PENSION FLEXIBILITY: BLESSING OR BURDEN

An investigation into the factors that cause differences in pension saving behavior between the Dutch self-employed and regular employees

Abstract

In the Dutch pension system most regular employees compulsory save for their pension through their employer while self-employed are expected to arrange their own pension. This added freedom in retirement saving options places a burden on the self-employed as they must make difficult financial decisions. Research shows that self-employed, on average, have lower pension savings than regular employees. This thesis investigates a range of possible factors that can cause and influence this difference. A large dataset of the Dutch Central Bank containing both financial as well as psychological information about individuals is tweaked to calculate the expected pension income of individuals. The analysis in this thesis shows that factors such as income and life expectancy do influence pension saving behavior, but these variables do not reduce the differences between being self-employed and regular employed. Interestingly self-employed seem to save worse than their counterparts early in life, but manage to decrease this gap later in life. When reaching the pension age self-employed have an eight-percentage point lower probability of having reached their pension target. The differences are significantly smaller for individuals who consider themselves financially knowledgeable or skilled at sticking to a savings plan.

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1. Introduction

The Dutch labor market has gone through significant changes in the past decades. There has been a sharp increase in so-called 'zzp-ers'; people who are self-employed without employees or contract workers (Kremer, Went, & Knottnerus, 2017). According to Statistics Netherlands (CBS), there are around one million self-employed in the Netherlands, and that number is rising (CBS, 2018a). One concern this expansion has given rise to relates to the differences between the social security arrangements of self-employed and regular employees in the Netherlands. Even though self-employed are heterogeneous regarding work field, most face similar financial risks (Ministerie van Financiën, 2015). Self-employed do not benefit from minimum wage laws and have to arrange insurance against disability and sickness personally instead of relying on an employer. In addition to the lack of social security, they also have more responsibility in making their own financial decision as they are responsible for arranging their pensions privately. While for over 95% of the regular employees their employer enrolls them in a sponsor planned savings plan this is not the case for self-employed (Giesen, Engelen, & Menger, 2017). Self-employed are expected to arrange their pensions privately by acquiring annuity insurance or by saving sufficiently. Compared to other countries, Dutch workers have high pension savings, but there are considerable differences between individuals (Knoef, Goudswaard, Been, & Caminada, 2015). Research shows that the self-employed save significantly less for their pension than their regularly employed counterparts (Goudswaard & Caminada, 2017). Only 62% of the self-employed manage to have a pension of at least 70% of their last earned income (an often-used threshold) compared to 70% of the regular employees (Goudswaard, Beetsma, Nijman, & Schnabel, 2016; Goudswaard & Caminada, 2017). Various researchers provide extensive statistics regarding this situation, but they fail to explain its underlying causes. Recently The Social and Economic Council (SER) (2015) and the Dutch Central Bank (DNB) (2015) stated that there should be more attention to the lack of pension savings of this group. Researchers and government agencies have established the differences in pension savings between employed and self-employed but failed to provide explanations for the underlying causes for these differences. This paper seeks to fill that gap by addressing the following research question:

What causes the Dutch self-employed to save less for their pension than regular employees?

The rest of this chapter explains the Dutch pension system and specifies the concept of self-employment. Followed by an introduction to the gaps in the existing literature, and the introduction chapter ends with a brief elucidation of the chosen research methods.

1.1. The current Dutch pension system

There are four different ways in which Dutch workers can build up their pension. These four ways are divided in the three pillars of pension income and a fourth unofficial pillar of regular savings. There are some critical differences between the pillars. Figure 1 is a simplified graphical representation of the way the three pillars operate.

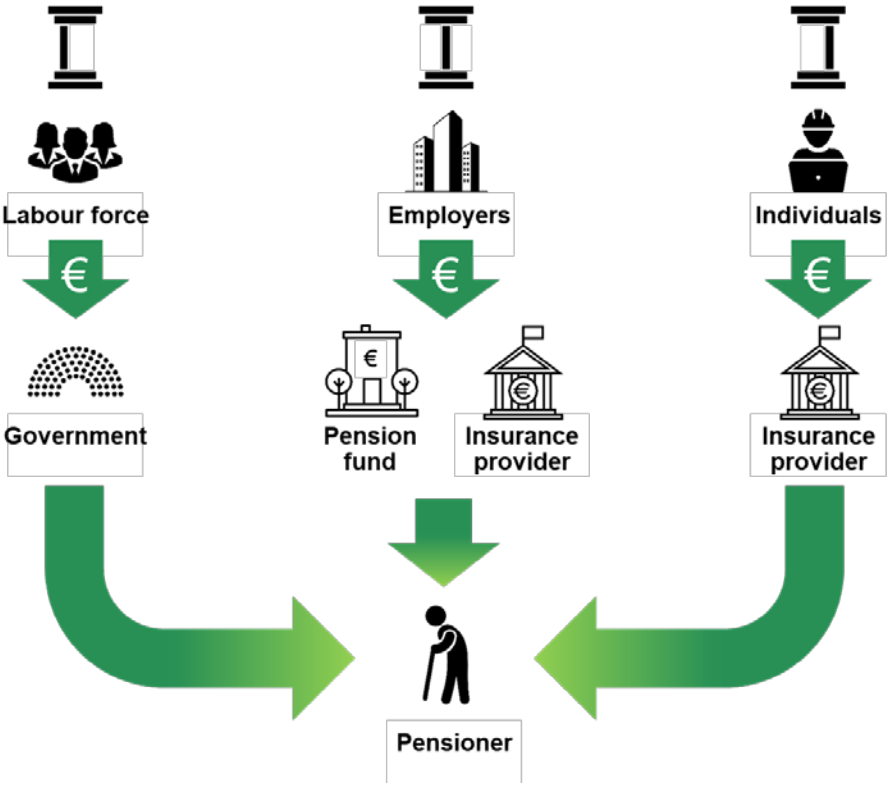

Figure 1: Graphical representation Dutch pension system

1.1.1. First pillar: AOW

The first pillar is a general state pension, called the AOW. The AOW is linked to the minimum wage, and all individuals who lived in the Netherlands between their 15th and 65th are entitled to it (Rijksoverheid, 2018a). The AOW is not dependent on lifetime income or total taxes paid. The AOW accounts for around 54% of the total pension rights, which is less than government contributions in surrounding countries (Bruil, Schmitz, Gebraad, & Bhageloe-Datadin, 2015; Vereniging van Bedrijfstakpensioenfondsen, 2015). The standing working population annually finances the AOW.

1.1.2. Second pillar: pension funds

The second pillar consists of the collective industry pensions and accounts for approximately 40% of the total pension rights (Bruil, Schmitz, Gebraad, & Bhageloe-Datadin, 2015). Employers arrange these pensions through a pension fund, a company fund or a private insurance company. Even though legally employers are only required to provide a pension when there is a collective labor agreement or an industry pension fund, only 4% of the regularly employed earning at least the minimum wage do not save for a pension through the second pillar (Giesen, Engelen, & Menger, 2017). The final payout of the

second pillar depends on the annually paid premiums and the returns the pension provider has managed to achieve. Hence, in contrast to the first pillar, the monthly amount paid out through the second pillar is dependent on the lifetime earnings.

1.1.3. Third pillar: annuity insurance

The final official pillar is the privately arranged third pillar. This pillar is the smallest of the three and accounts for around 6% of the total pension rights (Bruil, Schmitz, Gebraad, & Bhageloe-Datadin, 2015). Every individual can buy an annuity pension product from one of the corporate Dutch insurance providers. These products work in a similar way as the second pillar pension funds. The final payout of these products depends on annual premiums and returns on the investment. Self-employed can buy these products in a fiscally attractive way because they are unable to build a pension through the second pillar (Hoekstra & van Vuuren, 2013).

1.1.4. "Fourth" pillar

In addition to the three official pillars, there are alternative sources of pension income to which are sometimes called the fourth pillar (Mastrogiacomo & Alessie, 2015). Instead of buying an annuity product from an insurance company it is possible to independently set aside money for when one reaches one's pension age. Various methods are commonly used such as savings accounts, home equity, and stocks & bonds. When liquidated, this money can be used for day to day living expenses. However, because this income source is not an annuity, it is possible to 'run out of' money by becoming older than expected. There are also upsides with saving through the fourth pillar. The individual can access the assets and freely use them for emergencies or to live in a larger house than would otherwise be affordable. Furthermore, the assets that are left when a person dies can be inherited by the relatives, which is not possible for the savings in the second or third pillar. Next to individual savings through the four mentioned pillars, living off the income or savings of a partner is also possible and hence deserves to be considered an alternative source of pension income.

1.2. Gaps in literature

Various researchers have slightly different definitions for self-employed which can cause some confusion. The sociologist Dale (1986) describes self-employed as: "those who own their own means of production but who employ no-one else". Since this thesis focuses on the Dutch self-employed the most important definition is the slightly more elaborate one used by the Dutch government. Statistics Netherlands describes self-employed as; "a person who performs work for his own account or risk – in his own company or practice (self-employed person), or as director-majority shareholder (dga), or as a separate self-employed person (for example in an independent profession)" (CBS, 2018b). Within the group of self-employed there are differences, for instance related to how much of their time they work as self-employed (Ministerie van Financiën, 2015). In this thesis, the focus will be on the self-employed who work most of their time as self-employed.

In 2016 the Dutch government has stated that a future-proof pension system should aim to provide an adequate pension for all Dutch workers including the self-employed. The latest research using data from 2012 shows that especially the lowest earning self-employed have a high probability of not reaching an adequate pension (Goudswaard & Caminada, 2017). The often-used threshold of an adequate pension of at least 70% of the last earned gross income is used to show the differences. Of the lowest earning quintile around 72% of the self-employed are expected to not reach the threshold compared to 53% of the regular employees (Goudswaard & Caminada, 2017). These differences are smaller for richer and older people but remain relevant. The authors do not provide underlying drivers for the difference in total pension savings between self-employed and regular employees.

Economists including Friedman (1957) have tried to create rational models that predict optimal pension saving behavior. These models try to estimate an optimal course of action throughout an individual's life to limit the shifts in spending throughout a life. These models expect people to act rationally and in accordance with their own preferences. Behavioral economists have started to doubt these assumptions resulting in the fact that the models might not be a good representation of the true situation.

In existing research, the self-employed are often compared to the regular employees as if they are randomly drawn from the population. This assumption seems flawed as at least 90% of those who become newly self-employed choose to do so voluntarily (van der Veen, Wakkee, & van Nispen, 2016). Self-employed might differ in aspects such as risk attitude and optimism, known to be strongly correlated with starting a business (Koellinger, Minniti, & Schade, 2007). Furthermore, research from Thaler and Benartzi (2004) shows that most people under-save compared to the rationally predicted life-cycle rates. The two main reasons they present for this are *lack of self-control* and *bounded rationality*. Individuals who lack self-control might procrastinate saving for their pension. Self-employed are not necessarily worse when it comes to self-control, but due to their increased responsibilities, this propensity is bound to have more influence on the pension savings levels. In addition to self-control issues researchers present the problem of bounded rationality (Hilgert, Hogarth, & Beverly, 2003). While rational theories assume individuals to understand the complex problems involved in various possible financial investments, behavioral economists state that it is unlikely that all individuals do. The increased freedom in choice could lead to suboptimal decision making when people lack the financial knowledge to make the decisions optimally. These theories have yet to be tested on the Dutch situation. This research paper aims to provide more insights into how the differences in behavioral traits might cause differences in saving behavior.

1.3. Research approach

The central research question why self-employed save less for their pension than regular employees is answered with the help of an extensive dataset called the DNB Household Survey. The dataset consists of responses of over 46,829 individuals who filled in a large variety of questions about wealth, income and personal preferences. After performing a thorough data cleaning process 1,925 individuals are left in the dataset. The dataset was tweaked to be useful in answering the research question and sub-questions. For all the behavioral aspects proxies were created that tried to catch the individual's attitude.

