THE DETERMINANTS OF THE EXPECTED RETIREMENT AGE

Bachelor Thesis

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Table of contents

1. Introduction

Over the past decades the life expectancy in the Netherlands has been rising. The average increase in life expectancy is about 1 to 2 months per year (CBS Statline, 2019a). The relative proportion of elderly people increased in the Netherlands in the last decades. The baby boom generation, which was born in the years after the second war, became the old generation in the Netherlands. The relative proportion of people who are entitled to first pillar pension benefits increased from 13.3% in 2000 to 17.7% in 2019 (CBS Statline, 2019b). Therefore, the Dutch first pillar pension had to pay more pension benefits, because there are more elderly people who are older than the statutory retirement age. The statutory retirement age, the age people qualify for first pillar benefits, is already increased from 65 years to 66 years and 4 months. This statutory retirement age will further increase to 67 years in 2025 and after that the statutory retirement age will increase with 8 months for every additional year in life expectancy[1]. So, the statutory retirement age in the Netherlands will increase with life expectancy.

First, everyone that has the same date of birth also has the same statutory retirement age, while there are differences in life expectancies. There could be differences in the expected retirement age because of the differences in life expectancy among different socio-economic groups. The difference in life expectancy in the period 2014-2017 is 8.3 years between men from the lowest and highest 20% income group, respectively 74.8 and 83.1 year (CBS Statline, 2019c). According to this data the life expectancy is increasing with income. The differences in healthy life expectancy between the different socio-economic groups are even bigger. Next to that the life expectancy for the poorest groups are not growing as much as the other groups. This could lead to differences in the actual retirement age among the different income groups. For example, the poorer cohorts want to retire early, because they have a much shorter expected time in retirement. The healthy life expectancy would have a bigger effect on the actual retirement age for the poorer groups than for the richer groups.

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[1] The increase in statutory retirement ages according to the Dutch government. The increase in statutory retirement age for the next years is displayed in the article "AOW leeftijd stijgt minder snel" on the website of Rijksoverheid. The relationship between life expectancy and statutory retirement age is also available on this website. (Link).

Second, when people want to retire early, they must bridge the gap between the retirement age and the statutory retirement age. Because in general people do not receive first pillar benefits before the statutory retirement age. A possibility to bridge the gap could be early payments from the second pillar pension. The second pillar consists of a pension accrual which is built up through employment. In most cases about two thirds of the premium is paid by the employer and one third by the employee. Pension funds will invest this money to be able to pay indexed second pillar payments to the employees[2]. However, whether the pension fund is able to pay indexed benefits is dependent on historic contributions, the return on investments and paid benefits (funds' assets) as well as the accrued pensions (funds' liabilities). In the Netherlands, the second pillar pension plan is relatively big in comparison with other countries. The second pillar in the Netherlands is around 50% of total pension benefits in the Netherlands, while in countries like Spain, France, the United States, the United Kingdom and Germany this is 10% at most (Bovenberg, 2014). So, there could be a possibility to bridge the gap between the actual retirement age and the statutory retirement age. But also, here there are big differences between the different socio-economic groups. The amount of expected second pillar pension for the poorest decile is 24 euro, while this amount for the richest 10% is 39,200 euro (Woestenburg, 2020). Hence the difference in second pillar pension could explain a difference in the retirement age, where a higher second pillar plan could explain an earlier retirement.

Third, there is a difference between different income groups as regards savings. The bottom 20% of savers had at most 300 euros in their bank account in the Netherlands in 2018, where most people in this group overdraw their account. While the top 20% have at least 147,500 euro in capital in 2018, exclusive illiquid assets such as pension accruals (CBS, 2020). In the highest savings group four percent even have more than a million euro in savings. So, there is a big difference in savings among Dutch people. Savings are a possibility to bridge the gap between the statutory retirement age and the early retirement. Hence savings could be an important factor in forecasting the expected retirement age.

Next to that there are special arrangements for some professions, mostly heavy physical work, because many workers are not able to work until the retirement age. The employers

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[2] A brief overview about the Dutch second pillar pension plan on the website of Rijksoverheid. (Link)

can give workers a payment to retire for at most 3 years before reaching the statutory retirement age[3]. These arrangements can be made in the collective labour agreements and are valid from 2021 to 2025. The employers do not have to pay the so-called "RVU-heffing" for payments under 21,000 euros gross a year (Zulkarnain, Ter Rele & Zwaneveld, 2020). The professions in this category have more disability especially among older workers, but employers and employees must try to find work in a different category for the remainder until the statutory retirement age. Most people that work in heavy physical work are mostly from a lower socioeconomic class (Van Zon, Bultmann & Reijneveld, 2018). Therefore, these special arrangements for heavy physical work could cause differences in the actual retirement age as well.

