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The determinants of participation in the second pension pillar in the Netherlands

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Abstract

The aim of occupational pensions is to ensure a certain life standard after retirement. However, some workers do not participate in an occupational pension. In this thesis, I study the effect of individual and job characteristics on the probability of having an occupational pension in the Netherlands between 2016 and 2021. I use a unique dataset that contains more than 23 million observations. This study focuses on estimating the effect of the type of work contract on participation, as little is known about this relationship. Using logistic and linear regression models, I find that contract type is one of the main determinants of occupational pension participation. Employees having a flexible job are much less likely to build up occupational pensions, in particular the self-employed. These findings are robust after adjusting for random and fixed effects. It is important to improve the access to occupational pensions for the self-employed and for employees with a flexible job.

Contents

1 Introduction

The main goal of a pension system is to prevent old-age poverty and to ensure individuals can maintain a certain life standard after retirement (Ibragimova et al., 2019; van den Broucke et al., 2014). The system provides a social framework by enabling transfers of money over time (Bovenberg & van Ewijk, 2012). Many individuals are somewhat short-sighted, and save not enough to maintain a certain consumption level after retirement (Knoef et al., 2016; Levell, 2014). Pension schemes help address individual irrational behaviors by providing mains for financial planning (Levell, 2014).

Pension systems usually consist of multiple pillars. First, a basic state pension for all inhabitants, to prevent poverty (Holzmann et al., 2008). Second, there is usually an occupational pension system, to provide an income-related pension. Occupational savings are also referred to as supplementary savings which concerns the second pension pillar in the Netherlands. Income maintenance is measured by the replacement ratio. Knoef et al. (2016) find that first pillar pensions alone are insufficient to provide an adequate income-related pension after retirement. Therefore, it is important that individuals participate in additional pension savings using the second pillar. Third, additional voluntarily savings can be considered as a third pillar.

Occupational pensions have become more important since a recent reform of the pension system in the Netherlands.[1] The reform includes a more individualized approach by implementing age independent premia and lowers the pressure on the governments state pension liabilities. As a result, less focus lies on defined benefits from the government, and more on individual pension savings in the second pillar. The pension system has been reformed because changing demographics pressure the functioning, sustainability and goals of the pension system (Knoef, 2022). Developments such as the aging of the population, prolonged low interest rate and increasing mobility among workplaces jeopardize the system (Ewijk et al., 2014; Goedkoop et al., 2023; Sociaal-Economische Raad, n.d.; Stichting van de Arbeid, 2020; van den Heuvel-Warren, 2021; Zwinkels et al., 2017). Furthermore, the increasing share of self-employed pressure low maintenance costs and suitable risk sharing by lacking participation (Goudswaard & Caminada, 2017).

A remaining challenge of the Dutch pension system is to increase the participation in second pillar pensions. The Dutch government aims to half the group of employees not participating in the second pillar by 2027 (compared to 2019). Participation is important to ensure financial sustainability of the system as well as for reaching its goals of poverty prevention and income maintenance. Groups not participating in the second pillar put pressure on the system as these groups tend to use more social allowances, increasing public costs. In addition, the system is also more costly to sustain with fewer participants as the criteria of risk sharing and low maintenance costs cannot be met. Furthermore, individuals often fail to adhere to the life-cycle theory smoothing their consumption levels (Levell, 2014). A large

[1] Wet toekomst pensioenen (Wtp), Wet temporisering verhoging AOW-leeftijd, Article 223 Pensioenwet

share of the working population is not aware of their pension accumulation and fails to save adequate pension funds (Knoef et al., 2017). This endangers the goals of poverty prevention and income maintenance. Therefore, increasing participation is not only important for the sustainability of the pension system, but also for society. This makes it highly relevant to examine determinants of second pillar pension participation.

A better understanding of the determinants of pension participation may help policy makers to improve the participation in the second pillar pensions. For example, previous literature examined demographic determinants such as age, gender, education level and migration background (Lum & Lightfoot, 2003; Nivakoski, 2014; Stinglhamber et al., 2007; van Rooij et al., 2011; Yusof & Sabri, 2017). Age concerns one of the most influential determinants of pension savings and shows a positive relation between being older and saving for retirement. Furthermore, literature finds conflicting results of the effect of gender on participation (Huberman et al., 2007; Lum & Lightfoot, 2003; Mehdi & Ali, 2019). In addition, a higher education level is associated with increased retirement savings (Hira et al., 2009; Lum & Lightfoot, 2003; Nivakoski, 2014). Migration background is expected to negatively influence retirement savings (Hira et al., 2009; Metzger, 2017). Furthermore, marriage is found to increase contribution levels while couples value safeguards more (DeVaney & Chiremba, 2005; Stinglhamber et al., 2007).

Socioeconomic determinants of pension savings include area or residence and ownership of property (Metzger, 2017; Rey-Ares et al., 2015; Stinglhamber et al., 2007; Yusof & Sabri, 2017). Living in a more wealthy and more urbanized area is expected to positively affect participation. Social awareness, political orientation and regional history might play a role. Occupational characteristics are also influential to retirement participation (DeVaney & Chiremba, 2005; Mansor et al., 2015; Yang & DeVaney, 2012). Total wealth and level of income enable saving for retirement. Work sector is an important determinant of pension participation. While companies are often required to connect to a pension provider, it is generally mandatory for employees to contribute to the second pillar. The self-employed often do not have collective labour market agreements. Also, company size also seems to play a role (Stichting van de Arbeid, 2020). Citizens working for young and small companies often do not participate in saving individual retirement funds (Lutjens & van der Lecq, 2020). The effect of type of work on pension participation has not yet been studied.

To the best of my knowledge, this research is the first to estimate determinants of the second pension pillar in the Netherlands. The descriptive study of Biesenbeek et al. (2022) finds that the group that does not participate in the second pillar in the Netherlands often concerns individuals that are young, have a low income, have a low level of education and have a migration background. This research extends on the work of Biesenbeek et al. (2022) by quantifying the effect of determinants on second pillar pension participation, adjusting for other characteristics. Information on the determinants of second pillar participation could give important insights for effective policy making, as targeted decisions can be taken. This can improve the participation rate such that adequate pension for individuals and financial

sustainability of pension systems are ensured. Therefore, the information can add to the goal of maintaining a sustainable pension system, while providing adequate pensions for citizens. Specific interest lies in the effect of work contracts on second pillar participation, as little is known regarding this relationship. The findings add towards the 'plan of attack' of the social partners, which aims to increase the participation rate of the second pillar (Stichting van de Arbeid, 2020). Therefore, I aim to answer the following question:

What are the determinants of participation in the second pension pillar in the Netherlands?

I use a matched employer-employee dataset based on micro-data from Statistics Netherlands for the period 2016 till 2021. It contains data of Dutch individuals such as demographics, job characteristics, pension information and includes a matched employee-employer dataset. I exploit a logistic and linear regression model based on individual level panel data.

My results show that work contract is one of the main determinants of second pillar pension participation. Having a temporary or a flexible contract, or being self-employed decreases the odds of participation in the second pillar, compared to having a permanent contract. Moreover, the results establish a positive influence of income, age, being female and working in manufacturing, public administration or the health care sector on participation in the second pillar. Also, having a migration background decreases the odds of participation.

The remainder of this thesis is structured as follows. The theoretical background is elaborated upon in section 2. It entails the pension system, its challenges, the Dutch reforms and discusses literature related to retirement determinants. The methodology is explained in section 3. It discusses the model, data and variables. Section 4 presents the results. Lastly, section 5 includes the discussion and conclusion.

2 Theoretical background

2.1 The pension system

The pension system originated from the first half of the nineteenth century as citizens called for government intervention to prevent poverty of elderly (van den Heuvel-Warren, 2021). The main focus concerned easing poverty rates and ensuring that individuals can stop working after reaching a certain age (Grech, 2018). A system where employees and employers payed premia followed. The employee in return received regular payments at a later age. To decrease inequality, a universal system arose, including the non-working population. It entailed a state pension and an employment-based pension, who together should maintain a sufficient consumption level. This formed the basis for the system we now know.

The main goals of pension systems are to prevent old-age poverty and to ensure individuals can maintain a certain life standard after retirement (Ibragimova et al., 2019; van den

Broucke et al., 2014; van den Heuvel-Warren, 2021). The pension system provides a social framework for citizens. It enables to transfer money over time, such that people can receive income when they lose the ability to work.

Individuals often fail to adhere to the life-cycle theory (Levell, 2014). The theory states that rational people smooth consumption over time by saving during their working life and dis-accumulate when being older (Levell, 2014). A large share of the labor force is not aware of their pension accumulation and have limited attention to this topic (Knoef et al., 2017). Knoef et al. (2016) indicate insufficient income maintenance for a large part of the population. Furthermore, Zwinkels et al. (2017) show that around 30% of the employees and 45% of the self-employed do not reach the income maintenance benchmark. Knoef et al. (2017) state that 30% of households do not reach this benchmark as well.

Pension schemes help address this individual failure by providing financial planning (Bovenberg & van Ewijk, 2012). Consequently, it helps citizens to prevent falling into a poverty gap and promotes consumption smoothing (Balco et al., 2018). The overall shortage of pension savings can be explained by some behavioral factors. These include conditional rationality, undervaluation of the future, lack of financial expertise, poor ability of self-restriction, the status quo bias, myopia, loss aversion and procrastination (Knoef & Bruggen, 2017; Mastrogiacomo et al., 2014; Prast, 2017; van Soest et al., 2022; Yusof & Sabri, 2017). The irrational behaviors result in inefficient decision making, leading to unbalanced consumption levels. Often, the self-employed are more sensitive to these biases, making them more susceptible to a worse pension. The Netherlands entails a relatively large and increasing share of self-employed workers (Goudswaard & Caminada, 2017; van Gennip, 2022). Beusch and van Soest (2020) indicate that the self-employed do not close the savings gap via alternative savings. Therefore, attention is raised to this vulnerable group (van den Heuvel-Warren, 2021).