Following this introductory chapter, in which the main problem and its social relevance have been explained, the existing literature is discussed. In this chapter, hypotheses are formed by connecting the existing theories to the specifics of the Dutch situation. This chapter is followed by the methodology chapter in which the data transformation is discussed. All assumptions that are used are explained in detail. Afterward, the results and conclusions about the hypothesis are formed using various regressions. For each hypothesis the results are examined to provide a better understanding of the underlying drivers of the variables. The thesis ends with a concluding chapter in which the conclusions are drawn, policy implications are discussed, and the main shortcomings of the research are acknowledged.

2. Theories & Hypothesis

Various researchers have proposed a range of possible theories that try to explain differences in saving behavior. This chapter starts with describing the classical consumption smoothing theories. In these theories, rationality plays a crucial role. Secondly, theories about preferential differences between self-employed and regular employees are explored. Their possible implications for pension saving behavior are hypothesized. Thirdly, the attention will shift to theories regarding the behavioral traits that can influence pension saving behavior differently given the added freedom for self-employed.

2.1. Classical economic theory

2.1.1. Consumption smoothing theory: income

In traditional economics, decision-makers are assumed to act rationally (Nell, 1975). The idea is that all the decision makers are able to understand the products that are on offer and make use of their private knowledge to make the optimal decisions. One of the most far-reaching financial decisions in life is how to smooth income and consumption over a lifetime. In this context, Friedman (1957) came up with the permanent income hypothesis. The idea starts with looking at the utility function of an individual consumer were his utility is assumed to be based on his current and future consumption. The lifecycle of an individual is divided into three parts. Individuals start off by obtaining an education, this is followed by a period of working and the last cycle is retirement. Given the expected rationality of the individuals, the theory predicts that people save sufficiently to smooth their consumption over their lifetime. The theory, therefore, predicts that individuals borrow money while obtaining an education, save money while working and spend these savings during their pension period. Pension consumption is dependent on the lifetime savings, and the rate of return an individual will have earned on his assets, and the age the individual will reach as becoming older increases the total pension years but not the total earnings.

Given mortality rates and expected returns on investments, it is possible to calculate the optimal savings rate for everyone assuming that, as Friedman proposes, people want a stable consumption throughout their lives. Figure 2 shows the idea of consumption smoothing over a lifetime in a simplified way. There is, however, a significant difference between the Dutch system and the US-based one on which the model of Friedman is based; the state pension. When retiring the Dutch retirees still earn a state pension between €14,638 for singles and €10,008 for people living together (Rijksoverheid, 2018b). The difference that this makes is presented in the middle graph. This guaranteed state pension ensures that part of the income smoothing is taken care of by the government.

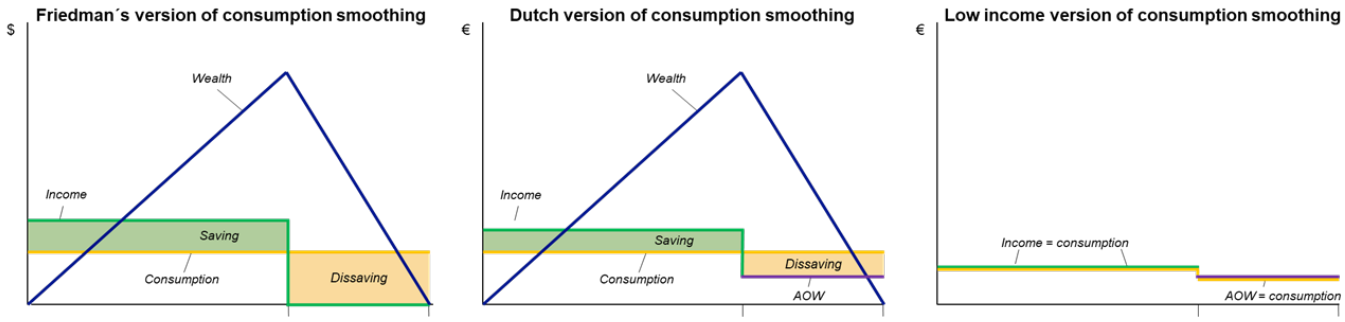

Figure 2: Graphical representation of consumption smoothing theory

Based on the model the most critical drivers of pension saving behavior should be income and life expectancy. The research of Goudswaard and Caminada (2017) shows that especially in the lowest income households the self-employed have difficulties saving for their pension. It could be the case that people only start saving for their pension after certain basic needs are fulfilled, as pictured in the right graph in figure 2. If income differs between self-employed and regular employees, this could explain differences in the pension savings. This leads to the first testable hypothesis:

H1.1: Self-employed and regular employees have different incomes, and these differences cause the differences in total pension savings

2.1.2. Consumption smoothing theory: life expectancy

While a higher income allows for higher savings, having a higher life expectancy makes it more important to have a sufficient pension. Buying an annuity insurance product makes more sense for individuals if they are likely to become older than the average person, assuming the insurance provider does not adapt their premium to each client's individual life expectancy. If the life expectancy of self-employed differs from that of regular employees, then this can explain differences in pension saving behavior. Three main relevant characteristics could cause a distinction between the life expectancy of the subgroups; gender, health, and education.

In the Netherlands, there are substantial differences when it comes to life expectancy between males and females. An average fifty-year-old male worker is expected to live an additional 26.0 years compared to 31.9 years for a female. The difference in life expectancy means that males need to save around 40% less through the fourth pillar to get the same annual pension income. In the annuity payments, this difference is smaller as insurance companies have different payout structures for males and females. If males make up a more significant share of the group of self-employed than of the group of regularly employed the overall life expectancy of the former would be lower, which in a rational model would lead to lower expected pension savings (CBS, 2018c).

Another characteristic that according to life cycle theory should be relevant to expected pension savings is health. As healthier people are likely to become older, they should care more about their pension

income as the period they need it is longer. Living below one's preferred pension income is worse for one's lifetime utility the older one becomes. It is therefore expected that people in better health are more inclined to save for their future. It is hard to determine a priori if and how self-employed and regular employees differ in health. There are however two possible effects that could cause a difference in general health levels of the two groups. First of all, there are some self-employed who became self-employed after a period of sickness (Jansen, et al., 2015). These self-employed should cause the group of self-employed to be less healthy than regular employees. At the same time, becoming self-employed is disadvantageous for people with ill health. Regular employees will continue to earn a salary when they are sick; this is in contrast to self-employed who lose their source of income when they become sick. It would, therefore, seem unlikely for a person in ill health to choose to become self-employed as the risk involved are more considerable than for regular employees. A priori it is impossible to predict how these differences in health levels influence the life expectancy of the two groups.

The education level of individuals is not only linked to expected income but also linked to life expectancy. In low educated labor-intensive sectors such as agriculture, forestry and fishing and the construction industry the life expectancy is lower than average (CBS, 2014a). However more and more self-employed are becoming active in the service industry (Ministerie van Financiën, 2015). The life expectancy in the service industry, in which most people are highly educated, is higher than in the low educated sectors. According to the CBS (2018) around 40% of the self-employed are highly educated compared to 36% of the entire workforce. This leads to the expectation that self-employed should become older than regular employees. However, since self-employed are overrepresented in labor-intensive sectors such as the construction industry, it is difficult to make predictions about the health of the group of self-employed caused by differences in education levels.

The differences in pension savings between self-employed and regular employees could fit in the life cycle theories if the two groups differ in life expectancy and the individuals act in accordance to this information. This leads to the second hypothesis:

> *H1.2: The difference in life expectancy between self-employed and regular employees causes the difference in pension saving behavior.*

2.1.3. Updated consumption smoothing

This basic model as seen in figure 2 assumes that income and consumption stay stable over a working life. Over the years various researchers have tried to make the model more realistic by doing empirical research (Gourinchas & Parker, 2002). Based on actual data from US households the consumption and savings levels are different from those in figure 2. The newer model improves the simplified one in various ways that have substantial implications for the expected behavior.

First, income levels are not stable but continuously changing throughout the life of an individual. Most individuals manage to increase their annual income between the start of their career (twenty-five years old) and the peak of their career (fifty years old). After becoming fifty, the average income tends to decrease again (Gourinchas & Parker, 2002). Not only income but costs also fluctuate over the course of a lifetime. For most people consumption rises when they are between 25 and 45 years old. One of the primary drivers for this increase in costs is having children. As households get kids, their total costs rise significantly; once those kids fend for themselves or the mortgages are paid off, costs are bound to drop. Given this constant change in spending needs, the assumption that individuals want to spend the same amount of money annually during their life seems inaccurate. Spending more money during expensive years while saving more money during inexpensive years seems preferable to spending and saving the same amount of money each year.

Self-employed have more freedom when it comes to their saving behavior as they can choose not to save (or even dissave) for their pension during expensive years. This additional freedom has benefits but can also cause difficulty for them as dissaving makes it harder to reach their final pension target. If self-employed spend too much money in some years and fail to catch up, this has negative consequences for their pension. However, it is also entirely possible that they will overspend (compared to regular employees who are not able to spend the money they involuntarily save through the second pillar) when they are younger, as these years are more expensive, and then make up for it later in life when life becomes cheaper (because the kids are out of the house or the mortgage is partly paid off). This pension saving gap can be closed both by saving more during working years or by being prepared to live cheaper during pension. This leads to two testable hypotheses. The first hypothesis is that:

> *H1.3: Self-employed save less early in life than regular employees but make up for this difference later in life*

Alternatively, self-employed spend more during their working life but still manage to reach their personal pension target. Current research often used a pension income target of 70% of the last earned income for all individuals. It is likely that the actual pension target is different for all individuals. Since regular employees have little freedom in saving for their pension income, it is possible that a lot of them are saving more than they would prefer. If regular employees are over-saving compared to their own targets they do save more for their pension than regular employees, but they are not smoothing their consumption as they would like. There is a possibility that it is not the self-employed who are under-saving, but the problem lies with the regular employees who are over-saving compared to their personal preferences. This leads to the hypothesis that:

> *H1.4: Self-employed are just as good as regular employees in reaching their personal pension income targets.*

2.2. Behavioral influences

As laid out so far, the classic rational paradigm suggests that the differences between the pension saving behaviors of self-employed and regularly employed might be fully explained by differences in income and life expectancy. More behavior-oriented theoretical approaches suggest further variables to consider. From the existing literature, we know that saving behavior and becoming self-employed may correlate with behavioral traits as risk attitude and optimism. What is relevant too is people's financial literacy and their skills when it comes to making and realizing plans is more important given the added freedom for the self-employed**.** In the sections to follow these factors will be examined one by one.

2.2.1. Risk attitudes

While the basic model of Friedman assumes that all individuals act rationally and are risk neutral, this assumption seems flawed. Business starters such as self-employed become exposed to more risks than regular employees. They trade their guaranteed salary for an uncertain salary and lose their insurance against sickness and disability. As shown by Kahneman and Tversky (1979) people attach their subjective probabilities to risks. These subjective probabilities differ for all individuals. Certain individuals weight the probabilities of good outcomes more strongly than the negative ones, leading to a bias towards taking risks. Recent extensive research in Germany has shown that males take more risks than females and that younger people take more risks than older ones (Dohmen, et al., 2011). Furthermore, research predicts that self-employed and entrepreneurs underestimate risks and can cope better with the situation in which risks are involved (Simom, Houghton, & Aquino, 2000).

The relationship between risk attitudes and long-term financial decision making is complicated. Unfortunately, there has been no empirical research that links risk attitudes to pension saving behavior, but from a theoretical viewpoint, a relation between risk attitudes and pension saving behavior is to be expected. The first way in which risk attitudes play an important role is in the investment decision progress. It is getting more common for individuals to choose a part of their pension investment portfolio's themselves. Insurance companies that provide pension products such as *Interpolis* and *Aegon* allow their customers to choose between different investment options. The riskier the options, the higher the expected returns and therefore the higher the expected total pension will be. This means that people who are okay with taking risks may expect better returns. Which leads to the hypothesis that being more risk-averse should lead to lower pension savings. This effect should be more significant for self-employed as they have more freedom in choosing the risk levels of their pension investments. The first behavioral hypothesis is, therefore:

> *H2.1: Risk aversion is negatively related to pension saving behavior, and this effect is stronger for self-employed.*

2.2.2. Over-optimism

It seems plausible that self-employed are (over)optimistic when it comes to financial decision making. Research into starting entrepreneurs in eighteen countries shows that confidence and optimism are directly linked to starting a company (Koellinger, Minniti, & Schade, 2007). Furthermore, starters of companies generally over-estimate the probability that their business will succeed (Liang & Dunn, 2008). These results are intuitive as it makes little sense for an individual to start a business believing one will fail. It does, however, raise the question if this optimism related to business decision making transfers to other financial decision-making areas.