Moreover, there are differences between people who own a house and people who rent. Since 2007 the rents in the Netherlands have on average gone up by 36%, so the housing cost of people who own a house is massively increased. While the house prices in the Netherlands increased by approximately 17% and the house price influences the mortgage payments, the cost of housing for homeowners (Eurostat, 2020). The relative bigger increase in housing cost could lead to a bigger financial advantage for homeowners. This could lead to a difference in retirement planning, where homeowners are expected to retire earlier than people that rent.

Moreover, there are big differences in health conditions between different socio-economic groups. People with lower socioeconomic status have worse health conditions in almost all health categories than high socioeconomic groups (Van der Werfhorst & Van Hest, 2019). People with a lower health condition expect not to be able to work as long as people with a good health condition (Gommans, 2017). Hence there could be a relationship between the health condition and the expected retirement age.

The goal of this paper is to determine whether there are differences in the expected retirement age among different socio-economic groups. After that, there should be determined what could explain the differences in expected retirement age. As described in this introduction the life expectancy, income, savings, second pillar pension plan, and the health condition could be important indicators of the expected retirement age. Then we look

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[3] According to the website of Rijksoverheid the government wants to give employers the possibility to let employees in heavy physical professions retire early. (Link)

if being in a relationship, having grandchildren, receiving a pension overview, age, gender or education has influence on the expected retirement age. The lower income groups are expected to want to retire earlier because of the lower life expectancies and more heavy physical work. While it is also expected that lower income groups are less able to afford to retire earlier because of a lack of savings and second pillar pension plan. In chapter 2 the relevant literature about the expected retirement age will be discussed. Then chapter 3 will discuss the data used in this paper. Next the method and explanation of the regressions will be discussed in chapter 4. In chapter 5 the results of the regressions will be discussed. In chapter 6 the conclusion will be presented.

2. Literature review

In this section the relationships between the retirement age and various other factors are discussed. First the relationship with income will be discussed, after that with life expectancy and the second pillar plan. Then the relationship between the retirement age and respectively health, savings and receiving a pension overview will be explained.

2.1 Income

The effect of non-investment income on the expected retirement age is significant for individuals in the United States (Montalto, Yuh & Hanna, 2000). The expected retirement age for middle income is 0.63 years higher than for low income groups. This difference is bigger than the difference between middle income and high-income groups, this is 0.27 years. So according to this paper the expected retirement age increases with income but at a decreasing rate.

Household income has a dominant influence over retirement decisions as this encompasses family resources which are available to finance retirement (Davies, Van der Heijden & Flynn, 2017). According to this paper about the United Kingdom lower income employees have less opportunity to accumulate sufficient financial resources over their lifetime and are less likely to be able to exit the workforce through early retirement. This implicates that there could be a difference in the expected retirement age for different income groups. Next to that this paper suggests that higher income groups have engaged in better financial planning than low income groups.

From the people who earn modal or less 36% has the possibility to retire 3 years before the statutory retirement age. While among people who earn between modal and twice modal this percentage is 86 and for the people who earn above twice modal this is 92% (Kok, Kroon, Lammers, Van Soest & Ter Weel, 2017). This research used CBS microdata about Dutch citizens to find the differences in possibilities to retire early between different income groups.

Research in Sweden showed that there is an negative correlation between income and the expected retirement age (Barban, De Luna, Lundholm, Svensson & Billari, 2020). The results of this research suggest that individuals with a higher pre-retirement income level are

more likely to retire early than individuals with a lower pre-retirement income level. So from this research in Sweden can be concluded that income has a negative correlation with expected retirement age, which is in line with the papers mentioned above.

However on the other hand people with low income work more regularly in professions like agricultural, industrial, construction and transport professions. These working sectors usually go together with heavy physical work and relative low income. The people working in those areas are on average less able to reach the statutory retirement age due to work disabilities (Smulders, Houtman & Van Den, 2009). There is a significant effect between heavy physical work and the possibility to work beyond the age of 65. This could lead to lower average retirement age for low income groups compared to high income groups

The decisions by older employees whether to work longer depends on both physical and rewarding aspects (Henkens, Van Solinge & Van Dalen, 2009). Physical strain and stress make older employees retire earlier, but income has the same effect. Because lower income groups have more physical strain but less income than high income groups, the effect of income on the expected retirement age could not be determined.