Core criteria of the pension system include adequate income after retirement, low maintenance costs, suitable risk sharing, freedom of choice and no unintended redistribution of funds (Ewijk et al., 2014). Pension systems are challenged to maintain individual pension adequacy while remaining (financially) sustainable (Clements et al., 2014). The sustainability of pension systems is defined by the funding ratio. The ratio is defined by available assets in relation to its liabilities (Goedkoop et al., 2023). The ratio needs to exceed 110% in order to pay out retirement funds. A high participation rate is important to keep low maintenance costs and perform suitable risk sharing, such that pension funds can remain financially sound. Therefore, participation is important to the sustainability of the pension system and for reaching its goals.

Pension adequacy is measured by three dimensions, namely by poverty protection, income maintenance and retirement duration (Social Protection Committee and European Commission, 2021). Most pension systems prevent poverty by providing state pension to all citizens on the basis of a pay-as-you-go system (first pillar) (Holzmann et al., 2008). Income maintenance is measured by the replacement ratio. This indicator is commonly used as a measure of inadequate retirement savings (Deloitte, 2020). Hence, it reflects whether someone

has saved up sufficiently such that no sharp decrease in income can be expected and the goals of poverty prevention and income maintenance can be reached. The ratio reflects the expected pension relative to the current income. It considers a benchmark of 70% (Knoef & Been, 2013; Knoef et al., 2016; Zwinkels et al., 2017). State pension generally only accounts for 45% of the replacement ratio. Therefore, additional pension savings are needed to reach this benchmark (Knoef et al., 2017). The focus for the remaining percentage of the replacement ratio lies on occupational pension savings, also referred to as supplementary pension savings. This concerns the second pension pillar in the Netherlands.

The Dutch pension system is considered one of the best pension systems by providing overall conforming pensions while maintaining lower costs than average (Ewijk et al., 2014; van den Heuvel-Warren, 2021). The pension system entails four pillars[2]. The first pillar concerns the state pension (AOW), which all Dutch citizens receive when reaching the retirement age. Currently, this unconditional income supplement is received when reaching the age of 67[3]. The second pillar consists of occupational pensions. These funds are based on the citizens employment history. Concerning wage-employees, both the employee and employer bear the responsibility of contributing to this pillar (van Soest et al., 2022). The third pillar concerns voluntary individual pension savings. It includes annuities and life insurances, amongst other products. Lastly, the fourth pillar originates from savings and investments. This includes all kind of assets such as a house or a business.

2.2 Challenges of the pension system

The functioning and sustainability of pension systems are under pressure. Changing demographics has put pressure on reaching its main goals. The functioning depends on relative stable interest rates, constant life expectancy and continuance of investing in the same pension fund. Developments such as the aging of the population, prolonged low interest rates and increase in mobility between workplaces jeopardize the system (Ewijk et al., 2014; Goedkoop et al., 2023; Sociaal-Economische Raad, n.d.; Stichting van de Arbeid, 2020; van den Heuvel-Warren, 2021; Zwinkels et al., 2017).

A higher life-expectancy increases the pension systems obligations of state pensions over longer periods of time. The current working population pays for the state pension entitlements of the pensioners. As a result, less and less workers are paying for the state pension of more pensioners (Balco et al., 2018). The low interest rate decreases confidence in the financial profitability of the pensions funds, making people less likely to participate. Also, pension systems find it difficult to cope with people changing jobs. When workers switch jobs, it is hard to reallocate the funds to a different pension provider. Additionally, the share of self-employed workers increased during the past decades (Goudswaard & Caminada, 2017; van Gennip, 2022). This group often does not participate in saving individual retirement funds. The increasing share of workers not participating in the system, put pressure on maintaining

[2]Article 223, Pensioenwet
[3]Wet temporisering verhoging AOW-leeftijd

low implementation costs and suitable risk sharing. Also, those that do not participate tend to use more social allowances, increasing public costs (van Soest et al., 2022). This shows the importance of citizens' participation to the financial sustainability of the system.

To deal with the demographic changes, pension systems are reforming their schemes in order to uphold the functioning of the system (Knoef, 2022). The reformation moves from a defined benefit towards defined contributions, decreasing the public pension liabilities (Balco et al., 2018; Ibragimova et al., 2019). This means that less focus lies on state pension (first pillar), and more on individual retirement savings, such as occupational pension contributions (second pillar).

2.3 Reformed pension system

The new Dutch pension law came into force on the 1st of July 2023[4]. A transformation from the old to the new system will take place in the upcoming years and should be completed by 2027. The new system provides a more solid foundation to cope with the challenges addressed in the previous section. Some criteria concerning the reformation include: solidarity, individual responsibility and balance between generations (van den Broucke et al., 2014).

The new law includes an agreement upon a slowdown of the increase in retirement age in proportion to the life expectancy (Koolmees, 2019)[5]. Another reform concerns the possibility of early retirement for physically demanding jobs, for example within the builder's industry[6]. One crucial improvement entails increased flexibility of pension savings, making it easier for the self-employed to contribute to the second pension pillar[7].

In addition, the law includes a more individualized approach by implementing age independent premia (Treur & Zanden, 2017). The principle that the people who contribute at the moment have to pay for the entitlements of the current pensioners is abolished. The system becomes more fair as premia are saved independently. Younger participants can now receive higher returns as their savings can be invested over a longer term. As a consequence, the savings for retirement depend more heavily on the contributions made at a younger age. Also, transparency increases as each individual can see their accumulated savings. While the individual pension savings can fluctuate depending on economic decisions, no guaranteed payment is promised. Furthermore, pension insurers can more freely decide on how to invest the individual contributed funds. As a result, increased risk can be taken for young people, because they are capable of absorbing shocks better while they are further away from the retirement age. A less risky approach can be chosen for elderly to ensure a stable pension.

The reforms will transact in the coming years, trying to decrease the pressure on the pension system. As a consequence, more focus lies on individual pension savings. These include second and third pillar savings. The Dutch government aims to half the group of employees not participating in the second pillar by 2027 (compared to 2019) (Stichting van de

[4]Wet toekomstig pensioenen (Wtp)
[5]Wet temporisering verhoging AOW-leeftijd
[6]Wet toekomstig pensioenen (Wtp)
[7]Article 223, Pensioenwet

Arbeid, 2020). Importance lies on increasing participation rates in the second pillar to ensure the sustainability of the system while adhering to its overall goals. Therefore, information on determinants of pension savings is highly relevant. Literature finds several determinants of retirement savings, which are discussed in the next section.

2.4 Related literature: determinants of pension savings

2.4.1 Demographic determinants

Age concerns one of the most influential determinants of pension savings (Yusof & Sabri, 2017). Research shows a positive relationship between being older and saving for retirement (Stinglhamber et al., 2007; van Rooij et al., 2011). This is contrary to the rational behavior of consumption smoothing. Therefore, young people tend to under-save for retirement. This can possibly be explained due to a lack of trust in pension systems, lack of (financial) knowledge, inability to afford savings and myopia (Foster, 2017). Hira et al. (2009) note the possible differences in age groups. Young citizens who are more aware of the importance of saving and already engage in acquiring information regarding retirement, participate significantly more compared to others in the same age group.

Also, gender entails a significant determinant of pension savings. A lot of research indicates male to be positively associated with pension accumulation (Lum & Lightfoot, 2003; Nivakoski, 2014; Yusof & Sabri, 2017). The arguments entail that females are more likely to have smaller contributions as they are less financially prepared due to having a lower income, being employed in lower skilled occupations, having a lower education level and working fewer years. However, other research finds conflicting evidence indicating a larger contribution by females (Huberman et al., 2007; Mehdi & Ali, 2019). They state that females participate more often because of a higher life-expectancy and greater taste for saving.

Moreover, a higher education level is associated with increased retirement savings (Hira et al., 2009; Lum & Lightfoot, 2003; Nivakoski, 2014; Yusof & Sabri, 2017). People with a higher education are seen to be more financially prepared, making them more likely to save for retirement. Additionally, financial knowledge increases financial planning skills as it increases numeric abilities and helps with a clear vision on financial goals (Banks & Oldfield, 2007).

Race and migration background also influence pension participation (Hira et al., 2009; Metzger, 2017; Yusof & Sabri, 2017). Being black and having a migration background is found to make you less likely to participate. This might be due to inequality between black and white people. Discrimination possibly leads to unequal work opportunities, which in turn leads to differences in pension savings. Furthermore, having a migration background might increase difficulty to participate in the pension system due to unawareness of regulations in place. Additionally, language problems might play a role.

Marriage is found to increase contribution levels (DeVaney & Chiremba, 2005; Stinglhamber et al., 2007). The reasoning entails that couples might value safeguards more than singles do. However, counter arguments state that couples living from one household income,

consume more and therefore have less opportunities for pension savings. Rey-Ares et al. (2015) find an in-conclusive result of the influence of marriage on retirement savings.

2.4.2 Socioeconomic determinants

Area of residence is also established as influential determinant of retirement savings (Metzger, 2017; Rey-Ares et al., 2015; Stinglhamber et al., 2007; Yusof & Sabri, 2017). Living in a more urbanized area is associated with higher savings. Also, wealth of the neighbourhood influences participation. For example, Stinglhamber et al. (2007) find that citizens living in the Flemish area of Belgium are more likely to save for supplementary pension funds. Furthermore, Metzger (2017) finds that citizens living in the Eastern part of Germany are less likely to participate in individual pension savings. Social connections in urban areas might explain regional participation differences, while discussing money related topics raises awareness. Also, regional characteristics, for example its history and the political orientation of its citizens, might play a role.

Ownership of property positively influences pension participation (Nivakoski, 2014; Stinglhamber et al., 2007; Yusof & Sabri, 2017). Literature argues that individuals who already own property have more money available for retirement savings. Those who have completely paid off their mortgage, have less housing costs, leaving room for additional savings. This relationship is also expected to hold for those who have not yet paid off their mortgage completely, but expect to do so before retiring. The reasoning entails that they envision a future without high housing expenses, making them more likely to save.

2.4.3 Occupational determinants

Level of income and total wealth positively affect pension savings (Mansor et al., 2015; Yang & DeVaney, 2012). An income enables someone to save for retirement. A higher income increases the chance that money is left for retirement savings after necessities. Also, Mansor et al. (2015) indicate that individuals with a higher income more often seek professional financial advice regarding retirement savings. This makes them more likely to participate. Workers with a higher income are often better educated on financial planning, while workers earning less money acquire knowledge regarding mortgage and debt clearance. Furthermore, a more sizable total wealth also increases opportunities for pension savings.