One assumption of Friedman's model is that all individuals calculate their future income and returns on investments using all available knowledge. Calculating future income does have a lot of uncertainty as it is hard to predict how one's career path develops. The optimism levels of an individual could influence the predictions. The first effect of over-optimism could cause the self-employed to overestimate their predicted future income. Optimistic people will likely expect their income to rise in the future and underestimate the chances of their income or assets decreasing (Seaward & Kemp, 2000). This belief could cause them to limit current pension savings, as they predict to be able to save significantly in the future. If self-employed are more financially optimistic about their future income than regular employees, this leads to the hypothesis that:

> *H2.2a: Self-employed are more optimistic when it comes to future income; this financial optimism leads to lower current pension savings.*

In the basic model of Friedman optimal saving levels are not just related to future income, but also to life expectancy. It may seem that people can rationally assess their life expectancy by looking at factors such as age, health, and gender, assuming they fit the averages. It is, however, likely that people do not believe they fit the average. In some cases these beliefs, in their turn, could be rational because people know they smoke or drink a lot. However, their beliefs may also be informed by their level of optimism. If it is the case that self-employed are more optimistic about making business decisions, it might well be that this optimistic attitude also informs other aspects of life. They may well underestimate the probability of their becoming ill and dying young. The more overoptimistic self-employed are when it comes to their subjective life expectancy the more likely it would be that they amply save for their pensions. If there is a selection bias of overoptimistic individuals who become self-employed, this causes the average self-employed to overestimate their probabilities to become old, leading to a higher subjective life expectancy which should lead to higher pension savings from this group.

> *H2.2b: Self-employed are more optimistic when it comes to becoming old and the more optimistic they are, the more they save for their pension.*

2.2.3. Financial literacy

The traditional model of Friedman assumes that all individuals carefully consider all possibilities using all available information and continuously change their choices when new information is received. However, calculating the benefits of pension products that could be monetized decades later is no straightforward task. The number of variables that can change during this time makes the decision-making progress complicated. One characteristic that is often linked to long-term financial decision-making is financial literacy (Lusardi, 2008). Lack of financial knowledge is linked to lower pension savings and a lack of emergency savings (Hilgert, Hogarth, & Beverly, 2003). Even if the self-employed try to act in accordance with their utility function as the rational model would predict they could still be making the wrong decisions unintentionally (Choi, Laibson, & Madrian, 2009). Furthermore, the more complex the choices are, the lower the quality of the choices is (Caplin, Dean, & Martin, 2011). Similarly, a field study from Beshears, Choi, Laibson, & Madrian (2013) shows that simplification of the decision-making progress leads to a higher enrolment rate in retirement saving plans. In addition to this effect, the participants who did save for their pension tend to stick to the default option (Benartzi & Thaler, 2007).

The problem for self-employed in the Netherlands is that for them a sensible default option does not exist. They need to be proactive to organize their pension savings, and if they do not do so, self-employed will end up with insufficient pension savings. Making these kinds of choices about pension savings is complicated for all people, but it is particularly important for self-employed because it is impossible for them to avoid making their own decisions. Having some financial knowledge seems crucial for individuals to make optimal decisions, this is especially true for self-employed, as they have more choices and there is no default available. This leads to the hypothesis that:

> *H2.3: Financial literacy is positively related to pension saving, and this effect is stronger for self-employed*

2.2.4. Sticking to a saving plan

A final behavioral bias has to do with one's ability to stick to a savings plan. Research shows that even if individuals have the financial knowledge to calculate and determine their optimal savings plan, they could still have trouble sticking to the plan. One often given critique on Friedman's model is procrastination (O'Donoghue & Rabin, 1998). Individuals can know that they should save, but still have trouble sticking to their plans. The more complex the decision-making process becomes, the more likely the individuals are to perform worse. People can choose not to choose when faced with a choice overload, leading to severely delayed decision making (Sethi-Iyengar, Huberman, & Jiang, 2004).

Some individuals are naïve in the sense that they think that they will save more later, but then keep postponing (Armour & Daly, 2008). As a result, individuals can procrastinate for years causing severe saving deficits compared to their initial intentions and goals (Thaler & Benartzi, 2004). Regular

employees are protected against this risk since they do not have the option to procrastinate saving for most of their pension income. Their employer will automatically transfer the money to the pension fund, making it impossible to procrastinate. Self-employed have more individualized responsibilities. They could choose to spend more than average early in life believing that they will be able to save sufficiently later, so their planning skills are more important than those of regular employees. This leads to the hypothesis that:

> *H2.4: Financial planning proficiency positively influences the likelihood of reaching the desired pension income, and this effect is stronger for self-employed.*

3. Methodology

This section lays out the empirical methods used to test these different hypotheses. The data comes from the DNB household survey (DHS). The original dataset consists of a large-scale survey that is filled in by more than five thousand individuals annually. The survey includes a wide range of question about health, incomes, and assets. The data collection is conducted by CentERdata, an organization that is affiliated with Tilburg University and the DNB.

The initially used dataset had 46,829 observations ranging from 2008 to 2017. Removing all subjects who were either too young (<18) or too old (>70) eliminated close to half of the observations. Investigating the individuals who had already reached their pension age could have been useful, but unfortunately, only very few questions about their how they had earned their pension were answered. What is more, this group contained few people who were self-employed before reaching their pension age, which made the data too limited to use. Next, the individuals who were neither self-employed nor working a regular job were removed, for example being in between jobs. Also, the influence of part-timers was reduced by removing all subjects with an income below €12,000, which is far below the minimum annual wage in the Netherlands. These removals do, however, lead to higher than average pension savings, income and wealth as only employed people are included in the final dataset. Then all individuals who failed to provide answers to the most crucial questions to calculate pension income were removed. For all individuals who filled in the dataset multiple years in a row, the most recent answers are used. Although this transformation removed some of the advantages of panel data the small number of individuals who filled in the questionnaire multiple years made it more advantageous to simplify the dataset. In the end, 1,925 individuals remain, but the reliability of the dataset is greatly increased. Not all subjects responded to all questions used to construct variables, meaning the exact number of respondents and statistical power can differ between separate tests as subjects are left out of regressions if certain important answers are missing. The economic significance of the results will be discussed in the results chapter.

Unfortunately, as with all extensive questionnaires, people inevitably make some small mistakes. Although these mistakes are likely to be by accident they can still cause some issues with the data. Therefore, all the used variables are checked for outliers that could distort the results. An example of a mistake is that one respondent answered that an adequate monthly pension allowance would be €1 billion. Although that would surely be adequate, it is most likely not the minimum number that the respondent would accept as adequate, which is the variable the question tried to measure. By removing such unmistakably wrong answers, the reliability of the dataset improved considerably.

In order to test the hypotheses some variables had to be altered or created in order to fit the purposes of this paper. The next section provides details on the operationalization of the variables and the underlying assumptions of these decisions.

3.1. Annual pension

The most important variable that needed to be created was the saved pension income. The yearly total pension earnings are calculated based on the four pillars of possible pension income.

3.1.1. Pillar one: AOW

As stated earlier all individuals in the Netherlands receive a fixed state pension: the AOW. The AOW depends on the number of years a person has lived in the Netherlands as well as on whether they live with a partner. It is unfortunately impossible to determine the number of years the subjects have lived in the Netherlands. Every year a person does not live in the Netherlands their AOW is reduced by 2%. Most of the individuals without a full AOW live outside the Netherlands and are therefore not part of the dataset (Nederland, Raijer, & Stavenuiter, 2005). At the beginning of 2018 around 19% of all AOW recipients did not receive the full AOW (CBS, 2018d). Since the majority of these were living outside of the Netherlands and the discount is often small everyone in the dataset is assumed to be eligible to receive the full state pension. Although this is not perfect the differences in expected AOW and true AOW are negligible. Fortunately, the difference between singles and partners can be controlled for as this is known for all subjects within the dataset. The annual payout including holiday allowance is €14,638 for singles and €10,008 for people living together (Rijksoverheid, 2018b).

3.1.2. Pillar two: employer-sponsored pension plan

The second pillar includes the pension savings that are saved through an employer. Fortunately, all respondents are asked what their annual payout would be when they reach the pension age if they stopped working now. The first problem with this question was the fact that many subjects answered that they would indeed receive a pension when reaching the pension age but failed to specify the amount of euro's they would be receiving. Individuals who stated that they had a regular job and had an employer-sponsored pension plan but failed to provide the pension income were removed. This removed a substantial part of the dataset but was necessary as the expected pension incomes of these individuals would be severely underestimated since their second pillar savings would be considered to be zero while knowing that this is not the case.

There were also some inconsistencies in the way individuals answered the questions. Some subjects made the mistake of adding a zero too much. For example, one subject stated in 2013 that his pension would be €72,030, in 2014 that it would be €72,038, in 2015 noted 67,400, and then suddenly jumped to €796,369 in 2016. Two steps were taken to overcome this problem. First, all the answers above are controlled for outliers and the highest answers are winsorized. This makes the dataset more reliable because since 2015 the maximum income that is eligible for the second pillar pension is €101,519 making pensions above €100,000 highly unlikely. However, more importantly, if individuals had filled in the question in multiple years than the median answer is used to overcome these typing mistakes.

The next problem arises because the question did not explicitly state if people were asked to provided numbers in 1,000's or nominal value, which led respondents to interpret the question differently. To fix this difference in interpretation, all the answers talking about annual pension payouts below € 50 are multiplied with 1,000 if the individuals earned at least € 5,000, were at least 30 years old and were active as a regular employee. Having an annual pension of only fifty euro's while having an average paying job seems highly improbable. Secondly, some individuals seem to have understood the question as if it asked after monthly income instead of annual income. By multiplying the given answer by 12 if the second pillar income was less than 5% of the last earned income, the person worked as a regular employee and is at least 30 years old this problem was decreased. It is highly unlikely for people with multiple years of work experience to have a pension of less than 5% of their last earned income. In total this influenced less than 2.5% of all the responses. Although these fixes did not solve all problems with this question, they did vastly improve the reliability of the second pillar savings.

3.1.3. Pillar 3: private annuity products

All subjects stated their privately bought annuity products. It is therefore easy to determine the third pillar income. All subjects who stated that they purchased an annuity product but did not specify the amount were removed to improve the reliability of the dataset, but this was only the case for a small number of subjects.

3.1.4. Determining net pension income

There is a difference between the taxes due on income earned in the first three pillars and the last pillar. The first three pillars are financially attractive to build up as what people put into them is exempt from income tax. however, income tax is due when people finally receive their pension (Belastingdienst, 2018a). This is not the case for the money that is saved in the fourth pillar. When using savings to supplement one's pension income, one does not have to pay additional taxes. To neutralize these differences the incomes received through the first three pillars must be converted to post-tax amounts.

The Dutch tax authorities calculate the annual income tax a person has to pay over their income by combining the first three pillars and an assumed income on the increases in house value. The tax authorities assume that the house income is around 0.7% of the home value, this is easily calculated for all homeowners as the value of the homes is known. By combining the three pillars and the assumed home income, the tax percentages of 2018 are used to calculate the gross tax per person (Belastingdienst, 2018b). The tax rates vary between 18.65% and 51.95% depending on the total income.

After the gross tax is calculated per individual, the possible tax discounts were determined. There are three tax discounts for seniors: general tax credit, elderly discount and single elderly discount (Belastingdienst, 2018c). The general tax credit discount is eligible to individuals with an annual income from work and living below € 68.507. The maximum discount is € 1.157 and given to people with an

income below € 20.142. The elderly discount of € 1.418 is eligible for all elderly who earn less than € 36.346 in total. To determine the eligibility of this discount, here the total income has been calculated in the way in which the Dutch tax authorities do this. The main difference between this amount and the amount used to calculate the general tax credit eligibility is the income made on assets. Since the tax authorities use estimates to calculate this, it was possible to use their calculations to determine everyone's total taxable income. The final tax discount is for seniors living alone; these receive an annual discount of € 436. The tax benefits are limited for the people with the lowest expected pension incomes as these are not able to fully benefit from the tax discounts (it is not possible to pay 'negative' taxes). By combining the various income sources with the net tax costs, the net annual pension income is estimated.

