and standard deviation. If it appears that there are outliers, these will be removed from the dataset to avoid bias. The number of missing values is also of great importance because we should look at the reason why these values are missing and how we should treat them. We also show a correlation matrix to see whether there are variables that strongly correlate with each other.

Table 2 displays the descriptive statistics for the dependent variable as well as all of the independent variables. The mean is the average number, the median refers to the middle value when ordering all values from lowest to highest and the mode the most occurring number in the dataset (Kumar, 2020). The standard deviation is a measure of the spread of observations within a dataset in relation to the mean. The minimum is the lowest value and the maximum the highest occurring number in the dataset (Kumar, 2020). The number of observations for all variables has been reduced to n=93 due to incomplete data. The reason for this is that not all needed data were mentioned for three pension funds in both 2020 and 2021 and two pension funds merged in 2020, leading to the same data for both of them, so one of these pension funds was removed from the dataset. Based on the Table below, there are no outliers. The big difference between the minimum and maximum of the measures of size is explained because there are bigger and smaller pension funds included in the analysis. The standard deviations and thus variances for the measures of size are also relatively big due to this.

Variable	N	Mean	Median	Mode	Std. Deviation	Minimum	Maximum
VBDO	93	2.216	2.200	1.4	.8222	.7	4.3
EmpCov	93	358771.16	94119	5616	665276.029	5616	3118276
RecNow	93	71414.88	22445	2448	160216.132	2442	974772
PortSize (mln €)	93	33719.25	9453	3693	84278.331	3693	551644
TypeIn	93	.55	1	1	.500	0	1
TypeCom	93	.43	0	0	.498	0	1
TypeOcc	93	.02	0	0	.146	0	1
SizeB	93	9.76	9	8	2.072	6	15
ChairP (%)	93	11.5636	11.1111	12.50	3.82252	6.67	28.57
EmplP (%)	93	37.4588	37.5	50	12.93819	14.29	87.50
WorkfP (%)	93	30.4073	30	25	10.17093	0	54.55
RetirP (%)	93	17.55	16.6667	12.50	7.77966	7.14	50
ExpP (%)	93	14.3273	11.1111	0	14.42621	0	50
Year	93	.51	1	1	.503	0	1

Table 2: Descriptive statistics

As described before, we would look at the boxplots and histograms to identify if the variance is relatively high and if there are any outliers in the dataset. As we observed in the boxplots in Appendix A, there are outliers for the variables of Size. However, this is due to the fact that bigger and smaller pension funds are included in the model. To include the data of bigger pension funds to identify the influence of Size on the VBDO scores, these observations will be kept in the dataset. For the variables of Board, outliers can be observed as well. However, these will not be removed either as this might

bias the outcomes of this study. As the variables Type and Year are dummy variables, it is not relevant to look at these graphs. When looking at the histograms for the measure of Size, it was observed that most of the observations are quite close to each other, with a few observations being larger. This is also due to the differences in the size of the included pension funds. All in all, no problematic outliers were found and the 93 observations will be kept for our data analysis.

3.4 Correlation coefficients

In this section, we will discuss the correlation coefficients of the variables. The correlation matrix below shows which of the variables are highly correlated. A correlation of above .5 or below -.5 is chosen to be regarded as a high correlation. In Table 3, it can be observed that the three measures of size are strongly correlating. In addition to this, ExpP has significant negative relationships with EmplP, WorkfP, and RetirP. When looking at the variable Board, there is a significant negative relationship between SizeB and ChairP. Besides this, the relationship between TypeOcc and EmplP is positive and significant as well.

	VBDO	EmpCov	RecNow	PortSize	TypeIn	TypeCom	TypeOcc	SizeB	ChairP	EmplP	WorkfP	RetirP	ExpP	Year
VBDO	1													
EmpCov	.578**	1												
RecNow	.586**	.908**	1											
PortSize	.539**	.867**	.988**	1										
TypeIn	.335**	.400**	.320**	.236*	1									
TypeCom	-.304**	-.380**	-.304**	-.227*	-.957**	1								
TypeOcc	-.112	-.076	-.059	-.036	-.163	-.129	1							
SizeB	.540**	.482**	.464**	.432**	.127	-.090	-.127	1						
ChairP	-.134	-.284**	-.271**	-.268**	.006	-.017	.037	-.549**	1					
EmplP	-.032	.200	.140	.100	.190	-.359**	.576**	-.046	.057	1				
WorkfP	.057	.129	.042	.023	.066	.064	-.446**	-.057	.154	-.267**	1			
RetirP	-.029	-.106	-.023	-.002	-.343**	.373**	-.097	-.024	-.061	-.223*	.037	1		
ExpP	-.018	-.205*	.134	-.101	-.020	.064	-.148	.069	-.107	-.558**	-.470**	-.343**	1	
Year	.169	-.001	.005	.011	.010	-.009	-.002	-.020	-.058	.025	-.067	.046	-.004	1

Table 3: Correlation matrix

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

4. Research method

A literature review was performed to describe the impact Dutch pension funds can make on sustainability by making sustainable investments. In addition to this, a literature review was used to find the factors potentially influencing the percentage of sustainable investments by pension funds according to the literature. The empirical part of this thesis tests the three hull hypotheses described in chapter 2 on the basis of multiple linear regression.