Work sector exhibits a substantial influence on retirement savings. Often, companies are obliged to connect an employee to a pension provider. Therefore, most employees are required to contribute to the second pension pillar (van Soest et al., 2022). However, in some industries this is not mandatory. These include arts, ICT and industrial design. For the self-employed it is often difficult to participate in the second pillar. Voluntary continuation in the second pillar is sometimes an option when switching from being employee to self-employed (Goudswaard & Caminada, 2017; Oerlemans & van der Lecq, 2009). In order to do so, some requirements have to be met. For some occupations of the self-employed it is mandatory to contribute to the second pillar. These include working in most health care

professions and working in the construction sector as a painter or plasterer for example. Furthermore, Nivakoski (2014) indicates that working in the public sector makes you more likely to participate in supplementary savings. Working in the agricultural sector or service industry is expected to negatively influence participation whilst being a wage-employee (Deloitte, 2020; Stichting van de Arbeid, 2020). Additionally, a positive relationship between high-skilled occupations and pension savings is found. Company size also seems to play an important role (Stichting van de Arbeid, 2020). Citizens working for young and small businesses often do not participate in saving individual retirement funds (Lutjens & van der Lecq, 2020). This is likely influenced by missing collective labour-market agreements, which provide means for saving. Therefore, working in a specific sector is determinant to retirement savings.

Research indicates large differences of participation rates between different work contracts. van Soest et al. (2022) report that employees with a temporary working contract contribute three times less than permanent employees. Biesenbeek et al. (2022) describe that 12% of employees do not save second pillar pension, compared to 94% of the self-employed. Hybrid workers do not do so in 29% of the cases. Consequently, type of work contract seems to be influential in determining pension savings. However, a lack of research on this subject hinders a good estimation of this relationship.

2.5 Research question

To summarize, the pension system's goals include poverty prevention and income maintenance. However, due to demographic changes, the system's sustainability is pressured. Therefore, a reform will take place. As a consequence, more focus lies on individual pension savings, such as contributions to the second pillar. The Dutch government aims to half the group of employees not participating in the second pension pillar. Participation is necessary to reach the pension system's goals, as well as to ensure the financial sustainability of the system. Therefore, estimating determinants of second pension pillar participation is highly relevant. Specific interest lies in estimating the effect of work contracts on participation. I examine the following research question:

What are the determinants of participation in the second pension pillar in the Netherlands?

2.6 Hypotheses

Literature established a number of determinants of retirement savings. Table 1 summarizes the expected relationships following the literature review. It is expected that being older, married and highly educated positively affect participation. Also, living in more urbanized areas and owning property are hypothesized to have a positive influence on participation. However, having a migration background is expected be negatively related. Furthermore, a

high level of income and total wealth are expected to increase participation as more funds are available to invest for retirement savings. On the contrary, working in the arts or ICT sector and working for small and young companies is expected to negatively influence participation. Research shows conflicting results regarding the effect of sex on participation. This leads to the following hypotheses:

Table 1: Hypothesized relations

Variable	Direction	Variable	Direction
Age	+	Sex: female	+/−
Education level	+	Migration: non-Western	−
Marriage	+	Residence: urban	+
Property ownership	+	Income	+
Total wealth	+	Work sector	+/−
Company size: small	−	Work contract: permanent	+

As of yet, no research estimates the effect of the type of work contract on pension participation. Therefore, specific interest lies in estimating this relationship. Descriptive studies show that groups with different contract forms have substantial different participation rates (Biesenbeek et al., 2022; van Soest et al., 2022). Hence, it is expected to be an influential determinant. I expect that a more secure work contract, such as a permanent contract, positively affects participation in the second pillar. The following relationship is expected:

Hypothesis: A more secure working environment (e.g. having a permanent work contract) increases the likelihood of participation in the second pension pillar.

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3 Research design

3.1 Model specification

I estimate determinants of second pillar participation by exploiting logistic and linear regression models based on individual level panel data. Earlier literature exploits a similar specification as below (Stinglhamber et al., 2007). The main aim of the empirical analysis is to estimate the impact of work contracts on the participation in the second pension pillar. The variable of interest is work contract, which is specified as a categorical variable in the five categories: permanent contract, temporary contract, temporary agency workers, flexible hour workers and self-employed. A logistic model is applicable due to the binary nature of the dependent variable (Hilbe, 2011). However, using the fixed effects logistic panel data regression is out of scope as the requirement of a large (infinite) time series is not met (Wooldridge, 2019). The limited time span of the data (of only six years) prohibits consistent estimation of the model parameters. As a result, the linear probability panel data model is estimated as best

alternative to exploit the panel data including individual fixed effects. Shortcomings of this model are reflected upon. Therefore, the analyses include a pooled logistic regression with year fixed effects and a linear panel probability model with year- and individual fixed effects.

The following pooled logistic model is estimated:

$$\begin{aligned}\text{Participation-secondpillar}_{i,t} = &\beta_0 + \beta_1' \text{Workcontract}_{i,t} + \beta_2' \text{Companysector}_{i,t} + \\ &\beta_3' \text{Residence}_{i,t} + \beta_4' \text{Educationlevel}_{i,t} + \\ &\beta_5' (\text{Education*Income}) + \beta_6' \text{Voluntarysavings}_{i,t} + \\ &\beta_7' \text{Totalwealth}_{i,t} + \beta_8' \text{Income}_{i,t} + \beta_9' \text{Age}_{i,t} + \\ &\beta_{10}' \text{Age}_{i,t}^2 + \beta_{11}' \text{Sex}_i + \beta_{12}' \text{Migrationbackground}_i + \\ &\beta_{13}' \text{Year}_{i,t} + \varepsilon_{i,t}\end{aligned} \tag{1}$$

The following fixed effects linear probability model (LPM) is estimated:

$$\begin{aligned}\text{Participation-secondpillar}_{i,t} = &\beta_1' \text{Workcontract}_{i,t} + \beta_2' \text{Companysector}_{i,t} + \\ &\beta_3' \text{Residence}_{i,t} + \beta_4' \text{Educationlevel}_{i,t} + \\ &\beta_5' (\text{Education*Income}) + \beta_6' \text{Voluntarysavings}_{i,t} + \\ &\beta_7' \text{Totalwealth}_{i,t} + \beta_8' \text{Income}_{i,t} + \beta_9' \text{Age}_{i,t} + \\ &\beta_{10}' \text{Age}_{i,t}^2 + \beta_{11}' \text{Year}_{i,t} + \varepsilon_{i,t} + \alpha_i\end{aligned} \tag{2}$$

The parameter of interest is β_1. The subscript i denotes an individual and t denotes the time in years. The dependent variable has a value of 0 if the individual does not participate in the second pillar and has the value of 1 when contribution is made. Therefore, the model estimates the extensive margin (the number of people that participate) and not the intensive margin (amount of contribution). The control variables include company sector, residence, education level, voluntary savings (third pillar participation), total wealth, income, age, sex and migration background. Both models include time fixed effects in the analyses. The standard errors are robust for clustering by persons, therefore correcting for individual clustering in time trends. The linear probability panel data model with fixed effects omits the non-time changing variables sex and migration background[8]. Furthermore, ε represents the idiosyncratic errors. It captures omitted influences on second pillar participation.

3.2 Methodology

The logistic regression estimates the probability of the dependent variable taking the value of 1. It is appropriate for models involving a decision which can be answered by yes or no

[8]The fixed effect estimation is used while the Hausman test provided significant results, indicating biases in random effect estimations.

(Ottenbacher et al., 2004). This study reports the coefficients of the logistic model transformed into odds. This is typically done while the normal coefficient of a logistic model is difficult to interpret (Stoltzfus, 2011). The odds tell whether the independent variable has a positive or negative effect on the odds of participation in the second pillar. The odds ratio represents the following:

$$Odds\ ratio = \frac{Odds\ of\ an\ event\ (Condition\ A)}{Odds\ of\ an\ event\ (Condition\ B)} \tag{3}$$

The odds ratio is always a positive number (not smaller than zero) and indicates the odds of an event happening. In this research scope, it concerns the event of participation in the second pillar. A ratio which is bigger than 1 indicates an effect of an increase in the odds of participation, meaning that the independent variable has a positive influence on the likelihood of the dependent variable occurring. On the contrary, an odds ratio smaller than 1 indicates a decrease in the odds of participation in the second pillar. The ratio tells the direction and gives an indication of the magnitude of the influence of the variable on participation in the second pillar.

Assumptions of logistic models are checked (Cramer & Ridder, 1988). It is important to note that the assumptions of a logistic model differ compared to those of a normal linear model (Hellevik, 2009). For example, the requirements of having normal distributed error terms and homoscedasticity are not applicable to this model. The logistic assumptions include that the dependent variable should be of the appropriate outcome structure. This assumption is met as the variable is binary. Second, it requires little or no multicollinearity between the independent variables. The correlation levels and estimated variance inflation factors indicate no problems. Third, no repeated measurements should be present. No duplicates are in the data, meeting the requirement of observation independence. Fourth, the Box-Tidwell test shows linearity between the independent variables and log odds. The insignificant log-transformed interaction results of the continuous variables show linear independence. Fifth, the assumption of a large dataset is met.

The fixed effects linear panel probability model estimates the effect of the independent variables on the probability of participation. It assumes the dependent variable to be binary. A positive coefficient outcome indicates an increase in the probability of participation in the second pillar. A negative coefficient states the opposite. However, estimating probabilities with a linear model has certain drawbacks. Estimates might be inefficient and estimated probabilities can fall outside the prediction range (0 to 1) (Papke & Wooldridge, 2008). Also, the estimated slope might be biased as the estimated relation might have a different curvature (Liao, 1994). The linear probability model serves as best alternative to estimate the effect of work contract on participation, exploiting the (limited) panel data using fixed effects.

For both models, year fixed effects are included to control for potential macro-economic influences. For example, these could capture GDP growth, inflation rates and economic recessions. Furthermore, the linear probability panel data regression also accounts for individual

fixed effects. These control for potential omitted variables that are stable over time, such as individual risk preferences or ethical beliefs.

3.3 Data

I use administrative micro-data from Statistics Netherlands. The data concerns a unique dataset including the years 2016 till 2021 and provides information on working citizens in the Netherlands. It contains data on individual characteristics, pension savings and includes matched employer-employee information. Considering the research objective, people from the age of 21 to 67, excluding students and (pre)pensioners, are selected. The resulting data contains around 23 million observations, distributed over six years.