3.1.5. Pillar 4: assets and liabilities

Determining the pension income of the fourth pillar consist of two parts: calculating the total net asset value and determining the expected pension years. Determining the total assets of the subjects was done with the help of the aggregated computed data by the DNB. The original survey consists of a variety of questions about the different kinds of assets and liabilities. The DNB added the aggregated data of the answers to these questions. To aggregate the data, the DNB computed the answers to the subcomponents per asset type. If an individual has multiple bank accounts, the total value of these accounts is determined. If an individual was not sure what the exact amount was, bracketed answer options are presented. These include answers such as between €500-€1000 or between €50,000-€60,000 depending on the type of question. In the case of a bracketed answer, the average value will be used to calculate the total asset subtype. This means that the answer €500-€1,000 is counted as €750 by the DNB. If a subject uses the last answer option (e.g., more than €10,000) than the lower bound of this bracket is used. The use of this lower bound leads to some underestimations in the total assets and liabilities of the wealthiest individuals. In the case that an individual does not answer the question at all the survey tries to see if the answer can be determined by taking the average answer of the two previous years.

In total there are twenty-five main asset components, eight debt component and one mortgage component. Cars, motorbikes, boats, and caravans are excluded in determining the total assets (in this thesis but not by the DNB) as these are not seen as assets by the Dutch tax authority due to their fast depreciation making them unsuitable for pension savings. The total net worth of all individuals is determined by combining all the different subcategories. Because there a few outliers the total net assets are winsorized at the 99% level to reduce the influence of the outliers. Households with individuals who share assets are only asked to report these assets once. This does, however, overstate the assets of the primary household earner and understates the assets of the spouse. Therefore, the assets are added together and then equaly devided over the subjects if the subject states that the money of their spouse is at considered mutual.

The average life expectancy data from the CBS (2018) is used to calculate the expected pension years per individual. For males and females, the expected years of pension are calculated using the best possible approximation available. The government decided that from 2022 onwards the pension age will be linked directly to the increase in expected age (CBS, 2014b). In 2060 the expected pension age is 71.5 years. This linear relation between life expectancy and pension age can be used to calculate an expected pension duration per individual. All individuals who were eligible for their pension before 2022 are expected to stop working when they become 67. Since the CBS expects the pension age to increase to 71.5 between 2022 and 2060 that implicates an increase of around 43 days per year. This rate is assumed to continue even beyond the current expectations of the CBS. The highest expected pension age in the dataset is 72.3 years for an 18-year-old who filled in the questionnaire in 2017.

By dividing the total net value of the assets of an individual by their expected years of pension, the yearly income from the fourth pillar is determined. This method is not perfect as it is possible that individuals consume their savings too fast or do not fully use them as they want to leave an inheritance to their children, but this problem is impossible to overcome and this method is used in comparable research (Goudswaard & Caminada, 2017). While this can cause differences in how the money is used it does not change the total available pension income and therefore raises no concern for the comparability of the subjects.

3.1.6. Total annual pension

By combining the newly created variables, it became possible to approximate the total annual pension income based on the current standings. The total annual pension income consists of the four pillar components:

Estimated total annual pension = pillar one income + pillar two income + pillar three income – (income tax over the first three pillars – tax benefits) + pension savings / expected pension years

There are some limitations to calculating the estimated total annual pension income in this way. The variable estimated total annual pension calculates the expected annual pension income as if the person would retire tomorrow (assuming the AOW age is reached). The most important implication of the way of estimating pension income is the role of age. The younger the respondents are, the less time they have had to save up for their pension. Therefore, the older individuals are within the dataset, the higher their expected pension will be. Furthermore, since the first pillar is the same for all individuals, this leads to an overestimation of the importance of the first pillar. Therefore, it is crucial that in all regressions the age effect is controlled for.

3.2. Behavioral variable creation

3.2.1. Sufficient pension income

After estimating the annual pension income, additional variables are constructed. For multiple hypotheses it is essential to see if individuals achieve their personal pension saving goal. The individual goal is calculated by changing the following questions to annual amounts: "*Suppose you reach the retirement age tomorrow and retire (or you are older and are already retired). What is an acceptable pension for you (including general old-age pension)? Please give a net amount per month.*" This question directly asks individuals to state an acceptable pension which is considered a minimum goal. By dividing the pension income by their personal pension goal, it is possible to determine how close people are to saving their desired amount of pension. One possible problem was that as people become older, they are better able to predict their pension income and adjust their acceptable pension accordingly. Therefore, the relationship between age and acceptable pension has been tested, but since there appeared to be no relationship between age and adequate pension income, the variable seems to have no apparent flaws.

3.2.2. Risk aversion

The next variable of interest is an estimation of risk aversion. There are a variety of ways in which risk aversion can be measured. Researchers have tried to determine risk aversion using lottery choices from experiments, auction behavior and simple bidding games (Holt & Laury, 2002). Although direct risk attitudes are not available, it is possible to find the risk attitudes of the individuals by combining questions about risk. All subjects are presented with six questions regarding financial risk-taking. An example of such a question is: *"I am prepared to take the risk to lose money when there is also a chance to gain money."* The respondents are asked on a 1-7 scale how much they agree with the statement with one being "totally disagree" and seven being "totally agree". By combining the answers to these questions, an individual score of risk aversion is created on a 1-7 scale. The higher the final score, the more risk averse a person behaves when it comes to financial decision making.

3.2.3. Optimism

There are two ways in which optimism is tested; financially and life expectancy based. To estimate the financial optimism various questions about expected future income are combined. All subjects are asked to state what they expect to be both the lowest and the highest total net income they could potentially earn in the next twelve months. Afterward, the survey asks four additional questions about the probabilities of earning certain incomes between the minimum and maximum stated income. For example, an individual states that the lowest possible income in the next twelve months is €20,000 while the highest income would be €40,000. Then the computer calculates possible incomes based on these answers. The following questions would, in this case, be: "what do you think is the probability that the net yearly income of your household will be less than €24,000/€28,000/€32,000/€36,000 in the next

twelve months". As the probability of earning less than €24,000 should always be lower than the probability of earning €36,000 all individuals who violated this basic rule of probabilities were excluded. This disqualified around half of the subjects as there were many violations. With the given answers a personal financial optimism score was created. This score is calculated in three steps. The first step is taking the averages of each income bracket. In the second step, the expected income is calculated by multiplying the answered probabilities of earning each income bracket times the average salarry of that income bracket. The last step involves comparing the expected income to the difference between the lowest and highest possible incomes. In table 1 an example is given for a person who expects his or her income to be between €20,000 and €40,000. The financial optimism scores can range from 0.1 to 0.9.

	Euro's	Probability of earning less	Income bracket * probability of that bracket
Minimum income	€ 20,000	0%	€ 0
Salary #1	€ 24,000	25%	€ 5,500
Salary #2	€ 28,000	50%	€ 6,500
Salary #3	€ 32,000	60%	€ 3,000
Salary #4	€ 36,000	80%	€ 6,800
Maximum income	€ 40,000	100%	€ 7,600
Expected income (the sum of the last row)			€ 29,400
Middle income ((minimum income + maximum income) / 2)			€ 30,000
Optimism score (expected income – minimum income) / (maximum income – minimum income)			**0.47**

Table 1: example calculation of optimism score

This method is based on various other papers in which the expected outcome of an individual is compared to one's prediction (Anderson, Baker, & Robinson, 2015). Because here the actual outcomes are unknown the middle income is used as a proxy for actual outcome. Although this method does not perfectly capture optimism regarding financial outcomes, it does provide a broad indication. Individuals who think they will earn close to the maximum possible are more optimistic when it comes to income than those who think they will earn close to the minimum.

Optimism regarding life expectancy was more accessible than financial optimism. All subjects are asked to estimate the chance of them becoming 80 years old on a 1-10 scale. The answer to this question will capture one's optimism regarding reaching an old age.

3.2.4. Financial sophistication

The variable needed to establish financial knowledge is directly available in the dataset and required no tweaking. All subjects are asked how knowledgeable they consider themselves when it comes to financial matters. The subjects can rate themselves somewhere between "not knowledgeable" and "very

knowledgeable". Although this question is subjective, it still can be considered as a reasonable approximation of actual financial sophistication.

3.2.5. Sticking to a saving plan

The last behavioral variable that is used has to do with procrastination and the ability to stick to a saving plan. All subjects are asked how difficult they find it to stick to a plan and control their expenditures. The subjects must state on a 1-7 scale with one being "very difficult" and seven being "very easy". The subjects with a higher score are therefore expected to be better at sticking to their saving plan and therefore procrastinate less when it comes to saving. Again, this question is subjective but is still a useful indicator of true saving behavior.

4. Results

The results chapter starts by discussing the descriptive statistics and comparing the sample to the overall working population. By comparing the dataset to the actual population, the reliability of the dataset is checked. This is followed by the testing of the various hypotheses. First, the hypotheses that aim to see if Friedman's consumption smoothing model can explain the behavior in the Dutch situation is tested. Then the differences in risk aversion and optimism that are likely to be correlated with becoming self-employed are introduced. The final part of the results chapter looks at how financial knowledge and planning skills correlate with the increased freedom of self-employed.

Category	Sub-Category	Regular employees	Self-employed
	# Unique respondents	1,661	264
Characteristics			
	% Males	56.3%	59.9%
	Average age	46.3	49.3
	% Higher educated	46.6%	51.1%
	Average subjective health score (1-5)	3.95	3.93
	Poor health (1)	0.2%	0%
	Not so good health (2)	1.8%	3.8%
	Fair health (3)	15.4%	17.1%
	Good health (4)	67.3%	61.7%
	Excellent health (5)	14.9%	17.4%
Financials			
	Average gross income	€ 40,275	€ 34,270
	Average net wealth	€ 67,905	€ 131,825
	Average pillar one income	€ 11,081	€ 10,832
	Average pillar two saved income	€ 12,490	€ 5,119
	Average pillar three saved income	€ 3,060	€ 5,905
	Average expected pillar four income	€ 4,437	€ 7,784
	Average gross pension income	€ 31,068	€ 29,640
	Average net pension income	**€ 27,129**	**€ 25,386**
Behavioral Traits			
	Risk aversion (scores range from 1-7)	5.18	5.08
	Optimism score (between 0 – 1)	0.56	0.51
	Subjective probability of reaching 80 years of age	62.9%	64.0%
	Financial knowledge (scores range 1-4)	2.24	2.24
	Financially: not knowledgeable (1)	13.8%	15.4%
	Financially: more or less knowledgeable (2)	53.4%	51.5%
	Financially: knowledgeable (3)	27.9%	26.4%
	Financially: very knowledgeable (4)	5.0%	6.6%
	Sticking to plans (scores range from 1-7, higher is better)	5.03	5.16

Table 2: descriptive statistics of the dataset

4.1.1. Descriptive characteristics

The dataset consists of more self-employed than would be expected based on the general workforce. While around 10% of the Dutch workforce is self-employed, they make up almost 14% of the dataset. This overrepresentation of the self-employed is primarily caused by the way in which the data was cleaned. The group of regular employees who did not state or did not know their pension savings were substantial. Because the regular employees who stated that they had second pillar pension savings but failed to provide an estimation have been removed for reliability, the self-employed are slightly over-represented.

The entire dataset consists of more males than females, and the share of males is more significant for the self-employed. This is more or less in line with the general population. The CBS estimates that around 53% of the regular workforce are male and this percentage is slightly higher for self-employed (CBS, 2015). Furthermore, the self-employed within the dataset are slightly older than the regular employees. This higher than average age for self-employed is in line with findings of the Dutch Ministry of Finance (2015).