4.1 Regression model

The independent variables and the dependent variable were discussed in the previous chapter. When combining the variables, the following regression model is formed:

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + \beta_2 X_{2,it} + \beta_3 X_{3,it} + \varepsilon_{it}$$

In this model, i refers to the pension fund and t to the control variable Year.

We will now discuss how we chose the combinations of X1, X2 and X3. We have a relatively small dataset and we wanted to avoid overfitting. Babyak (2004) described that findings in an overfitted

model do not actually exist in the population. Green (1991) has shown that with the power to detect an effect size, a good approach could be to have a minimum sample size of 50 observations and around 8 extra observations per predictor. However, if the impact size is modest or the predictors are highly linked, a substantially greater number of observations may be required (Green, 1991). According to Babyak (2004), combining different predictors can be a manner of avoiding overfitting. The combinations of independent variables that are included are chosen based on the VIF values, which were used to measure multicollinearity. To fulfil the multicollinearity assumption, the VIF values should all be below 10 and the tolerance should be above 0.1 (Field, 2009). If multicollinearity is an issue, we have to solve this by not including the variables with the highest VIF factors in our data analysis. This reduces the number of regressions that are run and prevents multicollinearity.

4.2 Hypothesis testing

For each of the models that we create based on the VIF values, we test the three hypotheses described in chapter 2. As there are indications that there is no homoscedasticity and normality of errors, we will use a Z-test with robust standard errors.

We expect a positive relationship between the size of a pension fund and the percentage of sustainable investments. Therefore, the null hypothesis becomes H_0^1: $\beta_1 > 0$ and the alternative hypothesis H_1^1: $\beta_1 \leq 0$. To test the null hypothesis, we run a z-test. We reject H_0^1 in favour of H_1^1 if the z-statistic $\left(\frac{\beta_1}{\sigma(\beta_1)}\right)$ < 5% quantile of z (equal to -1.645 (95% CI)).

We expect the type of pension fund to not make a difference in the percentage of sustainable investments. This leads to the null hypothesis *(H_0^2)*: $\beta_2 = 0$ and the alternative hypothesis *(H_2^2)*: $\beta_2 \neq 0$. A z-test will be run to test this null hypothesis. H_0^2 will be rejected in favour of H_2^2 if the z-statistic $\left(\frac{\beta_2}{\sigma(\beta_2)}\right)$ < 2.5% quantile of z (equal to -1.96) or if the z-statistic $\left(\frac{\beta_2}{\sigma(\beta_2)}\right)$ > 97.5% quantile of z (equal to +1.96) (95% CI)).

We expect a positive relationship between the size and diversity of the pension fund board and the percentage of sustainable investments. Therefore, the null hypothesis is *(H_0^3)*: $\beta_3 > 0$ and the alternative hypothesis *(H_3^3)*: $\beta_3 \leq 0$. To test the null hypothesis, a z-test will be run. We will reject H_0^3 in favour of H_3^3 if the z-statistic $\left(\frac{\beta_3}{\sigma(\beta_3)}\right)$ < 5% quantile of z (equal to -1.645 (95% CI)).

4.3 Regression quality

To get an overall view of the model, the Model Summary table in SPSS will be analysed. First, R^2 shows how much of the variation in the dependent variable is explained by the independent variables. However, R^2 always becomes higher when including more independent variables, so a regression model may appear to offer a better fit only because it has more independent variables (Frost, 2017). This can bias the results because the added independent variable might not actually improve the model fit. To solve this issue, the adjusted R^2 should be used as it corrects for the number of variables in the model. When using the adjusted R^2, the value only rises when it enhances the model fit more than would be predicted by chance alone. When the term doesn't sufficiently enhance the model fit, the adjusted R^2 falls (Frost, 2017). Because we have a multiple linear regression with multiple independent variables, the adjusted R^2 should be used to assess the model fit. A high adjusted R^2 indicates that the model is a good fit, while a low adjusted R^2 means that there are factors that influence the dependent variable which are not included in the model (Fernando, 2021).

There are multiple assumptions that should be fulfilled to be able to perform a multiple linear regression. First, the dependent variable should be continuous and the independent variables should be continuous or categorical, which is the case. The second assumption is that the observations should be independent. This can be done by looking at the Durbin-Watson statistic. Assumption three is that the independent variables should both separately and collectively have a linear relationship with the

dependent variable (Laerd Statistics, n.d.). There are multiple ways to check linearity, for example, by looking at the scatterplots and partial regression plots in SPSS. The fourth assumption is that the variances of the error term should be constant, also called homoscedasticity. To assess this, the standardized residuals should be plotted against the unstandardized residuals. No pattern should be observed to fulfil this assumption. Assumption five is that there should be no multicollinearity, which means that multiple independent variables are strongly correlated. SPSS automatically checks for multicollinearity, but we also look if the VIF values are below 10 and the tolerance is above 0.1 to check if assumption five could be fulfilled (Field, 2009). The last assumption is that the residuals are normally distributed. To fulfil this assumption, the Q-Q plot should be an approximately straight line (Laerd Statistics, n.d.).

If all of these assumptions were fulfilled, a multiple linear regression with a t-test could be used. However, there are indications that there is heteroscedasticity and no normality of errors, so we can still perform a multiple linear regression, but we have to use a Z-test with robust standard errors to solve this issue.

5. Results

This chapter presents the results of the data analysis. First, the Model Summary is given. Second, the selection of the combinations of variables for the regression analysis is discussed. Lastly, the results of the regression analysis are presented.