Using this unique and large dataset implied practical and computational challenges. To access the data, enrollment in the Statistics Netherlands server was needed. Due to the large dataset, computing the output required using the heavy data server of Statistics Netherlands. While this access is highly restricted and concerns limited availability, I experienced waiting time before being able to use this server. Once access was granted, estimating the regression output took several days. Before being allowed to document the output, it needed to be checked for individual privacy concerns by Statistics Netherlands. This generally took one to two working days. Therefore, obtaining the results was labour intensive.

Table 2 includes a description of the variables. It describes the same data as in the regressions models (table 3, column 1 and 2). While most variables are categorical, the mean does not provide meaningful information. Therefore, percentages of the different groups are provided. Variables of ratio level are included with their mean. Table 8 (appendix) provides the general summary statistics of the dataset. It entails the number of observations, mean and standard deviations.

The descriptive table shows that on average 79% of the working population participates in the second pillar over the period of 2016 till 2021. Furthermore, the work contract variable shows that the self-employed group presents 11% of the working population. Most people experience a medium educational level and live in a strongly urbanized area. Few people use the third pillar to save for additional retirement funds. In addition, most people work in business services and health care sectors. Both sectors entail around 19% of the working population. The average age concerns 41 years with a mean income of €46.000.

Table 2: Descriptive table

Variable		Variable	
Second pillar:		*Third pillar (voluntary savings)*:	
No participation	21.3%	No participation	94.5%
Participation	78.7%	Participation	5.5%
Work contract:		*Urbanization level*:	
Permanent contract	62.1%	Very strong (>2500 houses per km2)	24.9%
Temporary contract	17.5%	Strong (1500-2500 houses per km2)	30.9%
Temporary agency workers	3.5%	Medium (1000-1500 houses per km2)	15.4%
Flexible hours	2.6%	Low (500-1000 houses per km2)	21.7%
Self-employed	10.6%	Very low (<500 houses per km2)	7.2%
Other contract types	3.7%		
Education level:		*Migration background:*	
Lower	12.2%	None	82.2%
Medium	40.5%	Western	3.5%
Bachelor	28.8%	Non-Western	14.3%
Master	18.5%		
Company sector:		*Company sector:*	
Manufacturing	9.1%	Finance and insurance	3.5%
Electricity, gas, water	0.8%	Business services	18.6%
Construction	5.2%	Public administration	6.4%
Trade	12.8%	Education	8.4%
Transportation	4.2%	Health, social work	18.7%
Accommodation, food	2.7%	Agriculture	1.3%
ICT	4.2%	Other services	4.4%
Sex:		Age in years (mean)	40.7
Male	52.0%	Income in €1000 (mean)	46
Female	48.0%	Total wealth in €1000 (mean)	253

Note: the table includes information on the variables in the estimated regression models. The number of observations concerns 23.8 million, rounded to one decimal. The unique number of individuals followed over time is 5.8 million.

Reviewing the data gives reason for some adjustments to perform the analyses. Firstly, outliers in income and total wealth are dealt with by taking the log of both variables. As an alternative, income is categorized by calculating ten deciles. The ten categories give information on the difference between low and high income groups. The results of substituting the income variable can be found in the robustness section and appendix. Secondly, age to the power of two is calculated. Literature shows importance of including this variable in the regression due to the possibility of a non-linear relationship between age and pension contribution (Stinglhamber et al., 2007). It accounts for the possibility of individuals saving more during different stages in their life. Figure 4 (appendix) confirms this concern. It shows that those who are young and old participate less than other generations. Consequently, age to the power of two is included. Thirdly, an interaction term of education level and income is

included, as it is expected that they might be interrelated (Mansor et al., 2015). The effect of income on pension participation might depend on the level of education, while workers with a higher income are often better educated on financial planning.

3.4 Descriptive statistics

Out of the working population, 22% of the Dutch citizens did not contribute to second pillar pension savings in 2021 (figure 1). This percentage very slightly decreased compared to the previous year (appendix, figure 3). Of the employee group, 12% did not participate in occupational savings. These findings are in line with the numbers reported in Biesenbeek et al. (2022) and Statistics Netherlands (n.d.). However, Stichting van de Arbeid (2020) finds this to be around 10% using the long term approach. While the government aims to half the group of employees that does not participate in the second pillar by 2027, the lack of a decreasing trend might form a big concern. [9]

Figure 1 shows the composition of second pillar participation in 2021. As previously mentioned, 22% does not participate and saves no occupational pension. The green part shows the other 78% who do participate in these savings. The right side of the figure shows the composition of these parts and the different employment groups taking up the share of these percentages. The working population is categorized into wage-employees, hybrid workers and the self-employed.

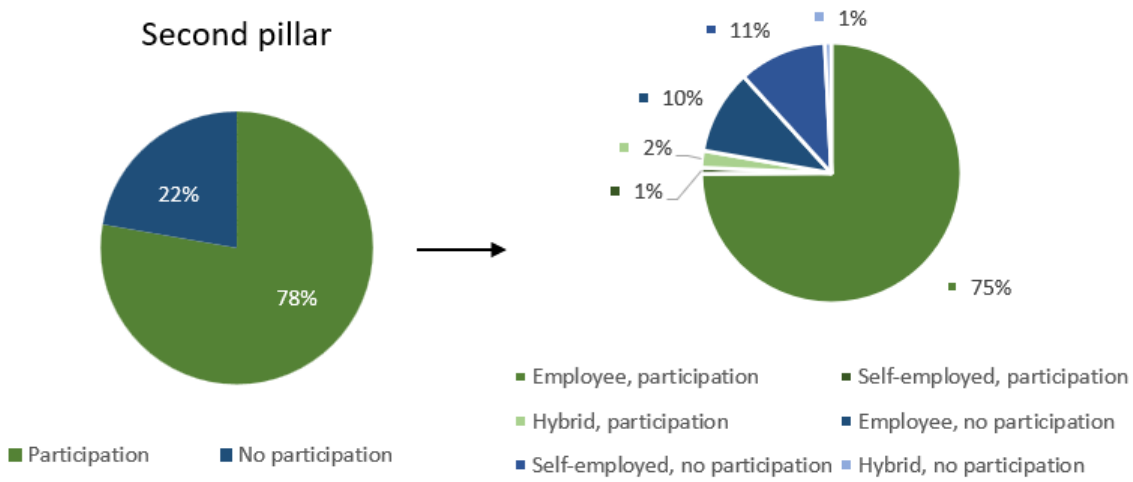

Figure 1: Second pillar participation and its composition in 2021

Figure 2 displays the second pillar participation per employment type in 2021. Of the employees, 12% did not save using the second pillar. The self-employed did not do so in 93% of the cases. The percentage of the hybrid-workers lays in between with 28%. These subsequent percentages remained relatively stable over the last years, just like the overall 22% mentioned.

[9] Wet toekomstig pensioenen and letter to parliament Stichting van de Arbeid feature S.A.22.97035

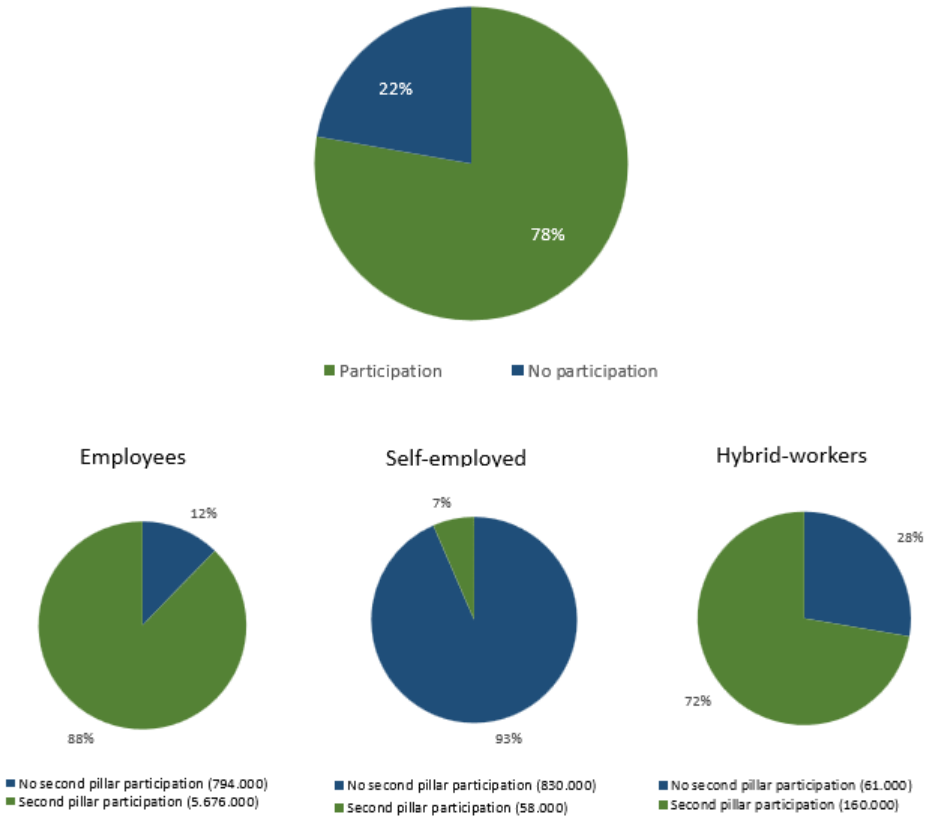

Figure 2: Second pillar participation per employment type in 2021

Further, additional descriptives are included in the appendix. Figure 4 (appendix) indicates importance of including age to the power of two in the model. The graph shows that younger (<30 years) and older (>=60 years) employees lack more occupational savings than the other generations. Figure 5 (appendix) shows that with an increase in income, an upward trend in participation can be seen. This relationship seems more linear for the self-employed than for the employees. In addition, figure 6 (appendix) indicates an increase in the participation rate for the young (<30 years) and older (>=60 years) employees over the last six years. While these groups experience the highest percentages of no participation, the decreasing trend can be interpreted as positive. Lastly, figure 7 (appendix) presents the employment type flows over the years.