The group of self-employed are on average slightly more often higher educated than the regular employees. However, both groups have a higher percentage of highly educated workers than would be expected. In 2016 around 36% of the workforce is considered higher educated (CBS, 2018e). The reason for the discrepancy between the dataset and the true workforce is not apparent; one possible explanation is that higher educated people are more inclined to fill in the entire questionnaire.

Self-proclaimed heath was not different on average, which is interesting as health is directly linked to a variety of other factors. First of all, the older people become, the worse their health is on average. As self-employed in the dataset are on average three years older, they would be expected to be in worse health. Secondly, education is linked to health by various studies which would also lead to the prediction that the group of self-employed should be more optimistic about their health (Winkleby, Jatulis, Frank, & Fortmann, 1992). Furthermore, males are more optimistic about their health which leads to the more optimism for the self-employed group (CBS, 2018f). On average the entire group consists of few people who rate their health as “bad” and the clear majority rates their health as “good” which makes the health status variable less distinctive.

4.1.2. Descriptive financials

The regularly employed earn notably more than the self-employed before tax. The differences are smaller when controlled for tax differences but still substantial. This is in line with other research that estimates that in the Netherlands the average self-employed earn around €34,500 annually and regular employees around €43,000 in 2016 (Bierings & Kösters, 2017; CBS, 2017).

Where self-employed score significantly worse on income, their average wealth is a lot higher. The difference in business equity mainly causes this difference. Almost two-thirds of the self-employed have put some equity in their business leading to a higher average net wealth.

The most substantial difference when it comes to future pension income comes from the second pillar. As the second pillar is only available to people who work directly for an employer; it is not surprising that people with a regular job have higher savings through the second pillar. Since a large part of the self-employed have worked as regular employees in their life, around 47% of the self-employed have saved money through a pension fund. The third pillar is higher for the self-employed than regular employees. Since self-employed can offset their lack of second pillar income by buying a private annuity, this difference is not unexpected. The fourth pillar is higher for the self-employed as well, this is mainly due to the money they have saved within their business.

To control for some large outliers with some individuals having enough savings to spend more than 200,000 annually during their pension period the outliers are winsorized at the 99% level to reduce their impact. After controlling for these outliers, the difference in net pension income between self-employed and regular employees is €1,743. Such a difference is expected based on the warnings from the DNB and SCP and findings from other researchers.

4.1.3. Behavioral traits

When it comes to the behavioral traits there seem to be few observable differences between self-employed and regular employees. It should be noted that not all subjects have filled in all the required questions to determine their personal trait scores, the statistical strength of the tests including the behavioral traits is therefore weaker. When it comes to risk aversion, financial knowledge, and sticking to plans the differences are minor.

Regular employees tend to score higher than self-employed when it comes to optimism towards income. Part of this could be caused by the fact that the income of self-employed can vary a lot more. This increased variance can have two possible effects that lead to a lower optimism score for self-employed. Either self-employed state a maximum income that is very optimistic and leads to their average expected income looking pessimistic. Another possible explanation is that they underestimate their expected income in order not to disappoint themselves. When it comes to optimism regarding health, the roles are reversed as now self-employed have a higher subjective probability of reaching 80, but this difference is minimal.

In general, the dataset appears to be an adequate representation of the true working population. The most noticeable difference is the larger than expected share of highly educated workers. This overrepresentation does not lead to any immediate concerns of the reliability of the dataset.

4.2. Hypothesis: rational income & life expectancy theory

For the first hypothesis, the differences in savings between self-employed and regular employees need to be measured after being controlling for the various demographical characteristics and income. As these characteristics can influence life expectancy, they can potentially alter the importance of pension savings. The characteristics of interest are gender, health, and education as these are directly linked to life expectancy. In addition, the variables age and income are needed as control variables. Age is needed since the dependent variable net pension income is largely dependent on age. The older subjects are, the more time they had to save for their pension which has a positive effect on pension savings.

	(1)	(2)	(3)	(4)
VARIABLES	(Self-employed)	(Gender)	(Health)	(Education)
Self-employed	-1,688	-1,826*	-1,817*	-2,138**
	(1,043)	(1,035)	(1,028)	(1,040)
Age	401***	396***	403***	425***
	(22)	(22)	(22)	(23)
Income (€ x1000)	206***	194***	192***	173***
	(22)	(23)	(23)	(23)
Male		2,190***	2,136***	2,482***
		(591)	(587)	(596)
General health condition: good			-1,183	-1,117
			(838)	(834)
General health condition: fair			-2,723***	-2,516**
			(982)	(981)
General health condition: not so good			-4,262**	-4,099**
			(1,835)	(1,857)
General health condition: poor			-7,495*	-6,800
			(4,504)	(4,177)
Higher educated				2,782***
				(636)
Constant	239	-259	866	-953
	(1,089)	(1,046)	(1,206)	(1,194)
Observations	1,925	1,925	1,925	1,925
Adjusted R-squared	0.313	0.318	0.320	0.328

Heteroscedasticity robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Multiple regression table to test the effect of the rational variables, dependent variable: net pension income

As expected the control variable age has a significant effect on the total expected pension income. The age variable is however not that meaningful as the way in which the expected total annual pension income is calculated partly dependent on age. Nevertheless, the significance of the variable confirms that older people have saved more for their pension than younger workers.

The second control variable income is also strongly related to annual pension income. For each additional €1,000 of current income, an individual's expected pension income rises with between €206-€173, which is significant at the 1% level. This result should not come as a surprise as all pillars, except the first one, are strongly linked to income. However, controlling for income does not remove the difference between self-employed and regular employees when it comes to pension saving behavior. The first hypothesis is, therefore, rejected as income alone fails to explain the differences in pension savings between self-employed and regular employees.

Being male compared to being female increases the expected annual pension income by between €2,190 - € 2,482 which is significant at the 1% levels in all models. This result is more substantial than expected as it stays significant even when controlled for factors such as education and income. As females become a lot older on average this effect does not make sense from a rational life expectancy point of view. There are two possible explanations that could explain this relationship between gender and pension savings.

The first possible explanation is that males do not take into account their true-life expectancy but use the average pension duration instead. In the Netherlands the gender-neutral average pension duration is 19.1 years (CBS, 2018c). When running the same regression but spreading the fourth pillar savings over 19.1 years instead of the real expected pension duration the male coefficient lowers to €1,739 but is still significant at the 1% level (see appendix 1). This could be a better representation of the true saving behavior, but the gender effect is still persistent.

The second possible explanation comes from the fact that males are more often the head of the household. Since the questions regarding household assets are often only filled in by the head of the household, it is possible that males forgot to add certain assets of their partner, leading to an underestimation of assets in households with females. By adding the variable of household position to the gender-neutral life expectancy model, the male coefficient lowers from €1,739 to €1,133 and is no longer significant at the 5% level but remains significant at the 10% level (see appendix 1). Compensating for household position and changing the pension expectations can therefore partly explain the effect caused by gender, but males keep having a higher pension income even after controlling for these possible explanations.

General subjective health also seems to have a positive effect on total annual pension income. A switch from "excellent health" to "no so good health" reduces the expected pension income with around €4,100 which is significant at the 5% level. The difference between "excellent health" and "poor health" is

around €7,000 which indicates that people with the worse health do not value their pension income a lot. These findings are interesting as it shows that people do adjust their saving behavior in line with their wellbeing. It makes sense that people who are ill will try to spend their money earlier in life as the probability of reaching the pension age is lower.

Education seems to have a positive effect on pension income. The introduction of the education variable reduces the influence of income as these are likely linked to each other, but income does stay significant at the 1% level. Having had higher education increases the pension income by around €2,782 which is significant at the 1% level. There are a few possible theories that explain this large difference even when the variable is controlled for by income. One possible explanation is the fact that family wealth and education are strongly connected (Szydlik, 2004). Research shows that people with higher education receive more money through inheritances during their lives. This could explain part of the differences but not all as the total difference in third and fourth pillar income between low and high educated workers is only €1,368 when not controlled for income. This explanation, therefore, seems insufficient and other behavioral factors such as financial sophistication are tested in the following paragraphs.

Without controlling for anything the difference between self-employed and regular employed was €1,743, after controlling for most of the variables that are important from the rational life expectancy point of view this amount changes to €2,138. Since the difference has increased this suggests that these variables alone do an insufficient job when it comes to explaining where the differences in pension income come from. While differences in gender, health, and education all affect total pension savings, they fail to explain the differences in pension savings between self-employed and regular employees. The second hypothesis is therefore also rejected.

4.3. Hypothesis: consumption smoothing

Even though the differences in life expectancy fail to provide a further understanding of the saving behavior of self-employed, this does not prove that the self-employed act irrationally. The regular employees have significantly higher second pillar savings, which is something that is outside their control. As individuals have flexible consumption patterns throughout their lives, it could be the case that self-employed are acting in their own best interest while regular employees save more than they would seem optimal. To test if the self-employed act in line with their own goals, their personal pension goals need be taken into account. With a logistic regression that determines if individuals have managed to reach their own goal, it is possible to determine how well self-employed perform when it comes to reaching their goals compared to regular employees.

VARIABLES	(1) (Logit model) (β)
Self-employed	-0.678*** (0.164)
Age	0.070*** (0.005)
Income (€ x1000)	0.004 (0.002)
Male	-0.149 (0.118)
General health condition: good	-0.008 (0.158)
General health condition: fair	-0.275 (0.201)
General health condition: not so good	0.077 (0.469)
General health condition: poor	-0.613 (1.304)
Higher educated	0.115 (0.116)
Constant	-2.651*** (0.277)
Observations	1,688

Heteroscedasticity robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: logistic regression table, dependent variable: having reached the personal pension target

The probability of reaching the pension goal is lower for self-employed, and this effect is significant at the 1% level. The various variables that were significant in the first model are no longer significant when looking at the personal saving goals. For income and education this suggests that the more people earn or the higher they are educated, the higher their pension goals become. An additional regression (shown in appendix 2) shows that an additional €1,000 income increases the expected target to rise by about €132 and higher educated individuals on average want a pension income that is €1,904 higher than low educated individuals, both these effects are significant at the 1% level. The more someone earns, the higher the minimum pension income that the individual finds acceptable becomes, earning more, therefore, does not automatically cause an individual to reach his or her private pension goal.

The general health status variable loses its significance when looking at personal goals. One possible explanation for this is that people who think they will die younger will care less about reaching an adequate pension income and, therefore, attach less weight to reaching their pension target. Failing to reach an adequate pension income should not concern someone who thinks his or her pension will only be short-lived. The data confirms supports this explanation as the better one's health is the higher the average pension target is. People in "excellent health" on average find an annual net pension of €23,658 adequate compared to €17,750 for individuals who rate their health as "poor". As being in better health increases pension target in a similar way as pension income, the variable is no longer statistically significant when looking at targets instead of nominal amounts.

In figure 3 the probabilities of having reached the personal pension goal are shown at all ages while keeping all other variables constant.