5.1 Model Summary

To get an overall view of the model, first, the Model Summary table in SPSS is analysed. As described before, we have a multiple linear regression with many independent variables, so we should use the adjusted R^2 to evaluate the model fit because the adjusted R^2 only rises when an additional independent variable enhances the model fit more than would be predicted by chance alone (Frost, 2017). A high adjusted R^2 suggests that the model is well-fitting, whereas a low adjusted R^2 indicates that there are variables influencing the dependent variable that is not accounted for in the model (Fernando, 2021). As can be observed in the Model Summary in Table 4 below, in which all of the variables in our model are included, the adjusted R^2 is .536. This shows that 53.6% of the variance in the VBDO scores is explained by the independent variables in the model. It depends on the context of whether an adjusted R^2 is a good model of fit. However, because this research is in the field of social sciences, the adjusted R^2 .536 can be considered relatively strong (Fernando, 2021). The average distance between the observed values and the regression line is shown by the standard error of the estimate (Frost, n.d.). It shows how consistently inaccurate the regression model is. Smaller values are better since they show that the observations are more closely aligned to the fitted line (Frost, n.d.). The standard error of the estimate is .5600, which is relatively high. This is most likely caused by the large difference in the size of pension funds included in our sample.

Model	R	R Square	Adjusted R Square	Std. error of the estimate
1	.772	.597	.536	.5600

Table 4: Model Summary

5.2 Selection of variables

In this section, we will discuss the selection of variables. As described before, we will choose the combinations of independent variables in our data analysis based on the VIF values to prevent multicollinearity. The variance inflation factor (VIF) calculates how much an independent variable's variance is inflated by its interaction and association with other independent variables. Variance inflation factors provide an assessment of the contribution of a variable to the standard error in the

regression (Investopedia, 2023). As described before, if the VIF values are below 10 and the tolerance levels are above 0.1, multicollinearity is not an issue (Field, 2009).

To test the effect of Size (X1) on the VBDO scores, one regression will be run with X1 = PortSize and one regression with X1 = EmpCov. The VIF values were checked again with PortSize included instead of EmpCov and these values were all below 10 as well, so there is no multicollinearity with the other variables in the regression. For X2, TypeIn was chosen as it is the only type of pension fund with a positive correlation. For X3, SizeB was selected for both regressions as it has a strong and significant correlation with the VBDO score and the other variables of Board do not have significant correlations. To test the effect of Type (X2), for each type a regression is run with X1 = EmpCov and X3 = SizeB for the reasons described before. For the variable Board (X3), for each variable of X3, a regression is run to test the effects of the size of the board and the effect of each type of board member on the VBDO scores. In these regressions, X1 = EmpCov as well, and X2 = TypeIn. In Appendix B, the tolerance levels and VIF values of each of these combinations of independent variables in a regression are given. The tolerance levels in all of these regressions are above 0.1 and the VIF values below 10, so multicollinearity is not an issue in these regressions.

5.3 Regression analysis

In this section, the regression analysis will be performed. As described before, there are indications that there is heteroscedasticity and no normality of errors, so we will use a Z-test with robust standard errors. In addition to this, the natural logarithm of Size (X1) was taken when running each regression to prevent heteroscedasticity. We looked at whether the results differed when we added and did not add the Year variable to our regressions. This showed that the Year variable did not make a big difference in the results. Since we have a small dataset, we omit the Year variable from our regressions.

5.3.1 Size

Below, Table 5 and 6 show the regressions for two measures of Size (X1): EmpCov and PortSize.

Parameter Estimates with Robust Standard Errors

Dependent variable: Overall VBDO score					
Parameter	B	Robust Std. Error	Z	Sig.	Adjusted R^2
Intercept	-1.813	.519	-3.493	<.001	.432
EmpCov	.244	.064	3.790	<.001	
TypeIn	.040	.180	.223	.824	
SizeB	.121	.042	2.867	.005	

Table 5: Regression 1

Parameter Estimates with Robust Standard Errors

Dependent variable: Overall VBDO score					
Parameter	B	Robust Std. Error	Z	Sig.	Adjusted R^2
Intercept	-2.316	.421	-5.501	<.001	.508
PortSize	.359	.069	5.173	<.001	
TypeIn	.289	.131	2.205	.030	
SizeB	.100	.044	2.282	.025	

Table 6: Regression 2

When looking at both regressions, it can be observed that the Z-statistics for EmpCov and PortSize are quite different from each other. On the other hand, the Z-statistics of SizeB in both regressions are quite close to each other, which shows robustness. However, the Z-statistics for TypeIn differ quite a

lot between the two regressions, which shows that the effect of TypeIn on the VBDO score is much larger when PortSize is taken into account instead of EmpCov. When looking at the adjusted R^2 of Regression 1 and 2, it can be observed that the adjusted R^2 is higher when the Portfolio financial size is included (adjusted $R^2 = .508$) in comparison to when the Number of employees covered is included in the regression (adjusted $R^2 = .432$). This shows that slightly more variability in the VBDO score is explained by the model with the Portfolio financial size included.