3.5 Variables

The available data includes individual characteristics, pension information and a matched employer-employee dataset which contains information over six years (2016 till 2021). The individual characteristics include age, sex, migration background, residence and education level. Age concerns the age of the individual in years. Sex consists of the categories male and female. The variable migration background includes three categories: no-, Western-, and non-Western migration background. Literature finds that citizens living in a more urbanized areas

tend to save more for retirement (Metzger, 2017; Yusof & Sabri, 2017). Therefore, residence is reflected by degree of urbanization to account for the difference between living in a city versus living on the country side. The degree of urbanization is reflected by the number of addresses per km2 and entails five categories. As a robustness check, other categorizations of residence are included. These entail regions and provinces. The variable education contains four categories: lower education, medium education, bachelor's degree and master's or PhD degree.

The pension data contains contributions to the second and third pillar. The dependent variable of second pillar participation is accounted for as a binary variable. It has a value of 1 when contribution is made and is 0 otherwise. A binary variable is chosen as the absolute pension amount is highly dependent on the years someone is working, their age and on the income they receive. Therefore, it is difficult to estimate the effect of variables on the total pension amount. This research looks at the extensive margin (number of people that participate) instead of the intensive margin (the amount of pension contribution). In addition, information on the contributions to the third pillar is present. These contributions entail voluntary savings and is also transformed into a binary variable. This variable is added to control for other individual pension savings. Information on house capital and total equity are available in the database. Using this information, total wealth is taking into account when estimating second pillar participation. This serves as an important control variable.

Details on the individual working environment include income, work sector, company sector, form of employment and contract type. Income data contains the annual income of the individual. Work sectors include hospitality, construction and care and well-being amongst other categories. Information on sub-sectors include professions such as being a physiotherapist, midwife or vet. Company sector contains fourteen categories, which is chosen to be added to the model. The categorical variables work sector and the subsequent sub-sectors contain too many groups for the estimation. The variable work contract contains the following categories: permanent contract, temporary contract, temporary agency workers, flexible hour workers and self-employed.

4 Results

4.1 Regression results

Table 3 presents the benchmark results. Column 1 includes the results of the pooled logistic model. Column 2 presents the results of the linear probability model (LPM) with individual fixed effects. It controls for (unobserved) constants of each individual. Both models include year fixed effects to capture the influence of time trends. The coefficients of the pooled logistic model (1) are reported in odds. A ratio above one indicates a positive effect on the odds of participation, a ratio below one indicates a negative effect on the odds. The coefficients of the linear probability model (2) reflect a decrease or increase in the probability of participation. A negative coefficient reflects a decrease in the probability of participation

while a positive coefficient indicates an increase in the probability of participation. Most variables are categorical of nature. Therefore, the coefficients are compared to the (omitted) baseline. The reference category is specified between brackets.

The pooled logistic model (1) indicates odds ratios smaller than one for the different categories of work contract. Therefore, they indicate that these types of contracts have a negative influence on the odds of participation, compared to their reference category. Thus, working flexible hours, on a temporary basis, as a temporary agency worker or via self-employment decreases the odds of participation, compared to being permanently employed. The odds ratio of 0.01 indicates that being self-employed decreases the odds of participation in the second pillar by 99% (1-0.01) compared to being an employee with a permanent contract. Therefore, being self-employed has a strong negative effect on the likelihood of saving second pillar pensions. Furthermore, having a temporary work contract decreases the odds of participation in the second pillar by 55%. Being a temporary agency worker instead of being permanently employed, decreases the chance of participation by 37%. Moreover, working flexible hours decreases the odds by 64%. To conclude, a less secure work contract type decreases the odds of participation in the second pillar. Being self-employed decreases the odds of participation the most. Also, temporary agency workers are more likely to participate than people working flexible hours.

Similar results are found in the fixed effects linear probability model (2). Except for the category 'Other contract types', all categories indicate a negative coefficient. Therefore, belonging to one of these categories negatively affects the probability of participation in the second pillar. For example, -0.03 indicates that having a temporary contract decreases the probability of participation by 3 percentage points (compared to having a permanent contract). The value of -0.59 indicates a decrease in the probability of participation for the self-employed by 59 percentage points. The self-employed category indicates the largest negative influence on the probability of participation in the second pillar. This is in line with the results of the pooled logistic model.

The variable work sector shows results in line with the literature (Goudswaard & Caminada, 2017; Nivakoski, 2014; Oerlemans & van der Lecq, 2009). The odds ratios of public administration and health care indicate an increase in the odds of participation when working in these sectors, compared to working in education. For example, the odds ratio of 1.56 indicates that working in public administration increases the odds of participation in the second pillar by 56%. This is in line with Nivakoski (2014) who find that working in the public sector makes you more likely to participate in supplementary pension savings. ICT indicates an odds ratio of 0.20. This means that working in ICT decreases the odds of participation by 80% compared to working in education. While it is not mandatory to save occupational retirement savings working in ICT, this result is expected. The fixed effects model (2) shows the same directional results of public administration, health care and ICT. While working in public administration and health care increase the probability of participation, ICT indicates a negative effect on the likelihood of participation. However, the sectors trade, transportation,

accommodation and food and agriculture indicate opposite directional results compared to the logistic model estimations.

The logistic regression model (1) shows significant results regarding the degree of urbanization, however the fixed effects model (2) does not. This could be due to the few years of data in which individuals do not move. The logistic model entails results in the opposite direction than is hypothesized. Individuals are more likely to participate in pension savings living in less urbanized areas. For example, living in a very low urbanized area increases the odds of participation by 17% compared to someone living in a very strong urbanized area. This is contrary to the literature finding a positive effect of urbanization on retirement savings (Metzger, 2017; Rey-Ares et al., 2015; Stinglhamber et al., 2007; Yusof & Sabri, 2017). To examine this contradictory result, two substitutes of urbanization are included in the robustness analysis. The positive effect of a low urbanized area on participation could be explained by young people living in large cities before progressively moving out when having children. Including an interaction term between urbanization and age could provide clearance on this view.

The logistic pooled regression model (1) indicates that a higher education level decreases the odds of participation, contrary to previous research (Hira et al., 2009; Lum & Lightfoot, 2003; Yusof & Sabri, 2017). Moreover, an increase in education level decreases the odds substantially. Having a master's degree decreases the odds of participation with 94% compared to having a having a low level of education. Having a bachelor's degree decreases the odds by 80%. However, the interaction terms between income and education indicate positive odds. Therefore, the positive effect of level of education on second pillar pension participation may be captured by the coefficient of income. It shows that the effect of income on participation is more positive for people who have a higher education level. The odds increase with a higher level of education. The fixed effects linear probability model (2) shows results in line with literature. This model examines the effect of changes in education level on participation over time, while it includes fixed effects. A higher education level is seen to positively affect participation. For example, having a masters degree increases the probability of participating in the second pillar by 8%. Therefore, when accounting for individual fixed effects, the effect of education is positive.

Participating in voluntary pension savings using the third pension pillar entails a negative effect on the likelihood of participation in the second pillar for both models. The odds ratio of 0.49 indicates a decrease in the odds of 51% for those participating in the third pillar, compared to individuals who are not. Furthermore, the negative coefficient of -0.03 indicates that individuals who participate in the third pillar are 3% less likely to participate in the second pillar than individuals who are not. Therefore, saving in the second and third pillar can be considered substitutes, rather than supplementary.

Furthermore, an increase in total wealth decreases the odds of participation by 7%. This is contrary to what literature finds (Mansor et al., 2015; Yang & DeVaney, 2012). Income positively affects the odds by 35%, in line with expectations. The linear probability model

finds that with an increase of income the probability of second pillar participation increases with 4 percentage points.

The logistic results (1) show that a one year increase in age increases the odds of participation in the second pillar by 3%. The linear probability model (2) shows that with one year increase of age, the probability of second pillar participation increases with 1 percentage point. This is in line with research establishing age to be a determinant (Stinglhamber et al., 2007; van Rooij et al., 2011; Yusof & Sabri, 2017). However, the result of the parameter regarding age squared shows no effect in both models. The odds ratio of one indicates no in- or decrease in the odds of participation. Furthermore, the coefficient of the linear probability model indicates no additional effect. Therefore, the effect of age on participation does not get stronger as people grow older. This is contrary of what was expected. Including age group dummies could capture the effect of different age groups on participation rates.

The fixed effects linear probability model (2) omits the variables sex and migration background due to their non-time changing characteristics. The logistic pooled model (1) indicates an increase in the odds of participation for females. This supports the view of Huberman et al. (2007) and Mehdi and Ali (2019). People with a Western or non-Western migration background are found to be less likely to participate in the second pillar. Therefore, it confirms the expected relation of people with a migration background to have a lower participation rate (Hira et al., 2009; Metzger, 2017).

Table 3: Benchmark results

	Pooled logit (1)	**LPM with fixed effects (2)**
Temporary contract (R: permanent)	0.45***	-0.03***
Temporary agency workers (R: permanent)	0.63***	-0.08***
Flexible hours (R: permanent)	0.36***	-0.07***
Self-employed (R: permanent)	0.01***	-0.59***
Other contract types (R: permanent)	0.04***	0.47***
Manufacturing (R: education)	1.52***	0.02***
Electricity, gas, water (R: education)	0.68***	-0.01***
Construction (R: education)	0.82***	0.00***
Trade (R: education)	0.47***	0.01***
Transportation (R: education)	0.70***	0.02***
Accommodation, food (R: education)	0.90***	0.03***
ICT (R: education)	0.20***	-0.08***
Finance and insurance (R: education)	0.26***	-0.06***
Business services (R: education)	0.27***	-0.06***
Public administration (R: education)	1.56***	0.01***
Agriculture (R: education)	0.48***	0.02***
Health, social work (R: education)	1.74***	0.07***
Other services (R: education)	0.19***	-0.09***
Strongly urban (R: very strong)	1.10***	0.00
Medium urban (R: very strong)	1.07***	0.00
Low urbanization (R: very strong)	1.12***	0.00
Very low urbanization (R: very strong)	1.17***	0.00
Education: medium (R: lower)	0.63***	0.06***
Education: Bachelor (R: lower)	0.20***	0.07***
Education: Master (R: lower)	0.06***	0.08***
Medium education*income (R: lower)	1.04***	-0.01***
Bachelor's degree*income (R: lower)	1.15***	-0.01***
Master's degree*income (R: lower)	1.30***	-0.01***
Voluntary pension savings (R: none)	0.49***	-0.03***
Total wealth (log)	0.93***	-0.00***
Income (log)	1.35***	0.04***
Age	1.03***	0.01***
Age^2	1.00***	0.00***
Sex: female (R: male)	1.15***	.
Migration: Western (R: none)	0.75***	.
Migration: Non-Western (R: none)	0.84***	.
Constant	1.04	0.32***
Year fixed effects	Yes	Yes
Individual fixed effects	No	Yes
N (in millions):	23.8	23.8
$R2_p$/R2:	0.42	0.12

Source: CBS Microdata, own computations. * = 10%, ** = 5%, *** = 1% significance level. Standard errors are robust for clustering by persons. Coefficients in model 1 are reported in odds ratios. LPM stands for linear probability model. Reference category stands between brackets.