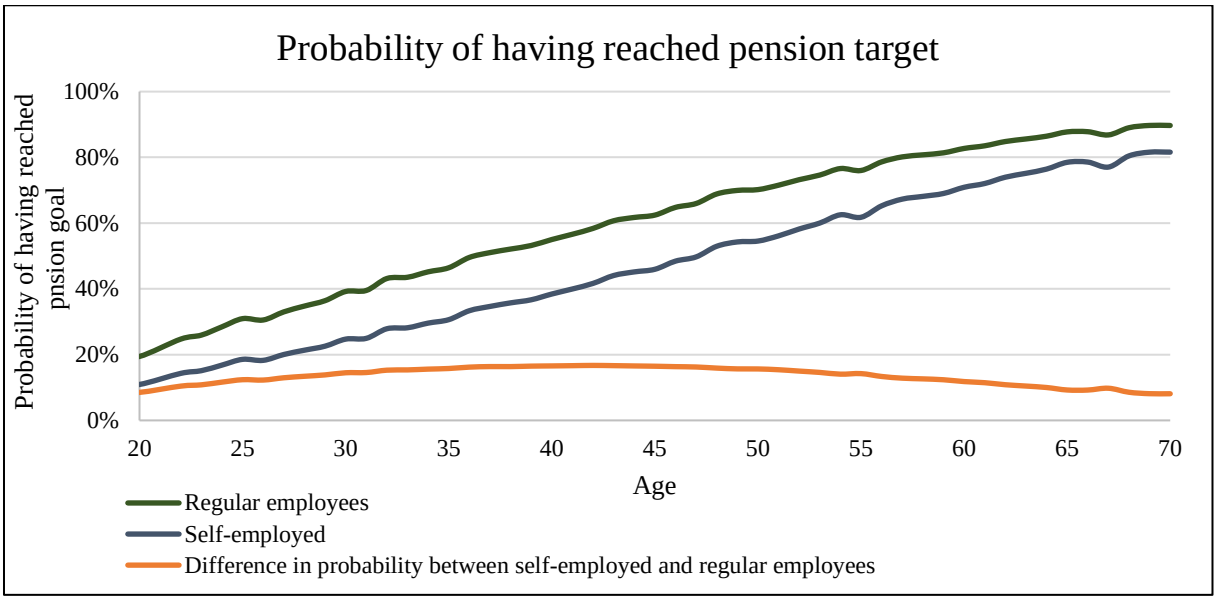

Figure 3 The difference in probabilities of having reached the pension goal for self-employed and regular employees

Two major conclusions can be drawn from the graph. The first conclusion is that self-employed do worse when it comes to reaching their pension target compared to regular employees when controlled for variables such as income and health. As expected the older individuals become the higher the probabilities are that they have saved enough for an adequate pension. However, when reaching the pension age of 67 self-employed have an 82 percentage points chance of having reached their target compared to 90% of regular employees. This difference of eight percentage points is significant at the 1% level. This answers hypothesis 1.4: self-employed people are worse when it comes to reaching their personal pension target.

Even though self-employed might fail to achieve their personal goal their saving behavior is insightful. The differences between self-employed and regular employees increase up to around 40 years of age. Gourinchas & Parker (2002) show that household expenditures rise rapidly during these years. Self-employed appear to save significantly less for their pensions during these years. An average 40-year-old self-employed has 17 percentage points less chance of having reached its personal pension savings goal. After these expensive years, the self-employed start to save more and the gap between self-employed and regular employees decreases. By the time the individuals are 67 years old the difference is reduced to 8 percentage points. The fact that individuals manage to make up for a large part of the difference gives reason to believe that this saving behavior is not random. The added freedom of self-employed lets them spread out their money in a more flexible way, which can be considered positive. However, the results do show that the self-employed are worse at reaching their own saving targets. This answers hypothesis 1.3: self-employed do save less early in life and are partly able to make up for this later in life, but not fully. Interesting to note is that compared to the research of Goudswaard and Caminada (2017) the number of individuals failing to reach an adequate pension is lower. In their research, 62% of the self-employed compared to 70% of the regular employees manage to reach the pension threshold of 70% of the last earned income. By using a personal target instead of a general threshold, it seems that a larger than expected share of the workforce find their pension adequate.

As seen in the previous tests even when controlled for a variety of factors self-employed still save less for their pension than regular employees, and on average they have more trouble in reaching their personal pension goal. Therefor it seems that rational reasons alone fail to provide a convincing answer to why self-employed are worse at saving for their pension. Therefore, the various behavioral biases that can influence pension saving behavior are investigated in the following paragraphs.

4.4. Hypotheses: behavioral traits

In this next part of the results chapter, the possible effects of behavioral traits are tested. In this first model the dependent variable is the total annual pension income in euros based on the current savings through the four pillars.

4.4.1. Risk aversion

VARIABLES	(1) (Base model)	(2) (Risk aversion)	(3) (Interaction variable)
Self-employed	-2,138**	-1,946*	-3,100
	(1,040)	(1,162)	(5,899)
Age	425***	426***	426***
	(23)	(25)	(25)
Income (€ x1000)	173***	162***	162***
	(23)	(24)	(24)
Male	2,482***	2,264***	2,266***
	(596)	(636)	(636)
General health condition: good	-1,117	-1,294	-1,291
	(833)	(903)	(903)
General health condition: fair	-2,516**	-2,573**	-2,571**
	(981)	(1,071)	(1,071)
General health condition: not so good	-4,099**	-4,083*	-4,104*
	(1,857)	(2,115)	(2,117)
General health condition: poor	-6,800	-7,755**	-7,755**
	(4,177)	(3,905)	(3,898)
Higher educated	2,782***	3,010***	3,013***
	(636)	(679)	(680)
Risk-aversion (1-7)		-1,140***	-1,166***
		(287)	(295)
Risk-aversion * Self-employed			227
			(1,106)
Constant	-953	5,428***	5,556***
	(1,194)	(1,879)	(1,954)
Observations	1,925	1,660	1,660
Adjusted R-squared	0.328	0.321	0.321

Heteroscedasticity robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Multiple regression table to test the effect of risk aversion, dependent variable: net pension income

The model expands the original version by adding the behavioral variable risk aversion. The higher the score of risk aversion, that ranges from 1-7, the more a person will try to avoid risks. The regression shows that risk aversion is negatively related to pension savings. Per point of risk aversion, the expected pension income drops with around €1,140. This effect is significant at the 1% level. This relationship is interesting as having insufficient pension income could be considered a risk, leading to the expectation that people who dislike risk would save more for their pension. As this is not the case, other explanations need to be searched for. One possible explanation for this result is that the individuals invest a part of the pension income. When looking at the investment choices of the respondents, it can be seen in figure

4 that the less risk-averse individuals are, the larger the share of pension income comes from high-risk assets such as equities (excluding personal business equity) and derivates. Since these investments on average perform better over a long period, it makes sense that having investments that carry high risk will be beneficial over a lifetime (Benartzi & Thaler, 1995). However, since the average percentage of risky assets allocations of self-employed is only 4.2%, this only explains part of the difference. Being risk averse appears to lead to a lower final pension income, which is most likely partly caused by lower expected returns.

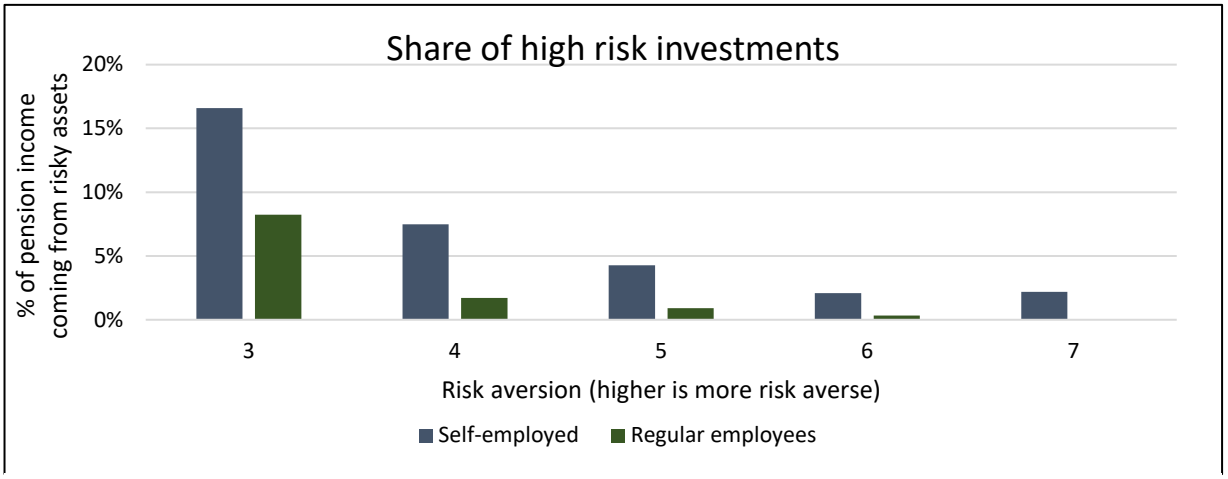

Figure 4: share of risky assets as % of total pension income (no respondents scored 1, too few respondents scored 2 to give insightful results (n=9))

When adding an interaction term between self-employed and risk-aversion as done in the third model the outcome does not change meaningfully. This means that while risk aversion is linked to pension saving, the effect of risk aversion does not differ between self-employed and regular employees. This is counterintuitive as it would be expected that the added freedom of self-employed would change their final pension income vis-à-vis their investment choices. One possible explanation for these results has to do with the way the variable risk aversion is created. The variable depends on answers about how people look at risks. One of these questions, for example, is “I am prepared to take the risk to lose money, when there is also a chance to gain money”. There is a high probability that people who recently had good returns on their investments are more inclined to agree with this statement. A bias can occur as people with good recent returns will both have more savings (as they have earned a return on their previous investments) as well as a lower risk aversion. This leads to problems with the variable as financial success will be linked to risk aversion. It is impossible to determine if this is the case, but this could explain the larger than expected results for the regular employees. The hypothesis, therefore, seems partly correct. Being more risk averse is negatively related to pension income, but this effect is not different for self-employed. Differences in risk-aversion, therefore, do not explain the differences in pension saving behavior between self-employed and regular employees.

4.4.2. Optimism

The next behavioral hypotheses revolve around optimism. Two types of optimism are used since their implications are entirely different. Firstly, the effect of optimism regarding future earnings is measured, which is expected to have an negative effect on pension savings as expecting a higher future income reduces the necessity to save today. Secondly, the effect of being optimistic regarding life expectancy is measured, which is expected to have a positive effect on pension savings as having a sufficient pension becomes more important if one is expected to become older. The number of observations for the financial optimism is limited due to the question not being asked to all subjects. The statistical power of the results is therefore greatly reduced.

VARIABLES	(1) (Base model)	(2) (Financial Optimism)	(3) (Financial Optimism Interaction)	(4) (Life expectancy Optimism)	(5) (Life expectancy Optimism Interaction)
Self-employed	-2,138** (1,040.4)	-1,124 (1,371.9)	-1,824 (3,919.0)	-1,896* (1,053.3)	-458 (3,577.1)
Age	425*** (23.0)	359*** (39.8)	359*** (39.9)	431*** (23.1)	431*** (23.1)
Income (€ x1000)	173*** (23.3)	210*** (24.6)	210*** (24.5)	172*** (23.3)	172*** (23.4)
Male	2,482*** (596.0)	1,698** (842.1)	1,703** (849.3)	2,449*** (596.9)	2,444*** (596.6)
General health condition: good	-1,117 (833.7)	-1,017 (1,307.1)	-1,018 (1,307.9)	-1,228 (833.7)	-1,226 (834.7)
General health condition: fair	-2,516** (980.8)	-4,131*** (1,462.0)	-4,128*** (1,462.3)	-2,669*** (988.4)	-2,670*** (987.6)
General health condition: not so good	-4,099** (1,857.1)	-1,045 (3,133.7)	-1,031 (3,141.8)	-4,685** (1,854.3)	-4,763*** (1,828.9)
General health condition: poor	-6,800 (4,177.2)			-7,512* (4,311.0)	-7,381* (4,305.1)
Higher educated	2,782*** (635.7)	1,276 (963.3)	1,284 (958.0)	2,779*** (636.1)	2,778*** (635.9)
Financial optimism (0-1)		1,483 (2,679.3)	1,261 (2,910.8)	-	-
Financial optimism * self-employed (0-1)			1,363 (7,590.7)	-	-
Subjective % live to 80				-17.8 (13.4)	-14.9 (13.2)
Subjective % live to 80 * self-employed					-22.4 (51.9)
Constant	-953 (1,193.5)	-54 (2,327.3)	63 (2,386.4)	34 (1,533.6)	-166 (1,560.6)
Observations	1,925	673	673	1,916	1,916
Adjusted R-squared	0.328	0.347	0.346	0.330	0.329

Heteroscedasticity robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Multiple regression table to test the effects of optimism, dependent variable: net pension income

Adding financial optimism to the model does not improve the model substantially. The maximum difference in financial optimism is 0.8; this means that financial optimism could only explain a maximum difference of €1,186, which is limited. Furthermore the effect is statistically not significant at any level. The fact that these results are insignificant is not surprising because most of the group saves mainly through the first and second pillar in which optimism plays no role. Adding the interaction term between being self-employed and financial optimism gives slightly more exciting results. The relationship between being optimistic and pension savings is stronger for the self-employed. The more optimistic one regards future income; the higher the current total pension savings are. This is not intuitive as one would expect that a higher future income leads to lower current savings, as it is easier to save more money in the future. The effect is statistically not significant at any conventional level, but this is partly caused by the fact that there are only 97 valid self-employed respondents. These findings do suggest that optimism does play a more important role for self-employed than for regular employees and that this relationship is positive. Unfortunately, the lack of observations weakens the strength of these conclusions.