As described before, the null hypothesis is H_0^1: $\beta_1 > 0$ and the alternative hypothesis H_1^1: $\beta_1 \leq 0$. When looking at the parameter estimates with robust standard errors, we can observe that $\beta_1 > 0$. For Regression 1, $\beta_1 = .244$ and for Regression 2, $\beta_1 = .359$. Besides this, the z-statistic $\left(\frac{\beta_1}{\sigma(\beta_1)}\right)$ should be < 5% quantile of z (equal to -1.645 (95% CI)) to reject the null hypothesis. However, the z-statistics for both EmpCov and PortSize are above -1.645, so we do not have enough evidence to reject the null *hypothesis 1 (H_0^1): Larger pension funds make a higher percentage of sustainable investments than smaller pension funds.* This is in line with the study of Sievänen et al. (2012), in which was found that larger pension funds appear to be more likely to make a higher percentage of sustainable investments than smaller pension funds.

5.3.2 Type

The regression for industry pension funds is already shown in Table 5: Regression 1. Below, in Tables 7 and 8, the regressions for the other Types (X2): company and occupational pension funds, are given.

Parameter Estimates with Robust Standard Errors

Dependent variable: Overall VBDO score					
Parameter	B	Robust Std. Error	Z	Sig.	Adjusted R^2
Intercept	-1.770	.571	-3.100	.003	.432
EmpCov	.243	.060	4.076	<.001	
TypeCom	-.045	.167	-.268	.789	
SizeB	.121	.042	2.881	.005	

Table 7: Regression 3

Parameter Estimates with Robust Standard Errors

Dependent variable: Overall VBDO score					
Parameter	B	Robust Std. Error	Z	Sig.	Adjusted R^2
Intercept	-1.893	.448	-4.227	<.001	.432
EmpCov	.254	.045	5.670	<.001	
TypeOcc	.057	.431	.133	.895	
SizeB	.118	.038	3.130	.002	

Table 8: Regression 4

When looking at the regressions, it can be observed that the Z-statistics of EmpCov in Regression 1 and 3 are quite close to each other. However, for Regression 4, when occupational pension funds are taken into account, the Z-statistic are much higher, showing a stronger effect of EmpCov on the dependent variable. This implies that when occupational pension funds are larger, the effect on the VBDO score is stronger than for the other types of pension funds. For SizeB, the Z-statistics in Regression 1 until 4 are all quite close to each other, which shows robustness in the results. When looking at the adjusted R^2 of Regression 1, 3 and 4, it can be observed that the adjusted R^2 are the same for all types of pension funds (adjusted $R^2 = .432$). This shows that for all types of pension funds, the same percentage of the variance in the VBDO score is explained by the variance of the independent variables in the regression.

As described before, null hypothesis is *(H_0^2)*: $\beta_2 = 0$ and the alternative hypothesis *(H_2^2)*: $\beta_2 \neq 0$. When looking at the parameter estimates with robust standard errors, we can observe that $\beta_2 \neq 0$, as β_2 is negative for Company pension funds ($\beta_2 = -.045$) and positive for Occupational ($\beta_2 = .057$) and Industry pension funds ($\beta_2 = .040$). H_0^2 will be rejected in favour of H_2^2 if the z-statistic $\left(\frac{\beta_2}{\sigma(\beta_2)}\right)$ < 2.5% quantile of z (equal to -1.96) or if the z-statistic $\left(\frac{\beta_2}{\sigma(\beta_2)}\right)$ > 97.5% quantile of z (equal to +1.96) (95% CI). However, the z-statistics for each type of pension fund fall within this 95% CI, so we do not have enough evidence to reject *null hypothesis 2 (H_0^2) is: the type of pension fund does not make a difference in the percentage of sustainable investments.* Because there is no existing literature on the influence of the types of Dutch pension funds on the percentage of sustainable investments, we did not know what to expect so this hypothesis was somewhat arbitrary.

5.3.3 Board

In Table 5: Regression 1, SizeB is taken into account. The regressions with the other variables for Board (X3) are shown below.

Parameter Estimates with Robust Standard Errors

Dependent variable: Overall VBDO score					
Parameter	B	Robust Std. Error	Z	Sig.	Adjusted R^2
Intercept	-1.877	.649	-2.894	.005	.368
EmpCov	.359	.053	6.823	<.001	
TypeIn	-.107	.170	-.632	.529	
ChairP	-.001	.022	-.045	.964	

Table 9: Regression 5

Parameter Estimates with Robust Standard Errors

Dependent variable: Overall VBDO score					
Parameter	B	Robust Std. Error	Z	Sig.	Adjusted R^2
Intercept	-1.662	.563	-2.953	.004	.385
EmpCov	.365	.051	7.089	<.001	
TypeIn	-.078	.166	-.468	.641	
EmplP	-.009	.006	-1.545	.126	

Table 10: Regression 6

Parameter Estimates with Robust Standard Errors

Dependent variable: Overall VBDO score					
Parameter	B	Robust Std. Error	Z	Sig.	Adjusted R^2
Intercept	-1.904	.567	-3.356	.001	.368
EmpCov	.359	.053	6.788	<.001	
TypeIn	-.109	.167	-.654	.515	
WorkfP	.000	.007	.045	.964	

Table 11: Regression 7

Parameter Estimates with Robust Standard Errors

Dependent variable: Overall VBDO score					
Parameter	B	Robust Std. Error	Z	Sig.	Adjusted R^2
Intercept	-1.938	.578	-3.355	.001	.368

EmpCov	.357	.052	6.849	<.001	
TypeIn	-.088	.175	-.500	.618	
RetirP	.003	.007	.434	.666	