4.2 Robustness checks

To check for robustness, deviations in the benchmark models are made. Firstly, urbanization is substituted with a categorical region variable, namely: North, East, South and West. Secondly, it is substituted with provinces. Additionally, the log of income is substituted with ten deciles to research the possible differences of participation rates between income groups (appendix, figure 5). Furthermore, a partner variable is added to the model to mimic the effect of marriage, since literature indicates this to be influential (DeVaney & Chiremba, 2005; Stinglhamber et al., 2007). Also, a probit model is estimated as an alternative to the logistic model (Chen & Tsurumi, 2010). Both models are applicable to estimate a binary choice. They differ in the fact that the error terms of the logistic model follow a logistic distribution, while the error terms of the probit model follow a normal distribution (Borooah, 2002). Lastly, a linear probability model with random effects and a correlated random effects model are estimated.

Table 4 presents the robustness checks of the pooled logistic model. Column 1 indicates the effect of changing the income variable by ten deciles. No large deviations in the odds ratios are seen concerning the work sector categories. The odds ratio of flexible hours (0.39) indicates a slightly less negative effect than the benchmark result of 0.36. Table 8 (appendix) shows the odds ratios of the different income deciles. The results show an increase of the odds ratio with an increase of the deciles. All odds are above one and indicate a positive effect of an increase of income on the odds of participation. However, the increase in odds is declining after decile 5, which indicates that the effect lessens after a certain income is reached.

Column 2 indicates the results of substituting degree of urbanization by the four different regions North, East, South and West. No changes regarding the odds ratios of work contract are present. The odds ratios in table 8 (appendix) indicate a decrease in the odds of participation living in the East, South or West compared to living in the North. Subsequently, substitution of the degree of urbanization by provinces (column 3) also leaves the odds ratios of work contract unchanged. Table 8 (appendix) shows odds ratios above one for less urbanized areas (for example Overijssel and Limburg) and indicates odds ratios below one for more urbanized provinces (such as Utrecht and Zuid-Holland). Therefore, the effect of urbanization level, which presents results in the opposite direction than is hypothesized, seems to be robust.

Including the partner variable causes no significant changes in the work contract parameter (column 4). The odds ratio of the partner variable of 0.98 (table 8, appendix) indicates a small decrease of 2% in the odds of participation in the second pillar. This result is in conflict with expectations (DeVaney & Chiremba, 2005; Stinglhamber et al., 2007). The probit model (column 5) reports slightly different odds ratios compared to the bench model. However, the results indicate similar directional effects. Having a temporary contract, being a temporary agency worker, working flexible hours or being self-employed all decrease the odds of participation in the second pillar. The ratios are less spread out compared to the logistic estimation.

Table 4: Robustness checks concerning the pooled logistic model

Work contract (R:permanent)	**Categories (1)**	**Region (2)**	**Provinces (3)**	**Partner (4)**	**Probit (5)**
Temporary contract	0.46***	0.45***	0.45***	0.45***	0.65***
Temporary agency workers	0.63***	0.63***	0.62***	0.63***	0.77***
Flexible hours	0.39***	0.36***	0.36***	0.36***	0.57***
Self-employed	0.01***	0.01***	0.01***	0.01***	0.06***
Other contract types	0.04***	0.04***	0.04***	0.04***	0.16***
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Individual fixed effects	No	No	No	No	No
N (in millions):	23.8	23.8	23.8	23.8	23.8
$R2_p$:	0.42	0.42	0.42	0.42	0.42

Source: CBS Microdata, own computations. * = 10%, ** = 5%, *** = 1% significance level. Standard errors are robust for clustering by persons. Coefficients are reported in odds ratios. Only the odds of the variable of interest are reported. Column 1 concerns the results of substituting the log of income by ten deciles. Column 2 and 3 represent the substitution of the degree of urbanization by region and provinces. Column 4 indicates the influence of adding the categorical variable partner to the model. Column 5 reports the estimation of the probit model.

Table 5 presents the robustness checks of the fixed effects linear probability model. Substituting the variable income with ten deciles indicates no substantial difference in the effect of work contract on second pillar participation (column 1). Table 9 (appendix) shows that the with an increase in the deciles, the probability of participating in the second pillar increases. Furthermore, substituting the degree of urbanization with regions or provinces does not alter the coefficients of work contract as well (column 2 and 3). Including the partner variable to the model, does not change the coefficients of the variable of interest (column 4). The variables regions, provinces and having a partner or not indicate no large influence on participation when accounting for fixed effects (appendix, table 9). The random effects model indicates slightly different coefficients regarding the categories of work contract (column 5). The coefficients are larger, indicating a more negative effect on the probability of participating in the second pillar. The category self-employed experiences the most negative result by indicating a decrease of 71 percentage points, compared to having a permanent contract.

Table 5: Robustness checks of the fixed effects linear probability model

Work contract (R:permanent)	**Categories (1)**	**Region (2)**	**Provinces (3)**	**Partner (4)**	**Random effect (5)**
Temporary contract	-0.03***	-0.03***	-0.03***	-0.03***	-0.05***
Temporary agency workers	-0.07***	-0.08***	-0.08***	-0.08***	-0.07***
Flexible hours	-0.07***	-0.07***	-0.07***	-0.07***	-0.09***
Self-employed	-0.59***	-0.59***	-0.59***	-0.59***	-0.71***
Other contract types	-0.48***	-0.47***	-0.47***	-0.47***	-0.53***
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes	Yes	No
N (in millions):	23.8	23.8	23.8	23.8	23.8
R2:	0.12	0.12	0.12	0.12	.

Source: CBS Microdata, own computations. * = 10%, ** = 5%, *** = 1% significance level. Standard errors are robust for clustering by persons. Only the coefficients of the variable of interest are reported. Column 1 concerns the results of substituting the log of income by ten deciles. Column 2 and 3 represent the substitution of the degree of urbanization by region and provinces. Column 4 indicates the influence of adding the categorical variable partner to the model. Column 5 reports the estimation of the random effects model.

Additionally, table 6 includes the results of modelling a linear probability model with random effects (1) and includes the parameter outcomes of running a correlated random effects model (2). The correlated random effects model is an alternative of the fixed effects model (Yang, 2022). It controls for cross-sectional correlation by adding time averages of the variables, so that it resembles fixed effects. This is also known as the Mundlak approach. For this estimation, I included the averages of income, age, voluntary savings, education level, work sector, urbanization, total wealth, work contract and age to the power of two. The significant coefficients of the time averages indicate that there are unobservables affecting participation and the other variables at the same time. This indicates an omitted variable bias. Therefore, running a fixed effects model is preferred. The coefficients of the work contracts become more in line with the results of the benchmark model using the correlated random effects model including fixed effects. Therefore, it shows robustness of the coefficients of work contract in the benchmark model.

Table 6: Robustness checks of the fixed effects linear probability model by estimating random effects

Work contract (R:permanent)	**Random effects (1)**	**Random effects incl FE (2)**
Temporary contract	-0.05***	-0.04***
Temporary agency workers	-0.07***	-0.06***
Flexible hours	-0.09***	-0.07***
Self-employed	-0.71***	-0.63***
Other contract types	-0.53***	-0.42***
Year fixed effects	Yes	Yes
Individual fixed effects	No	Some
N (in millions):	23.8	23.8
$R2_p$:	.	.

Source: CBS Microdata, own computations. * = 10%, ** = 5%, *** = 1% significance level. Standard errors are robust for clustering by persons. Only the coefficients of the variable of interest are reported. Column 1 concerns the results of the random effects model. Column 2 presents the results of the correlated random effects estimation.

5 Discussion and conclusion

In this study, I estimated determinants of second pension pillar participation in the Netherlands and specifically add to literature by estimating the effect of work contracts on participation. The logistic results indicate that working on a temporary, flexible or self-employed basis decreases the odds of participation in the second pillar, compared to having a permanent contract. Furthermore, the results of the linear fixed effects probability model confirm the influence of these work contracts on the probability of participation. Being self-employed decreases the likelihood of participation the most. The odds ratio of 0.01 indicates a decrease in the odds of participation by 99% compared to having a permanent contract. The coefficient of -0.59 regarding the linear probability model indicates a decrease in the probability of participation by 59 percentage points being self-employed. Likewise, working flexible hours or on a temporary basis decreases the odds of participation substantially compared to being permanently employed. Therefore, work contract significantly influences participation in the second pillar and can be established as an influential determinant.

Furthermore, the results establish a positive influence of income, age, being female and working in the manufacturing, public administration or healthcare sector on participation in the second pillar. Having a migration background was found to decrease the odds of participation. These findings are in line with the literature (Huberman et al., 2007; Mehdi & Ali, 2019; Metzger, 2017; Nivakoski, 2014; Yusof & Sabri, 2017). However, conflicting evidence is found regarding the effect of urbanization and total wealth on pension participation (Rey-Ares et al., 2015; Stinglhamber et al., 2007). I find a negative influence of a higher urbanization level and total wealth on the likelihood of participation in the second pillar. A possible explanation regarding the contrary evidence of urbanization degree entails that young people might live in large cities before progressively moving out when having children. Including an interaction term between degree of urbanization and age might give clearance on this view. The decrease in the odds of participation with a higher total wealth might be explainable by the substitution effect. Individuals who have a large total wealth might save more using alternative forms of investments.