2.2 Life expectancy

The subjective life expectancy is a factor that is considered in retirement decision making (Van Solinge & Herkens, 2010). According to this paper old workers with a higher life expectancy want to work longer on average. The difference in retirement between people with a high and low subjective life expectancy is approximately 1 year and 4 months on average. This effect of life expectancy on the expected retirement age was significantly positive. So according to Van Solinge & Herkens the employers who expect to live longer intend to retire later than those who expect a shorter life span.

People who expect it is unlikely to reach the age of 75 are more likely to retire early than those who expect to reach the age of 75 (Herkens, Van Solinge & Van Dalen). Towards the end of their career employees have good insights in their remaining life expectancy. These expectations have an influence on the different intended retirement ages.

People with a higher subjective life expectancy have a lower chance of being retired early in Australia (Griffin, Hesketh & Loh, 2012). Subjective life expectancy was significantly correlated with intended retirement age. So people with a lower subjective life expectancy tend to retire earlier than people with a higher subjective life expectancy.

A paper by Jijiie, Alonso-Garcia and Arnold also concludes there are significant differences in mortality between the most deprived and least deprived individuals in OECD-countries. An increase in statutory retirement age will lead to a relatively big difference in AOW benefits with the highest socio-economic groups profiting the most. This could lead to substantial transfers from those with shorter lifespans than to those that will live longer on average (Jijiie, Also-Garcia & Arnold, 2019). This difference in mortality could lead to the lowest socio-economic groups wanting to retire early.

2.3 Second pillar pension

The second pillar pension plan in the Netherlands consists of a pension accrual financed by employment. On average the employer pays two thirds of the premium, while the employee has to pay one third of the premium. However the relative premiums by the employers and employees can differ between pension funds. These premiums are gathered by pension funds and invested to be able to pay indexed payment to its retirees. One of the big advantages of this second pillar plan is the risk sharing among all the people in the specific pension fund, which leads to significant prosperity gains (Goudswaard, 2013). The majority of the second pillar benefits are paid to retirees as an annuity plan. There is a possibility to for example high benefits in the beginning and lower benefits later in retirement. However the annuity plan is the most common second pension plan in the Netherlands. But there is societal discussion whether solidarity among all participants is desirable. There is a redistribution from people with lower income and education to people with the higher income and education, because the high income group has a much higher life expectancy as described above (CBS, 2019c). These unfair payments could still have an indecisive effect on the retirement age. However this redistribution is reduced by sector, profession and firm specific pension funds. The differences between people in a specific pension fund are smaller than the difference between all Dutch employees. On the one hand the higher second pillar payments could make it easier to bridge the gap between the retirement age and the statutory retirement age and there is possibility to take a high-low second pillar pension plan option. This means you get relatively much pension benefits in the beginning and relatively less later in retirement, which could be beneficial for people with a low expected life expectancy. But on the other hand, the second pillar plan in the Netherlands has a so-called franchise. This is a certain income threshold and people who have a lower income pay no contribution, but have also no

accrual (Van Meijl, Jansson, Banse & Woltjer, 2009). Hence these low-income individuals do not accrue pension benefits and are not able to bridge the gap between their retirement age and the statutory retirement age with the second pillar pension plan in the Netherlands.

According to research from the Ministry of Social Affairs and Employment in the Netherlands 49% of workers have enough second pillar pension and savings to retire at least one year before the statutory retirement age (Kok, Kroon, Lammers, Van Soest & Ter Weel, 2017). This 49% would be able to maintain their standard of living during this additional year in retirement. 83% of the workers in the Netherlands have enough second pillar pension to retire at least one year before the statutory retirement age with at least maintaining the social minimum. But then some people would need to adapt their lifestyle to be able to retire at least one year early, because their regular income is above the social minimum.

"The Dutch pension fund for civil servants, ABP, appears to be regressive, even if we do not take differential mortality into account." (Nelissen, 1999). This effect would be strengthened by the existence of differential mortality. This is remarkable because occupational pension schemes are not intended or designed to be redistributive. In the Dutch second pillar scheme, the young workers subsidize the old workers because of uniform contribution. In combination with the average-wage scheme, which implicates that the average wage decides the pension benefits that are accrued, people with relative high income later in their working life accrue more pension benefits than are actuarially fair (Bonenkamp, 2009). According to Nelissen there are subsidies in the pension scheme towards those whose earnings increase by more than average. Moreover these subsidies are from those with high mortality rates to those with low mortality rates. So generally low education groups subsidize high education groups. So according to this research the rich income cohorts profit the most from the second pillar in relative and absolute terms. Therefore the difference in ability to bridge the gap between retirement and the statutory retirement age becomes even bigger.