Table 12: Regression 8

Parameter Estimates with Robust Standard Errors

Dependent variable: Overall VBDO score					
Parameter	B	Robust Std. Error	Z	Sig.	Adjusted R^2
Intercept	-2.040	.580	-3.516	<.001	.373
EmpCov	.367	.053	6.923	<.001	
TypeIn	-.121	.169	-.712	.478	
ExpP	.004	.005	.765	.446	

Table 13: Regression 9

When looking at the regressions, it can be observed that for TypeIn, the Z-statistics are quite close to each other when the other variables change, which is a sign of robustness. On the other hand, for EmpCov, the Z-statistics are differing. In comparison to the regressions in the previous section, the Z-statistics of EmpCov are quite a lot higher when another variable for Board is chosen than SizeB. This shows that when a percentage of board representatives is taken into account, the effect of pension fund size on the VBDO score is stronger. When looking at the adjusted R^2 of Regression 1, 5, 6, 7, 8, and 9, it can be observed that the adjusted R^2 is highest when the Size of the board is included (adjusted $R^2 = .432$) in comparison to when the percentage of board representatives are included in the regression. This shows that more variability in the VBDO score is explained by the model with the Size of the Board included than the percentage of board representatives included in the regression. When comparing the adjusted R^2 of Regression 5 until 9, it can be seen that the adjusted R^2 are all quite close to each other, but is highest when the percentage of employers on the board (adjusted $R^2 = .385$) are included, followed by when the percentage of independent experts (adjusted $R^2 = .373$) are included in the regression. The variables which explain the lowest variability in the VBDO scores are the percentages of chairmen, pensioners and employees on board with an adjusted R^2 of .368.

As described before, we expect a positive relationship between the size and diversity of the pension fund board and the percentage of sustainable investments. The null hypothesis is *(H_0^3)*: $\beta_3 > 0$ and the alternative hypothesis *(H_3^3)*: $\beta_3 \leq 0$. As can be observed from the parameter estimates with robust standard errors, $\beta_3 > 0$ for most types of board members. In Regression 1, $\beta_3 = .121$, in Regression 5, $\beta_3 = -.001$, in Regression 6, $\beta_3 = -.009$, in Regression 7, $\beta_3 = .000$, in Regression 8, $\beta_3 = .003$, and in Regression 9, $\beta_3 = .004$. To reject H_0^3 in favour of H_3^3, the z-statistic $\left(\frac{\beta_3}{\sigma(\beta_3)}\right)$ should be < 5% quantile of z (equal to -1.645 (95% CI)). However, the z-statistics for each type of board member are above -1.645 (95% CI). This means that we do not reject the *null hypothesis 3 (H_0^3): the larger and more diverse the pension fund board, the higher the percentage of sustainable investments.* This is in line with research by Eccles, Ioannou, and Serafeim (2014) who discovered that organisations with more diverse boards are more likely to engage in ESG practices, such as sustainable investment. The reason for this may be that more diverse boards have a wider set of viewpoints and experiences, also about sustainable investments.

6. Discussion

The following sections present an in-depth discussion of each factor that focuses on the key findings, their relevance, and their contribution to the existing literature and practical knowledge.

6.1 Size

Null hypothesis 1 (H_0^1): Larger pension funds make a higher percentage of sustainable investments than smaller pension fund

We wanted to discover if larger pension funds make a higher percentage of sustainable investments than smaller pension funds. This study's findings revealed that we do not have enough evidence to reject the null hypothesis, showing that there is a significant difference in the proportion of sustainable investments made by larger and smaller pension funds. This finding is consistent with prior research by Sievänen et al. (2012), who discovered that responsible investments are more common in large pension funds. It also supports the literature's view that larger enterprises place greater emphasis on the environment in financial considerations than smaller firms (Hawley and Williams, 2000).

The findings of this study may be looked at from the perspective of different theoretical approaches as well. According to agency theory, which studies the relationship between principals and agents, larger pension funds may have more resources to match their investment strategies with the desires of their beneficiaries (Schnatterly et al., 2008). Larger funds benefit from economies of scale that allow them to overcome conflicts of interest and information asymmetry more easily, to make sure their investment decisions match the interests of their beneficiaries. This is consistent with the view that larger pension funds often have more financial resources at their disposal and can more easily allocate a portion of their portfolio to sustainable investments without affecting their overall financial health (Della Croce et al., 2011).

Stakeholder theory may also help explain why larger pension funds have a higher share of sustainable investments. Bigger funds, according to stakeholder theory, have a bigger number of stakeholders who may demand sustainable investments and emphasise the inclusion of social concerns into operations (Freeman, 1983). According to stakeholder theory, a company's most important role is to build relationships and provide value for all stakeholders. With a bigger shareholder base, larger pension funds are more likely to feel pressure to choose sustainable investments. This is confirmed by the findings of Cordeiro and Tewari (2015), who discovered that larger firms obtain a better investor response to their sustainable investments, owing to their increased visibility.

This study makes a theoretical contribution by applying and extending agency theory and stakeholder theory to the setting of pension funds. The findings show that larger funds benefit from economies of scale, allowing them to overcome agency issues and better match the expectations of their beneficiaries. Furthermore, this study advances stakeholder theory by emphasising the importance of stakeholders in influencing pension fund decisions regarding investments.