The results of this study provide insights in determinants of pension participation in the Netherlands. These insights may help the government with its aim to decrease the group of employees that is not participating in second pillar pensions. The results of this study can help the government take targeted action, for example by changing regulations. The self-employed often do not participate in the second pillar. While the self-employed highly value flexibility and individual responsibility, easing the administration process of saving in the second pillar could be a practical option (Oerlemans & van der Lecq, 2009, 2013). If this is insufficient, the government might consider mandatory pension participation for the self-employed.

Better communication may increase the pension coverage of workers who switch from wage-employment to self-employment. They can continue participation in the same pension

fund after their switch, but they hardly do so. This voluntary continuance of saving in the second pillar could be improved by a more equal and transparent reporting of pension contribution. Now, employees only see their part of pension contribution, while two-thirds gets paid by their employer (Oerlemans & van der Lecq, 2014). Therefore, when switching to being self-employed, it seems to be more expensive compared to being an employee. This 'expensive' surprise could be suppressed by ensuring that wage-employees are fully informed on their contributions to pension savings. Therefore, it would incentivize participation and ease comparison between the groups. In addition, changing regulations regarding offering permanent contracts could increase the participation rate. An example of this could be the obligation for companies to offer a permanent employment contract after a temporary contract of one year. Furthermore, the government could further reduce the waiting time of pension savings for temporary agency workers. As a result, they could more easily start saving pension while working somewhere for a short amount of time. Lastly, the results of the other determinants could include guidance on targeting specific groups. For example, campaigns could be run in highly urbanized areas or the government could target young individuals to increase awareness of the importance of pension participation.

A shortcoming of this study includes the examination on the extensive margin (participation rate), and not the intensive margin (amount of pension contribution). Hence, this study is not able to reflect on the level of (adequate) pension savings. Furthermore, the use of a linear probability model to estimate the effect on a binary variable has several shortcomings. Estimates might be inefficient and estimated probabilities can fall outside the prediction range (0 to 1) (Papke & Wooldridge, 2008). Also, the estimated slope might be biased as the estimated relation might have a different curvature (Liao, 1994). Performing the analysis with a fixed effects logistic panel model would improve the results, but is beyond the scope of this research due to the limited data of six years.

A recommendation for future research includes examining the intensive margin to provide relevant results for forecasting participation rates. Also, if additional data years are available, a fixed effects logistic panel data could be estimated. Furthermore, including an interaction term between the degree of urbanization and age might improve the results by giving an indication of the reason behind the conflicting evidence relating to urbanization degree. Similarly, substitution of age by categorical dummies might refine results, capturing the differences between age groups. Moreover, adding time lags could account for delayed influences. Finally, literature suggests variables to be of influence which were not available in the database that is used for this study. Including marriage, company size or property ownership are interesting topics for future studies.

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6 Appendices

Table 7: Summary statistics

Variables	N (millions)	Mean	Std dev
Second pillar	23.8	0.79	0.41
Work contract	23.8	1.93	1.52
Company sector	23.8	8.00	4.19
Residence	23.8	2.55	1.27
Education level	23.8	2.54	1.27
Voluntary savings	23.8	0.05	0.23
Total wealth	23.8	253*	314
Income	23.8	45.6*	51.7
Age	23.8	40.7	11.7
Sex	23.8	1.48	0.50
Migration background	23.8	1.32	0.71

Note: the table displays the variables over the years 2016-2021. It contains information on the sample used in the regressions. Therefore, it is a specific selection of citizens between the age 21-67, excluding students and (pre)pensioners. The unique number of individuals in the data concerns 5.8 million. * denotes the number is in thousands of euros.

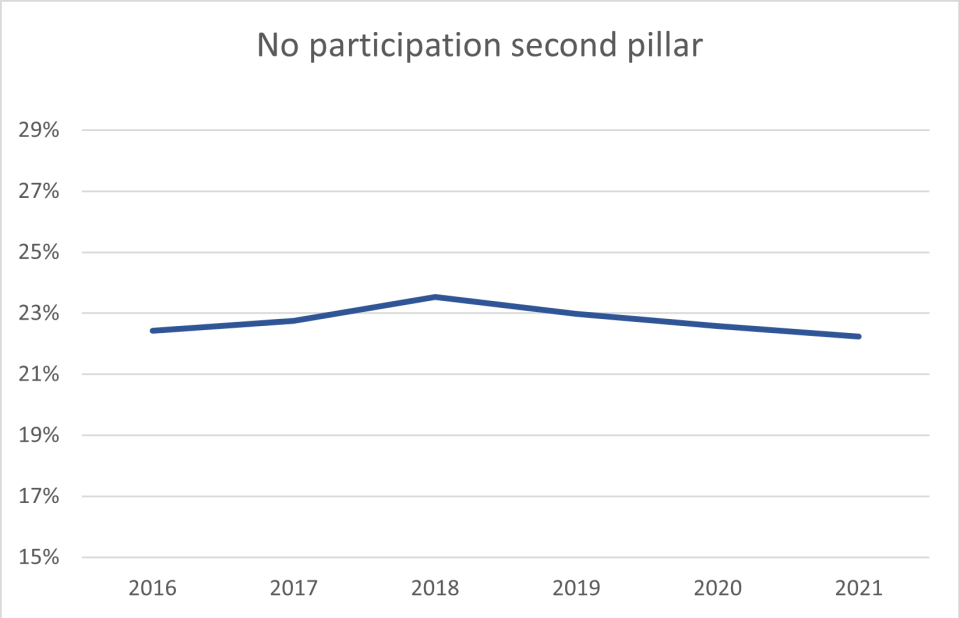

Figure 3: No participation stable over time

Note: the figure shows the percentage of the labor force not participating in the second pillar over the years 2016-2021. The rate stays relatively stable over time.

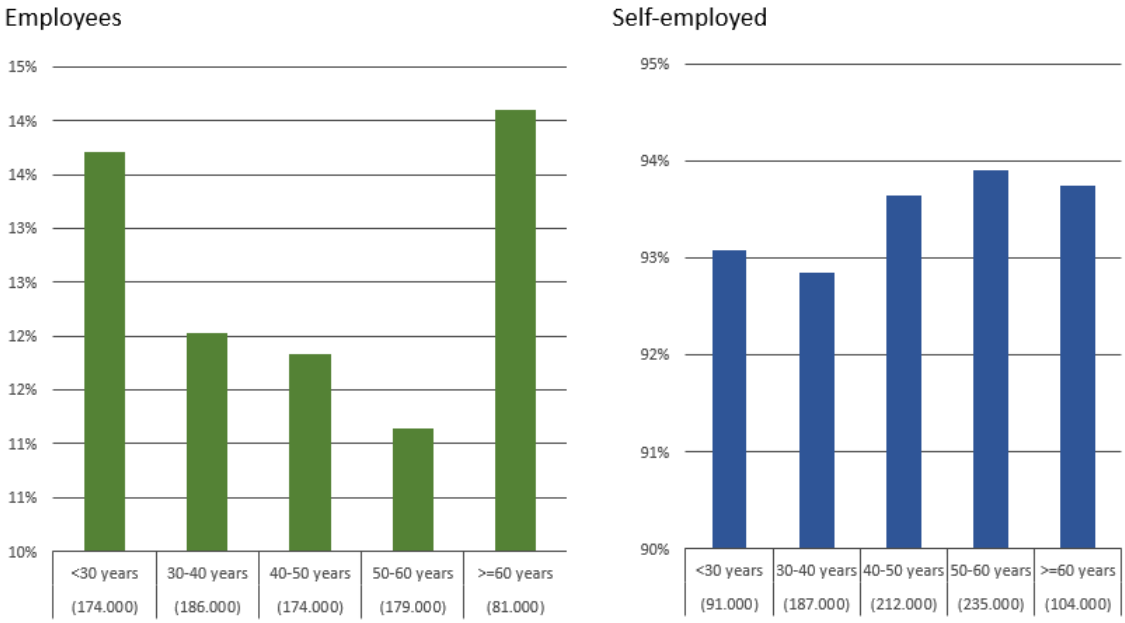

Figure 4: No participation by age, 2021

Note: the figure shows the different relationships between not participating in the second pillar and age. Left concerns the wage-employees and right reflects the self-employed. The left histogram show that younger (<30 years) and older (>=60 years) employees lack more occupational savings, compared to other generations. It indicates the possibility of a non-linear relationship. Hence, age to the power of two is added to the model.

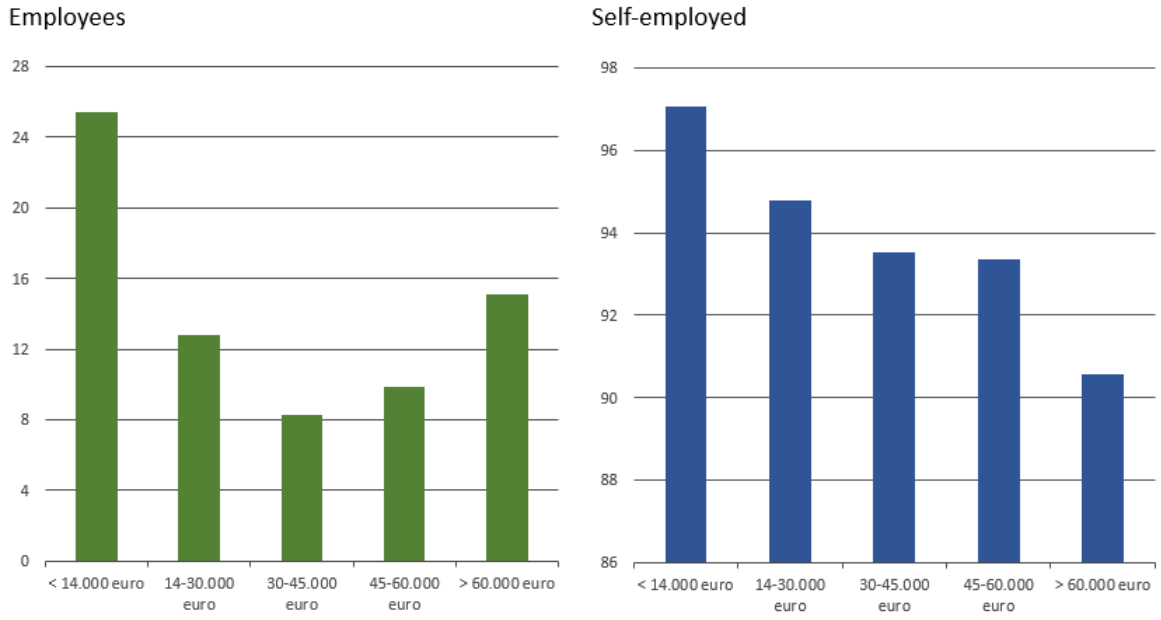

Figure 5: No participation by income, 2021

Note: the figure shows the relation between no participation and different income groups. Overall, with an increase in income, an upward trend in participation can be seen. This relation is more linear for the self-employed.