Since there are a lot of assumptions behind the used financial optimism variable a secondary regression is used with a different variable for financial optimism. All subjects are asked to indicate their financial situation in five years. The answers range from “much worse than now” to “much better than now”. The results (see appendix 3) show that people who think that their financial situation will “be more or less the same” have higher pension savings than the groups who think their situation will be either better or worse. These results are not significant at the 10% level and remain similar when the interaction variable of financial optimism and being self-employed is introduced. Changing the way in which financial optimism is determined does not seem to lead to new insights. The first hypothesis regarding optimism is therefore inconclusive. Being financially optimistic does not cause the pension savings to become lower. Instead the results show some evidence towards the opposite.

Having a higher subjective life expectancy should lead to higher pension savings as the importance of an adequate pension income rises. Adding the subjective probabilities of reaching 80 years of age does little compared to the basic model. The initial results indicate that the more optimistic people are, the less they save for their pension. This result is both economically and statistically not significant. Having a 10 percentage points higher subjective probability of reaching 80 years leads to a reduction in expected total pension income of around €180. Since it could be the case that people are good at predicting their probability of reaching 80 based on their health status an additional model is created in which various health indicators are included. The results do not change considerably when variables about BMI, long-term illness, smoking and drinking behavior are added (see appendix 3). The effect size of the variable of reaching 80 changes from -17.8 to -20.9 but stays insignificant at any conventional level.

The results do not change a lot once the interaction term is introduced. Self-employed with a 10 percentage points higher subjective probability of reaching 80 are expected to have around €370 lower annual pension income. This is both illogical and limited from an economic point of view. Furthermore, the results stay statistically speaking insignificant. Again, introducing various additional health variables about BMI, long-term illness, smoking and drinking behavior does not improve the model in any way (see appendix 3). The second hypothesis about optimism, therefore, must also be rejected. Self-employed who think they will become older fail to adjust their pension savings in accordance with the increased importance of a reliable pension income. The findings are counterintuitive as higher life expectancy should rationally be linked to more pension savings. These results are remarkable since health status at the moment of filling in the questionnaire is directly related to pension saving behavior as can be seen by the significance of the "general health condition" variable.

4.4.3. Financial knowledge

For the next hypothesis the effect of financial knowledge is investigated. The more financial knowledge one the higher the expected pension is. Due to the increased freedom of self-employed the effect is expected to be stronger for the self-employed.

VARIABLES	(1) (Base model)	(2) (Financial knowledge)	(3) (Financial knowledge Interaction)
Self-employed	-2,138** (1,040)	-2,001* (1,092)	-6,236*** (1,665)
Age	425*** (23)	422*** (24)	421*** (24)
Income (€ x1000)	173*** (23)	159*** (24)	157*** (24)
Male	2,482*** (596)	2,201*** (615)	2,216*** (614)
General health condition: good	-1,117 (834)	-1,089 (888)	-1,055 (883)
General health condition: fair	-2,516** (981)	-2,406** (1,053)	-2,335** (1,044)
General health condition: not so good	-4,099** (1,857)	-3,800** (1,889)	-3,573** (1,805)
General health condition: poor	-6,800 (4,177)	-7,146* (4,020)	-6,964* (4,058)
Higher educated	2,782*** (636)	3,007*** (654)	3,081*** (654)
Financial knowledge: more or less knowledgeable		744 (795)	138 (854)
Financial knowledge: knowledgeable		3,488*** (911)	2,679*** (978)
Financial knowledge: very knowledgeable		5,707*** (1,624)	4,573*** (1,754)
Financial knowledge * Self-Employed: more or less knowledgeable			4,243** (2,118)
Financial knowledge * Self-Employed: knowledgeable			5,848** (2,862)
Financial knowledge* Self-Employed: very knowledgeable			7,362* (4,230)
Constant	-953 (1,194)	-1,916 (1,376)	-1,328 (1,416)
Observations	1,925	1,742	1,742
Adjusted R-squared	0.328	0.334	0.335

Heteroscedasticity robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7 Multiple regression table to test the effects of financial knowledge, dependent variable: net pension income

Compared to the lowest level of financial knowledge ("not knowledgeable") pension savings increase significantly as the self-proclaimed amount of knowledge increases. Being "very knowledgeable" increases expected pension income by €4,573 compared to being "not knowledgeable". This effect is significant at the 1% level. These results are in line with the expectations. As many people consider long-term decision making to be complicated, having some financial knowledge is crucial for people to plan for the future. The effect of knowledge is stronger for self-employed as can be seen in model three. Being "more or less knowledgeable" compared to being "not knowledgeable" increases the expected pension income by only €138 for regular employees, for self-employed this number increases with €4,243 to €4,381. This difference is statistically significant at the 5% level. This provides evidence that having enough financial knowledge is particularly crucial for self-employed when it comes to saving for their pension. As regular employees save most of their money through the first two pillars, knowledge plays a smaller role in their pension saving behavior. The results also hold when tested against the individual goals as can be seen in figure 5.

Financial Knowledge	**Probability of reaching pension target at 67 years old**		
	Regular employee	Self-employed	**Difference**
Not Knowledgable	84.1%	74.3%	**-9.8%**
More or less knowledgeable	88.2%	80.4%	**-7.9%**
Knowledgeable	90.2%	83.4%	**-6.8%**
Very knowledgeable	91.7%	85.7%	**-5.9%**

Table 8: differences in probability of having reached the personal pension goal at the pension age

Being "not knowledgeable" as a self-employed reduces the probability of reaching the target by almost 10 percentage points compared to regular employees with the same financial knowledge. The more knowledgeable the self-employed are, the smaller the gap between self-employed and regular employees is. Self-employed who rate themselves as "very knowledgeable" only perform about 5.9 percentage points worse than regular employees. The "very knowledgeable" self-employed outperform the regular employees with least financial knowledge. For regular employees the total difference explained by financial knowledge is less than 8 percentage points while for self-employed the difference between the group can account for more than 11 percentage points. These results are expected as the increased freedom of self-employed makes it more beneficial too have some financial knowledge. These findings, therefore, support the hypothesis; additional financial knowledge increases pension savings and the probability of reaching the personal pension target, and the importance of financial knowledge is more substantial for self-employed.

4.4.4. Sticking to a saving plan

The last model tests the effect of an individual's ability to stick to a plan on pension saving behavior. The higher the planning variable is, the better the respondents rate their ability to stick to a savings plan. As planning is related to personal goals this final model is again, a logistic regression in which the dependent variable is either having reached the desired pension income or not. The difference to the model of hypothesis 2.1 is the fact that this time the irrationality of having problems sticking to a savings plan is introduced.

VARIABLES	(1) (Base model) (β)	(2) (Planning) (β)	(3) (Interaction planning) (β)
Self-employed	-0.678*** (0.164)	-0.626*** (0.173)	-0.551 (0.658)
Age	0.070*** (0.005)	0.064*** (0.005)	0.064*** (0.005)
Income (€ x1000)	0.004 (0.002)	0.003 (0.002)	0.003 (0.002)
Male	-0.149 (0.118)	-0.170 (0.123)	-0.170 (0.123)
General health condition: good	-0.008 (0.158)	0.065 (0.163)	0.064 (0.163)
General health condition: fair	-0.275 (0.201)	-0.110 (0.205)	-0.110 (0.205)
General health condition: not so good	0.077 (0.469)	0.245 (0.470)	0.246 (0.470)
General health condition: poor	-0.613 (1.304)	-0.575 (1.429)	-0.575 (1.431)
Higher educated	0.115 (0.116)	0.117 (0.121)	0.116 (0.121)
Planning (1-7)		0.190*** (0.040)	0.191*** (0.043)
Planning*Self-employed (1-7)			-0.015 (0.124)
Constant	-2.651*** (0.277)	-3.385*** (0.345)	-3.393*** (0.351)
Observations	1,688	1,577	1,577

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9: logistic regression table, dependent variable: having reached the personal pension target

The regression results show that planning ability is linked to reaching the pension saving goal. The better one is at planning, the higher the probability of reaching the pension goal and the effect is significant at the 1% level. This result is impressive as most of the pension saving for the regular employees is done

through the first and second pillar on which the planning skills have no influence. It makes sense that individuals who state that they can save well are better at saving money in the long term, but the significance is higher than initially expected. One possibility is that people who know that they have reached their pension targets are more likely to state that they are good at financial planning, resulting in a reverse causality effect. To test for this possible reverse causality effect, two new regressions are run in which the dependent variable is either only the first two pillars and one with only the last two pillars. The effect of planning stays significant at the 1% level for the third and fourth pillar saving levels, but the variable becomes insignificant when only looking at the first two pillars (see appendix 4). This makes sense as planning skills and the first two pillars should not be connected, these results make the possibility that there is a reverse causality problem unlikely.

The results become change little when the interaction term of self-employed is introduced. For self-employed, the effect of planning skills is close to zero in the interaction term. But when looking at the marginal effect of being self-employed for the different planning more clear results show. Table 10 shows how planning skills influence pension saving behavior for both regular employees as well as self-employed. The worst financial planners that are self-employed have a 13 percentage points lower probability of having reached their pension target when they become 67 years old compared to regular employees. Furthermore, they also perform a massive 20 percentage points worse than the best self-employed planners.

Financial Knowledge	**Probability of reaching pension target at 67 years old**		
	Regular employee	Self-employed	**Difference**
Planning skill: 1	77.4%	64.2%	**-13.2%**
Planning skill: 2	85.6%	75.8%	**-9.9%**
Planning skill: 3	83.7%	73.0%	**-10.8%**
Planning skill: 4	82.7%	71.5%	**-11.2%**
Planning skill: 5	87.0%	77.8%	**-9.2%**
Planning skill: 6	90.7%	83.6%	**-7.1%**
Planning skill: 7	91.1%	84.2%	**-6.8%**

Table 10: the effect of planning ability on self-employed pension reaching goals

Than there seems to be a middle group of planners who rate themselves between two and five on the one to seven scale of sticking to a financial plan. In this group the probability of reaching their pension target when becoming 67 is around 9-11 percentage points lower for the self-employed than for regular employees. For the individuals with the highest financial planning score the differences between the self-employed and regular employees become a lot smaller. On average this group has around a 7

percentage points lower probability of reaching their own pension target compared to regular employees with the same planning skills. However, these self-employed are about equally as likely to reach their pension target as a regular employee with average financial planning abilities. The total differences in the group of regular employees are 14 percentage points compared to the 20 percentage points of the self-employed. Planning skills therefor seem to be more important for self-employed than regular employees. This answers the fourth behavioral hypothesis: both self-employed and regular employees who have trouble sticking to a saving plan are worse at saving for their pension, and this relationship is significantly stronger for self-employed.

5. Conclusions and limitations

The goal of this thesis was to provide new insights into the way pension saving behavior works for Dutch self-employed. Where various other researchers have found differences in final pension savings, they have failed to provide compelling arguments to what causes these differences. By testing a wide range of possible explanations, the underlying drivers behind pension saving behavior were explored.

Purely rational explanations such as differences in life expectancy or wages do not seem to explain the differences. While it is true that people with worse health tend to save less for their pension this cannot explain the total differences between the groups. Furthermore, income does have a major role when it comes to pension savings, but this is not different for self-employed. Therefore, the first hypothesis that purely rational factors cause the difference between self-employed and regular employees is rejected.

The updated life-cycle theory is introduced to test how self-employed spread out their money differently than regular employees. The results show that self-employed are saving less up towards becoming 40 years of age. After becoming 40, they start closing the gap between self-employed and regular employees. However, even with the comeback, they are still worse at reaching their personal pension target. The second hypothesis that tests if the self-employed are just as good at reaching their personally preferred pension income is therefore also rejected.