This research's findings have effects on pension fund managers and policymakers. It emphasises the need to consider the size of pension funds when developing strategies and policies to support sustainable investing. Given their resources, stakeholder expectations, and visibility, larger pension funds may have a better capability and desire to include sustainability in their investment decisions. Policymakers can profit from the current situation by offering incentives and assistance to encourage sustainable investments among pension funds, while also taking into account the specific problems and restrictions that smaller funds face.

6.2 Type

Null hypothesis 2 (H_0^2): the type of pension fund does not make a difference in the percentage of sustainable investments

The results do not give enough evidence to reject the null hypothesis and according to the results of this study, the type of pension fund does not make a difference in the percentage of sustainable investments. This implies that taking sustainability into account when making investment decisions is a common practice among various types of pension funds. It indicates that the desire to engage in sustainable investments is not restricted to particular types of pension funds.

According to the worldwide literature, public pension funds are more likely to engage in sustainable investments and evaluate long-term risks, such as protecting the environment, due to their visibility and fewer conflicts of interest. This is consistent with the idea that public pension funds are more accountable to the public and are more likely to prioritise societal well-being (Sethi, 2005; Juravle and Lewis, 2009). Furthermore, because pension funds frequently have a time horizon of many decades, they are well-suited for long-term commitments such as corporate social performance (CSP) investments (Graves and Waddock, 1994; Gilson and Kraakman, 1991). The findings provide credibility to the notion that a long-term view is connected with superior company accounting and social performance (Hill and Snell, 1988). However, it should be noted, that this study focuses on the Dutch pension fund environment, which consists of other types of pension funds, including industry pension funds, company pension funds, and occupational pension funds. While worldwide research indicates that public pension funds are more likely to engage in sustainable investments, research on the impact of various pension fund types in the Dutch environment is scarce. This study adds to the pool of research by investigating the link between pension fund types and the percentage of sustainable investments in the Netherlands. However, additional research is needed to investigate the influence of Dutch pension fund types on sustainable investment practices.

6.3 Board

Null hypothesis 3 (H_0^3): the larger and more diverse the pension fund board, the higher the percentage of sustainable investments.

The outcomes of this study do not give enough evidence to reject the null hypothesis, so the larger and more diverse the pension fund board, the higher the percentage of sustainable investments. Although we used another measure of the diversity of the board than in the literature where board diversity often refers to the age and gender of board members, the measure of diversity we adopted regarding the percentage of representatives on the board on behalf of the employers, employees, pensioners and independent experts also leads to a higher percentage of sustainable investments. The larger and more diverse a pension fund board, the greater the opportunity for embracing different viewpoints, information, and experiences (Clark and Urwin, 2008b). This diversity promotes active discussion and challenges pre-existing assumptions, eventually leading to more in-depth discussions about sustainable investments (Clark, 2007). Eccles, Ioannou, and Serafeim (2014) discovered that organisations with more diverse boards are more likely to engage in ESG practices, such as sustainable investments. The authors claim that diverse boards are better suited to address sustainability issues and opportunities because they have a wide set of viewpoints and experiences. These findings are also supported by a number of theoretical points of view, including stakeholder theory, agency theory, and resource dependency theory.

Stakeholder theory emphasises the necessity of addressing all stakeholders' rights and desires in decision-making processes (Freeman, 1983). A broader and more diverse board is more likely to reflect the interests of a wide range of stakeholders, including those calling for long-term investments.

Agency theory investigates the interaction between pension fund principals (beneficiaries) and agents (board members) (Eisenhardt, 1989). A larger board with diverse members decreases the possibility of conflicts of interest and guarantees that the board reflects more and broader viewpoints. This increases accountability and supports decision-making that is aligned with the beneficiaries' interests in the long term, such as adopting sustainable investments.

According to resource dependency theory, organisations, including pension funds, rely on outside resources and relationships to grow (Pfeffer & Salancik, 2003). The board acts as a resource provider, providing several resources and connections. A bigger and more diverse board brings a wealth of experience, expertise, and external connections to the table. This improves the board's ability to hold more in-depth discussions regarding sustainable investments, possibly resulting in a larger percentage of such investments.

Because the null hypothesis could not be rejected, the relevance of board size and diversity in supporting sustainable investing practices in pension funds is emphasised. The findings point out the need for pension funds to consider the composition of their boards and actively pursue larger and more diverse boards to strengthen their commitment to sustainability. This study adds to the literature on pension fund governance and sustainability by emphasising the role of board composition in supporting sustainable investment practices in the pension fund industry. Besides this, another measure of diversity is studied in this research, adding to the existing literature as well.

7. Conclusion

This study has shed light on the variables influencing Dutch pension funds' percentage of sustainable investments. This study investigated three factors of sustainable investments in pension funds: size, type, and board composition.

The results on pension fund size did not give enough evidence to reject the null hypothesis, showing that larger pension funds make a higher percentage of sustainable investments than smaller ones. As described before, larger funds have more resources and economies of scale, allowing them to tailor their investment strategies to the preferences of their beneficiaries (Della Croce et al., 2011). Furthermore, the higher number of stakeholders connected with larger funds puts pressure on fund managers to prioritise sustainable investments (Cordeiro and Tewari, 2015).

In terms of pension fund type, the null hypothesis was not rejected, implying that the pension fund type has no significant impact on the percentage of sustainable investments. While international research suggests that public pension funds are more likely to engage in sustainable investments, this study focused on the Dutch pension fund environment and found no meaningful association.