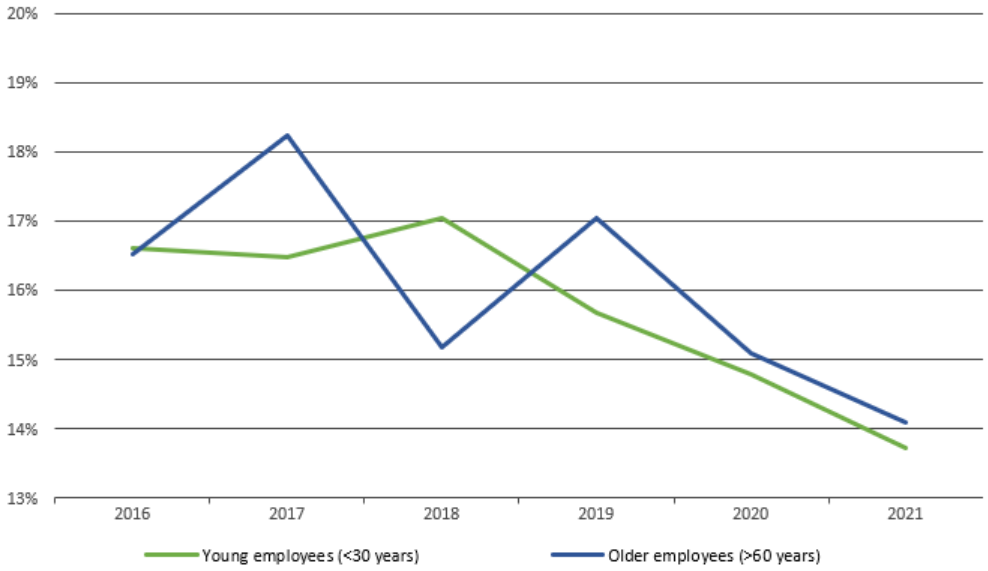

Figure 6: No participation by generation

Note: the figure shows that the participation rate of young (<30 years) and old employees (>60 years) increased over time (from 2016 to 2021). As can be seen, there is a decline in the group not participating in the second pillar.

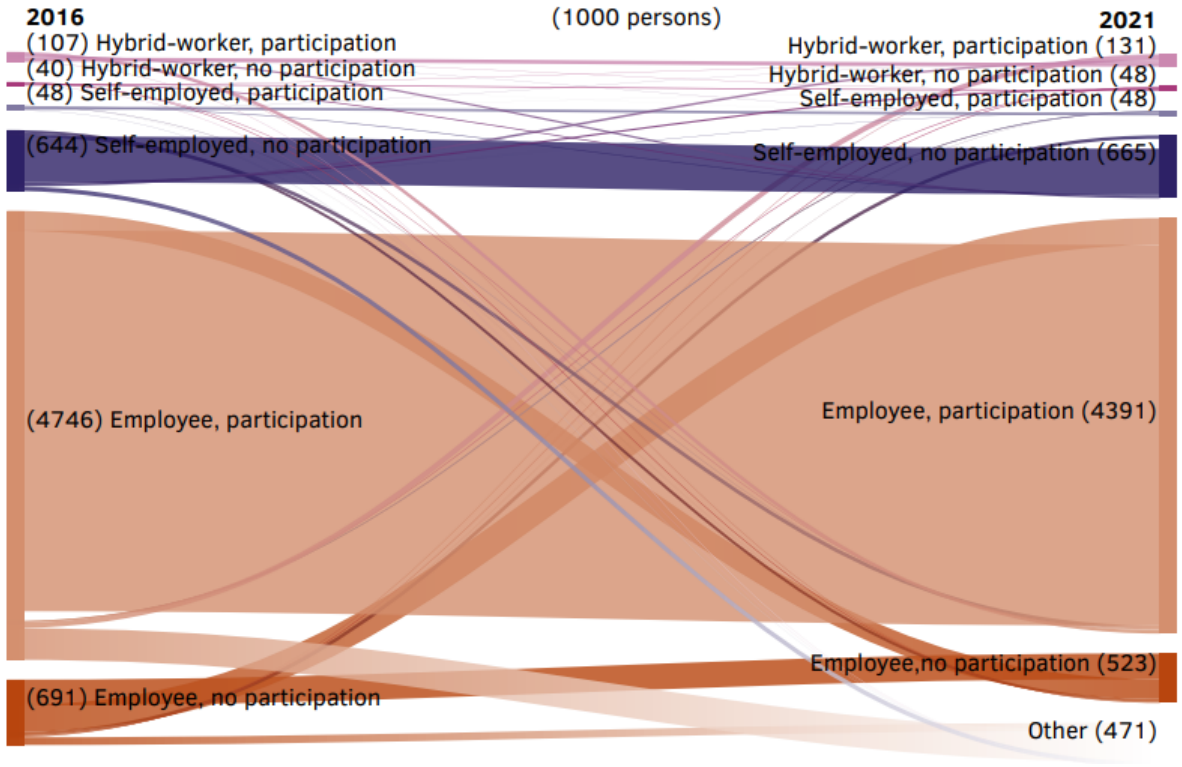

Figure 7: Employment flow 2016 to 2021

Note: the figure shows relatively stable employment groups over the years 2016-2021. The category 'Other' mainly concerns individuals who make use of social securities.

Table 8: Robustness checks of the pooled logistic model including the results of the changed variables

	Categories (1)	**Region (2)**	**Provinces (3)**	**Partner (4)**
Temporary contract	0.46***	0.45***	0.45***	0.45***
Temporary agency workers	0.63***	0.63***	0.62***	0.63***
Flexible hours	0.39***	0.36***	0.36***	0.36***
Self-employed	0.01***	0.01***	0.01***	0.01***
Other contract types	0.04***	0.04***	0.04***	0.04***
Income decile 2 (R:1)	1.84***			
Income decile 3 (R:1)	2.31***			
Income decile 4 (R:1)	3.69***			
Income decile 5 (R:1)	2.94***			
Income decile 6 (R:1)	2.67***			
Income decile 7 (R:1)	2.46***			
Income decile 8 (R:1)	2.16***			
Income decile 9 (R:1)	1.73***			
Income decile 10 (R:1)	1.23***			
East (R:North)		0.93***		
South (R:North)		0.93***		
West (R:North)		0.84***		
Friesland (R:Groningen)			1.02*	
Drenthe (R:Groningen)			1.02*	
Overijssel (R:Groningen)			1.04***	
Flevoland (R:Groningen)			0.80***	
Gelderland (R:Groningen)			0.93***	
Utrecht (R:Groningen)			0.91***	
Noord-Holland (R:Groningen)			0.81***	
Zuid-Holland (R:Groningen)			0.85***	
Zeeland (R:Groningen)			0.95***	
Noord-Brabant (R:Groningen)			0.91***	
Limburg (R:Groningen)			1.05***	
Partner (R: no)				0.98***
Year fixed effects	Yes	Yes	Yes	Yes
Individual fixed effects	No	No	No	No
N (in millions):	23.8	23.8	23.8	23.8
$R2_p$:	0.42	0.42	0.42	0.42

Source: CBS Microdata, own computations. * = 10%, ** = 5%, *** = 1% significance level. Standard errors are robust for clustering by persons. Coefficients are reported in odds ratios. Only the coefficients of work contract and variables that are changed, are reported. The results of the other variables are left out to improve readability. Column 1 concerns the results of substituting the log of income by ten decile. Column 2 and 3 represent the substitution of the degree of urbanization by region and provinces. Column 4 indicates the influence of adding the categorical variable partner to the model.

Table 9: Robustness checks of the linear probability model including the results of the changed variables

	Categories (1)	**Region (2)**	**Provinces (3)**	**Partner (4)**
Temporary contract	-0.03***	-0.03***	-0.03***	-0.03***
Temporary agency workers	-0.07***	-0.08***	-0.08***	-0.08***
Flexible hours	-0.07***	-0.07***	-0.07***	-0.07***
Self-employed	-0.59***	-0.59***	-0.59***	-0.59***
Other contract types	-0.48***	-0.47***	-0.47***	-0.47***
Income decile 2 (R:1)	0.05***			
Income decile 3 (R:1)	0.07***			
Income decile 4 (R:1)	0.09***			
Income decile 5 (R:1)	0.10***			
Income decile 6 (R:1)	0.11***			
Income decile 7 (R:1)	0.11***			
Income decile 8 (R:1)	0.11***			
Income decile 9 (R:1)	0.11***			
Income decile 10 (R:1)	0.10***			
East (R:North)		0.01***		
South (R:North)		0.01***		
West (R:North)		0.01***		
Friesland (R:Groningen)			0.01*	
Drenthe (R:Groningen)			0.00	
Overijssel (R:Groningen)			0.01***	
Flevoland (R:Groningen)			0.01	
Gelderland (R:Groningen)			0.01***	
Utrecht (R:Groningen)			0.01***	
Noord-Holland (R:Groningen)			0.01***	
Zuid-Holland (R:Groningen)			0.01***	
Zeeland (R:Groningen)			0.01***	
Noord-Brabant (R:Groningen)			0.01***	
Limburg (R:Groningen)			0.01***	
Partner (R: no)				-0.00
Year fixed effects	Yes	Yes	Yes	Yes
Individual fixed effects	No	No	No	No
N (in millions):	23.8	23.8	23.8	23.8
$R2_p$:	0.12	0.12	0.12	0.12

Source: CBS Microdata, own computations. * = 10%, ** = 5%, *** = 1% significance level. Standard errors are robust for clustering by persons. Only the coefficients of work contract and variables that are changed, are reported. The results of the other variables are left out to improve readability. Column 1 concerns the results of substituting the log of income by ten deciles. Column 2 and 3 represent the substitution of the degree of urbanization by region and provinces. Column 4 indicates the influence of adding the categorical variable partner to the model.