As both rational hypotheses fail to provide convincing answers, various behavioral explanations have been tested on the Dutch situation. The results show that risk aversion does have a substantial effect on the pension savings of individuals. The more financial risks a subject is willing to take the higher his pension income is. This is presumably caused by differences in investment choices. While this effect is strong, it does not explain the differences between self-employed and regular employees. Both groups are influenced by risk aversion in a similar way. The hypothesis that risk aversion influences pension savings is, therefore, half right: risk aversion does influence pension savings, but differences in risk aversion for self-employed and regular employees are limited.

Both financial optimism and optimism regarding life expectancy fail to provide useful new insights. The effects are economically small and statistically insignificant. The second behavioral hypothesis that revolves around the relationship between optimism and pension savings is therefore rejected. This is counterintuitive as one would expect there to be a strong relationship between one’s probability of becoming at least 80 and the importance of a substantial pension income.

The third behavioral hypothesis tests the effect of financial knowledge on pension saving behavior. Financial knowledge does have both an economically relevant and a statistically significant effect on pension saving. For self-employed, these differences are more substantial than for regularly employed. Financial knowledge therefore seems to be an important factor when it comes to saving. The self-employed with the most financial knowledge have a higher probability of reaching their target than

regular employees with little financial knowledge. Self-employed with more knowledge are better able to reach their personal pension goals, and therefore are better able to handle the increased freedom.

The final tests regard the hypothesis that there is a relation between planning skills and pension savings. As expected the worse people are in sticking to a financial plan, the lower their pension savings will be and vice versa. The results show that this relation is stronger for self-employed. The self-employed with the least trouble sticking to a financial plan have about the same probability of reaching their pension target as an averagely skilled regular employee. This proves that having financial discipline is more important for the self-employed than for regular employees.

5.1. Limitations and its implications

As with all research, some weaker aspects need to be highlighted for further research. Although the dataset provided many advantages to different research methods it is important to note the weaknesses of the dataset. The biggest problem with the data was the large part of the dataset that had to be removed due to lack of answers. After the data cleaning progress less than 5% of the original responses remained. The significance of all statistical tests is lowered due to the reduced number of data points that were used in the final version.

Even after the data cleaning progress, some data issues remained. First, the way in which financial optimism is calculated is suboptimal. Most subjects got similar scores and this lack of difference made it hard to determine the actual effects of financial optimism. This problem was tried to overcome by introducing a second method of determining financial optimism and the results ended up not differing significantly. Secondly, a lot of the question about for example financial knowledge and planning skills were subjective and can, therefore, differ from the truth. Fortunately, from 2018 onwards the questionnaire will include some questions to test actual financial knowledge levels of individuals. This enables future researchers to overcome this problem somewhat in the future. Thirdly, the way in which the questions about taking financial risks were stated could cause people with recent financial success to answer the questions more optimistically. This lead to a situation in which people who made recent financial gains also appear to be more risk seeking. In addition to this there is a risk that people who are better at financial planning are more aware of their assets. As all subjects are given questions about financial assets in over 25 categories, it is possible that the individuals with better financial planning skills can come up with all their assets while the people who spend their money without planning are less aware of their saving accounts. This theory is unfortunately not testable given the data.

There is one aspect that cannot be controlled for: the costs of saving for pension. Since self-employed cannot voluntarily join a pension fund of the second pillar, they are only able to go through a private insurance provider if they want an annuity product that is comparable to a second pillar pension income. As these private insurance firms aim to make a profit, the management costs will be higher than in the not-for-profit second pillar pension funds. As these increased costs make it less attractive to save, part

of the difference in saving behavior can be explained by this cost difference. The effect of this cost difference is not observable with the available data.

5.2. Discussion and practical implications

Whether having additional pension flexibility is a blessing or a burden appears to depend on the individual. The fact that self-employed with sufficient financial knowledge are almost as good in reaching their individual pension targets as regular employs shows that the additional freedom does not necessarily cause people to under save for their pension. A large group of self-employed choose to over-spend early in life but can make up most of this difference later in life. This is however not true for the self-employed with limited financial knowledge. This group on average has a 15 percentage points lower probability of reaching their pension target, which is an alarmingly high number. Further research could investigate if providing more financial knowledge to self-employed could increase their knowledge and indirectly their saving levels. If providing more knowledge can increase the number of self-employed who manage to reach their pension target the problems of the freedom are reduced while the advantages remain.

Another fact that this thesis has overlooked which is important from a policy point of view is the potential risks involved with saving through the fourth pillar. Most self-employed have the majority of their savings invested in their company. This makes sense as investing in their company saves money compared to getting external financing. However, this increases the risks for self-employed massively. If the company of a self-employed goes bankrupt the effects will be double-edged. Not only do self-employed lose their main income source, making it more difficult to earn enough to save for a pension in the coming years. They also lose a large part of their pension savings. Thus, while the total savings of these individuals might be high enough to achieve an adequate pension income the risks of these savings evaporating before reaching the pension age are substantial. The government partly stimulates this risk as there are fiscal limitations to saving through the third pillar (Goudswaard & Caminada, 2017).

The differences between employees and self-employed may evolve further in the future. The pension age is rising and expected to rise further, which may be good news for the self-employed. As the self-employed tend to save more later in life the fact that the general pension age is rising could further decrease the differences in pension income for self-employed as well as regular employees. However, as life expectancy increases, the threat of insufficient pension savings, for example among those who are self-employed, becomes an increasingly pressing social issue. Thus, further unpacking the drivers of savings decisions will continue to be an important area of research.

6. Appendix 1

6.1. Appendix 1: gender differences

VARIABLES Dependent variable: pension income	(1) (Base Model)	(2) (Gender neutral life expectancy)	(3) (Household position)
Self-employed	-2,138** (1,040)	-2,830*** (970)	-2,745*** (968)
Age	425*** (23)	434*** (22)	436*** (23)
Income (€ x1000)	173*** (23)	161*** (22)	157*** (23)
Male	2,482*** (596)	1,739*** (558)	1,134* (595)
General health condition: good	-1,117 (834)	-1,187 (775)	-1,208 (779)
General health condition: fair	-2,516** (981)	-2,422*** (913)	-2,471*** (915)
General health condition: not so good	-4,099** (1,857)	-3,876** (1,772)	-3,990** (1,766)
General health condition: poor	-6,800 (4,177)	-6,282 (4,252)	-5,286 (4,432)
Higher educated	2,782*** (636)	2,803*** (593)	2,791*** (589)
position in the household: spouse			-1,493** (691)
position in the household: permanent partner (not married)			-1,415* (824)
position in the household: parent (in law)			-8,161*** (1,228)
position in the household: housemate			-626 (4,970)
position in the household: family member or boarder			-5,284*** (1,975)
Constant	-953 (1,194)	-1,474 (1,117)	-603 (1,371)
Observations	1,925	1,925	1,925
Adjusted R-squared	0.328	0.345	0.345

Heteroscedasticity robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6.2. Appendix 2: pension target

	(1)
VARIABLES	(Pension target)
Dependent variable: pension target	
Self-employed	2,511***
	(824)
Age	20
	(16)
Income (€ x1000)	132***
	(21)
Male	3,288***
	(488)
General health condition: good	-872*
	(514)
General health condition: fair	-778
	(694)
General health condition: not so good	-4,044***
	(1,522)
General health condition: poor	-3,996***
	(1,411)
Higher educated	1,904***
	(491)
Constant	13,679***
	(1,023)
Observations	1,710
Adjusted R-squared	0.273

Heteroscedasticity robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6.3. Appendix 3: optimism

VARIABLES	(1) (Base model)	(2) (Financial Optimism)	(3) (Financial Optimism)	(4) (Financial Optimism)	(5) (Financial Optimism)
Self-employed	-2,138**	-1,379	-1,820	-2,025*	-580
	(1,040.4)	(1,174.1)	(1,964.7)	(1,058.5)	(3,573.9)
Age	425***	394***	394***	437***	437***
	(23.0)	(28.3)	(28.3)	(23.7)	(23.7)
Income (€ x1000)	173***	163***	163***	171***	171***
	(23.3)	(25.1)	(24.9)	(23.4)	(23.5)
Male	2,482***	3,088***	3,089***	2,381***	2,378***
	(596.0)	(677.3)	(681.9)	(602.3)	(602.0)
General health condition: good	-1,117	-1,786*	-1,780*	-1,032	-1,028
	(833.7)	(960.3)	(963.0)	(834.4)	(835.7)
General health condition: fair	-2,516**	-3,031***	-3,013***	-2,003*	-2,004*
	(980.8)	(1,130.2)	(1,132.6)	(1,031.0)	(1,030.3)
General health condition: not so good	-4,099**	-3,685*	-3,634*	-3,654*	-3,736*
	(1,857.1)	(2,116.0)	(2,062.6)	(1,982.4)	(1,957.4)
General health condition: poor	-6,800	-10,851**	-10,879**	-6,717	-6,591
	(4,177.2)	(4,940.6)	(4,943.8)	(4,438.3)	(4,432.8)
Higher educated	2,782***	3,463***	3,481***	2,677***	2,674***
	(635.7)	(701.6)	(702.8)	(642.0)	(641.7)
Economic Situation in five years: much worse		-3,647*	-3,623*		
		(1,861.0)	(1,950.8)		
Economic Situation in five years: worse		-2,184**	-2,191**		
		(870.7)	(897.8)		
Economic Situation in five years: better		-2,663***	-2,878***		
		(674.6)	(673.4)		
Economic Situation in five years: much better		-2,493*	-2,208		
		(1,354.6)	(1,505.8)		
Economic Situation in five years: much worse * self-employed			-1,014		
			(3,204.0)		
Economic Situation in five years: worse * self-employed			103		
			(2,772.2)		
Economic Situation in five years: better * self-employed			1,478		
			(2,597.3)		
Economic Situation in five years: much better * self-employed			-1,584		
			(3,570.8)		

BMI				-30	-31
				(68.9)	(69.0)
Long term illness				-1,240*	-1,232*
				(675.3)	(674.8)
smoke cigarettes: every now and then				570	555
				(1,129.8)	(1,134.4)
smoke cigarettes: every day				-1,332*	-1,341*
				(745.3)	(746.7)
>4 alcoholic drinks per day				1,281	1,288
				(1,841.9)	(1,848.0)
Subjective % live to 80				-21	-18
				(13.6)	(13.4)
Subjective % live to 80 * self-employed					-23
					(51.7)
Constant	-953	2,033	2,045	1,022	878
	(1,193.5)	(1,585.9)	(1,604.8)	(3,038.3)	(3,065.0)
Observations	1,925	1,616	1,616	1,916	1,916
Adjusted R-squared	0.328	0.311	0.310	0.330	0.330

Heteroscedasticity robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6.4. Appendix 4: planning on different pillars

	(1)
VARIABLES	(Pillar one and two)
Dependent variable: **Pillar one and Two**	
Self-employed	-7,345***
	(905.9)
Age	243***
	(21.3)
Income (€ x1000)	187***
	(28.2)
Male	1,777***
	(610.3)
General health condition: good	87
	(698.8)
General health condition: fair	458
	(873.8)
General health condition: not so good	-174
	(2,043.5)
General health condition: poor	-1,110
	(4,205.1)
Higher educated	2,754***
	(615.0)
Planning	66
	(172.1)
Constant	1,983
	(1,405.3)
Observations	1,751
Adjusted R-squared	0.324

Heteroscedasticity robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

	(1)
VARIABLES	(Pillar three and four)
Dependent variable: **Pillar three and four**	
Self-employed	5,841***
	(2,184.9)
Age	325***
	(35.7)
Income (€ x1000)	65***
	(22.4)
Male	2,125***
	(818.7)
General health condition: good	-2,828
	(1,733.7)
General health condition: fair	-3,811*
	(2,113.5)
General health condition: not so good	-5,740***
	(2,125.0)
General health condition: poor	-9,366***
	(3,033.6)
Higher educated	1,423
	(946.9)
Planning	1,172***
	(281.7)
Constant	-15,330***
	(2,435.9)
Observations	1,751
Adjusted R-squared	0.100

Heteroscedasticity robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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