The findings on pension fund board composition led to the null hypothesis not being rejected. The larger and more diverse the pension fund board, the bigger the share of sustainable investments. Although we used another measure of the diversity of the board than in the literature due to the lack of available data, the measure of diversity we adopted also leads to a higher percentage of sustainable investments. This conclusion is consistent with previous research and theoretical views such as stakeholder theory, agency theory, and resource dependency theory. A diverse board allows for a wide range of perspectives and experiences, allowing for more informed decisions about sustainable investments (Clark et al., 2006).

Pension funds may use these insights to improve their sustainable investing practices and link their investment strategies with long-term environmental and social goals as the demand for sustainable investments grows. As this study shows, larger pension funds and larger and more diverse boards positively influence the percentage of sustainable investments by pension funds. To increase the percentage of sustainable investments, pension funds may consider merging with another pension fund to increase their financial resources, which may often lead to a higher percentage of sustainable investments as their financial health will be less affected when allocating a portion to sustainable investments. By providing incentives and support to encourage sustainable investments among pension funds while also taking into consideration the unique challenges and constraints that smaller

funds encounter, policymakers may take advantage of the current scenario. Besides this, pension funds may reconsider their board composition as larger and more diverse boards are more likely to have a higher percentage of sustainable investments.

Overall, this study contributes to the present literature by providing insight into the factors impacting sustainable investment practices, in particular by Dutch pension funds. This study adds to the literature on sustainable investing in pension funds by providing light on the impact of size, type, and board composition. Understanding these characteristics may help in the creation of strategies and regulations that promote long-term investing by pension funds.

7.1 Limitations and recommendations

There are several limitations that influenced the outcomes of this research. First, the findings of this study are based on a particular sample of Dutch pension funds given by the VBDO, which may not be representative of the total population of Dutch pension funds. In addition to this, it might be that our sample was too small to reject the null hypotheses, because of a low level of statistical power, which may have influenced our results. A non-rejection can also signify that there is either sufficient or no evidence supporting the null hypothesis. The expectation can be written down as the alternative hypothesis in further analysis, after which hypothesis testing can be done to determine whether the expectation has enough evidence. A more diverse and bigger sample size might increase the reliability and generalisability of the results. Besides this, the data for certain independent variables were not available for all Dutch pension funds. For example, the division of age and gender of pension funds' boards was not available and there was no existing literature on the effect of Dutch pension fund types. This could lead to omitted variable bias where one or more important factors could not be added to our analysis. Second, this research's analysis is based on the accessibility and accuracy of data on pension funds' sustainable investments. Data restrictions, such as inadequate or incorrect reporting, may have impacted the results. Another limitation of this research is that the VBDO stated that sustainable investments are made by the great majority, but responsible investing has so far had too little effect on sustainability in the world (Hofman, 2021). As stated before, this is a problem because the large and strong pension system in the Netherlands may have a significant influence on sustainability by increasing its percentage of sustainable investments only marginally. This limitation implies that, despite pension funds' efforts, the impact of their sustainable investments on larger sustainability results may be restricted.

We also have recommendations for further research. This research focused on the overall sustainability scores given by the VBDO, while the other VBDO scores on governance, policy, implementation, and accountability are interesting to study in future research as well. Besides this, it would strengthen the literature to include other measures of sustainability besides the VBDO scores, such as the percentages of sustainable investments made by pension funds. Further research could also focus on examining the variables from this study on the percentage of sustainable investments by pension funds in other countries in order to compare the results, which could provide useful insights into the factors impacting sustainable investment decisions. For example, the measure of board diversity in this research could be studied further or the effect of other measures of diversity on the percentage of sustainable investments could be interesting to study in further research. In future research, it can also be a beneficial addition to include qualitative data as well, such as a case study or interview to gain a better understanding of pension funds' motives, decision-making processes, and problems in executing sustainable investments.

Addressing these limitations and exploring the suggested future research, would result in a deeper understanding of sustainable investment practises and their effects, leading to improved sustainability outcomes within the Dutch pension fund market as well as beyond.

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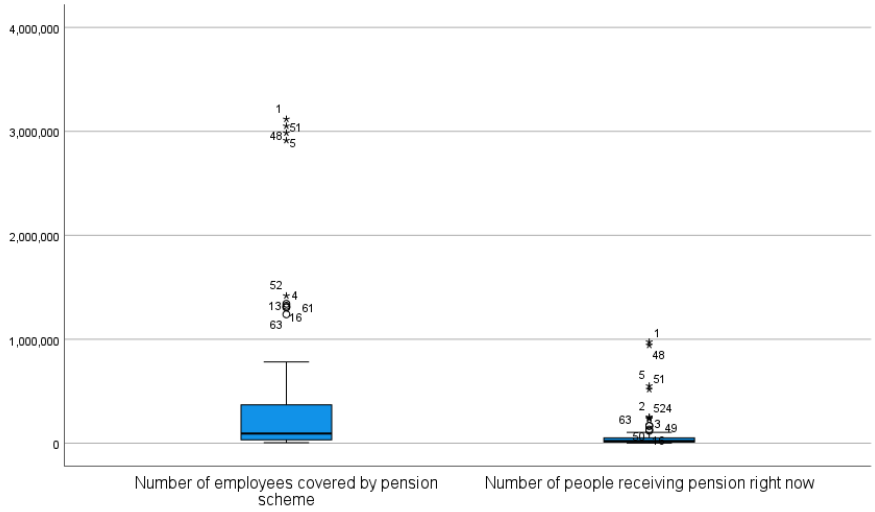
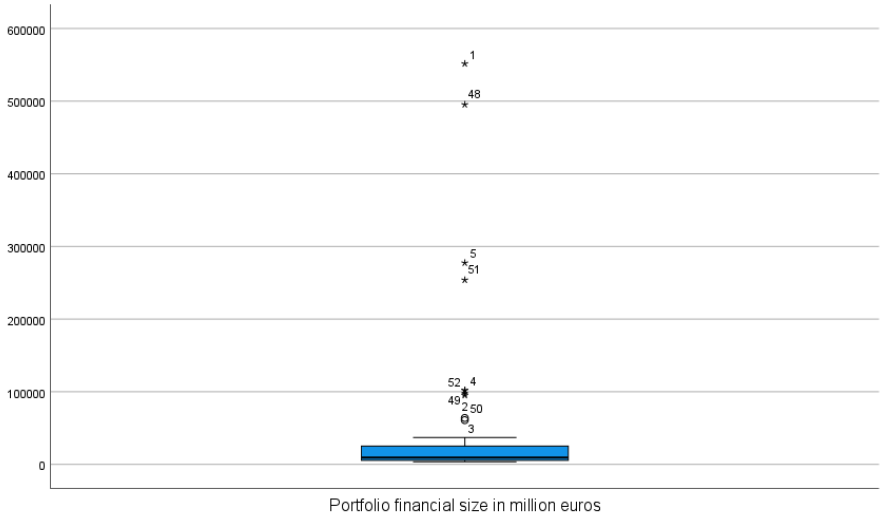
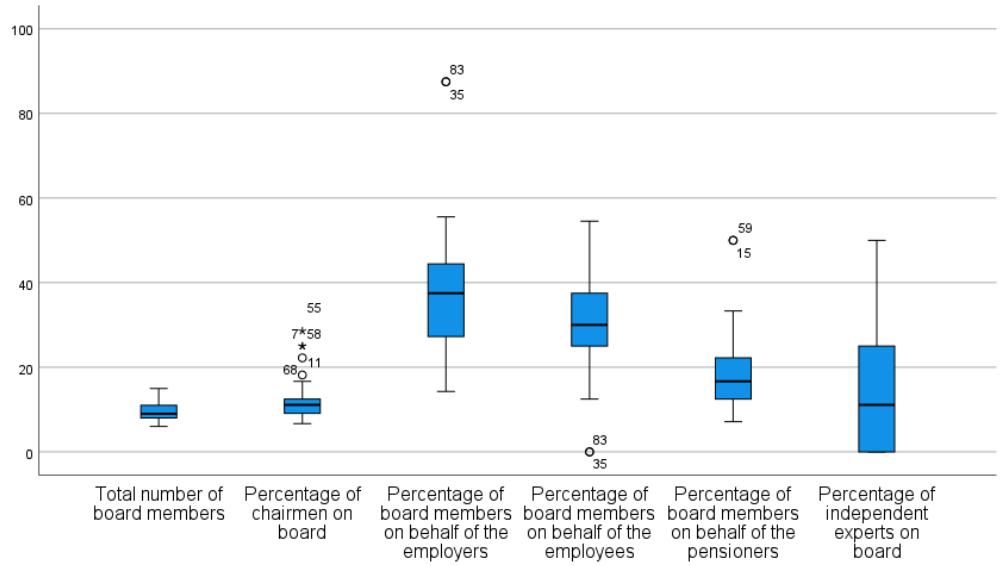
Appendix A - Boxplots







Appendix B – multicollinearity assessment

Variables	Tolerance	VIF
EmpCov	.651	1.536
TypeIn	.834	1.199
SizeB	.763	1.311

Table 14: Regression 1 multicollinearity assessment

Variables	Tolerance	VIF
PortSize	.780	1.282
TypeIn	.943	1.060
SizeB	.813	1.230

Table 15: Regression 2 multicollinearity assessment

Variables	Tolerance	VIF
EmpCov	.654	1.529
TypeCom	.845	1.184
SizeB	.758	1.319

Table 16: Regression 3 multicollinearity assessment

Variables	Tolerance	VIF
EmpCov	.768	1.302
TypeOcc	.984	1.017
SizeB	.760	1.316

Table 17: Regression 4 multicollinearity assessment

Variables	Tolerance	VIF
EmpCov	.758	1.320
TypeIn	.824	1.213
ChairP	.902	1.109

Table 18: Regression 5 multicollinearity assessment

Variables	Tolerance	VIF
EmpCov	.824	1.214
TypeIn	.827	1.209
EmplP	.946	1.057

Table 19: Regression 6 multicollinearity assessment

Variables	Tolerance	VIF
EmpCov	.829	1.206
TypeIn	.840	1.191
WorkfP	.983	1.017

Table 20: Regression 7 multicollinearity assessment

Variables	Tolerance	VIF
EmpCov	.839	1.192
TypeIn	.749	1.336
RetirP	.881	1.135

Table 21: Regression 8 multicollinearity assessment

Variables	Tolerance	VIF
EmpCov	.801	1.248
TypeIn	.836	1.196
ExpP	.953	1.049

Table 22: Regression 9 multicollinearity assessment