2.4 Health

There could also be a possible relationship between the retirement age and people's health. Early retirees tend to experience worse pre-retirement health conditions than those who retire later (Barban, De Luna, Lundholm, Svensson & Billari, 2020). This effect is even bigger when people retire earlier before the age of 65 than for people who retire closer to the statutory retirement age. The largest differences are observed among individuals who

anticipate for their retirement. So health conditions are an indicator to predict the actual retirement age.

The lowest income groups have a relative bad health condition at all ages. Next to that the health of the lower income groups also decrease faster when they get older (Van Kippersluis, Van Doorslaer & Van Ourti, 2009). There is a significant social inequality in health conditions and diseases in the Netherlands. There is a strong relationship between these health conditions and their income. On average the lowest socio-economic groups start with a health condition and during their lifetime the gap in health conditions becomes bigger. This effect could mainly be explained by the lower labour force participation among people in poor health. So according to this paper the effect of health on income is bigger than the effect of income on health. This difference in health conditions could influence the retirement age among different socio-economic groups.

Subjective reports of health do have important effects on retirement. These effects are arguably stronger than those of financial variables (McGarry, 2004). The effects of subjective health remain large in this research even if objective health measures of health like diseases are included in the models. This suggests that the subjective health condition is a good indicator of the actual health condition. The main finding by McGarry is that retirement expectations are driven to a much greater degree by changes in health than by changes in income and wealth. So the choice of a retirement is undoubtedly impacted by the worker's health.

According to cross-sectional data in the United States unhealthy retire on average earlier than healthy people (French & Jones, 2017). Bad health could affect retirement decisions in different ways. The first reason that could lead to early retirement is a decrease in productivity due to unhealthy conditions. Moreover bad health conditions could lead to changes in preferences, where people tend to retire earlier.

Health shocks influence decisions concerning economic activity and hence retirement planning. In this research was found that a major reason for retirement among British men was ill health. Similar trends were observed in other countries like the United States and The Netherlands (Disney, Emmerson & Wakefield, 2006). There is a correlation between men without access to an occupational pension and the bad health condition. This will lead to relatively lower socio-economic people applying for disability benefits.

2.5 Savings

Savings are an important factor in determining the retirement age among employees (Henkens, Van Soling & Van Dalen, 2009). Especially for low income groups the lack of savings makes it a necessity to work longer. This is because savings are another possibility to bridge the gap between actual retirement age and the statutory retirement age. Moreover research concluded that saving decisions are important for retirement planning, especially among low income individuals (Van der Klaauw & Wolpin, 2008). So despite people are in the same income groups there are still differences in retirement age due to savings.

Another paper looked at the effect of receiving an inheritance on the retirement decision (Brown, Coile & Weisbenner, 2010). Because an inheritance is a shock in savings, the effect of savings on retirement could be established by this inheritance. Inheritance receipt is associated with a significant increase in the probability of retirement. The higher the inheritance gets the higher the probability someone will retire. The effect on retirement is twice as large when the inheritance is unexpected. This suggests that someone who receives uncalculated additional savings retires even faster than when it is calculated. Hence when savings increase the chance that someone will retire increases. This implicates savings negatively correlates with expected retirement age according to this study by Brown, Coile and Weisbenner.

2.6 Pension overview

Pension overviews give individuals information on their financial situation during retirement. Combined with financial literacy, knowledge how to read the pension overview, an individual can make thought-out decisions about retirement planning. This financial literacy leads to better quality in retirement planning and saving (Mitchell, 2017). However not everyone received a pension overview according to the data used in this paper, while this is compulsory. Individuals who did not receive a pension overview will have less information that is necessary for retirement planning.

3. Data description

In this paper use is made of the data of the DNB Household survey. The DNB Household survey (DHS) was launched in 1993 and gathered information on work, pensions, housing, mortgages, income, assets, loans, health, economic and psychological concepts, and personal characteristics (De Bruijne & Streefkerk, 2018). The data is collected from households participating in the CentERpanel, an internet panel that reflects the composition of the population in the Netherlands.

The DHS data from the wave 2018 is used, which is the latest completed survey by the CentERdata. In this 26th wave of DHS data 2165 households have participated. The DHS consists of 6 different questionnaires: general information on the household, household and work, accommodation and mortgages, health and income, assets and liabilities and economic and psychological concepts. By combining the answers of the different questionnaires the following datasets are created: aggregated data on income and aggregated data on assets, liabilities and mortgages. Then there is a weight file which is computed on the household level and is meant to improve the representativity of the data when weighing the variables income and home ownership among others.

The data which is used in this paper are from different questionnaires. The health and income, household and work, assets and liabilities, accommodations and mortgages, general information on the household, aggregate income and weights data is used. Because not all respondents have completed all questionnaires, the number of respondents is reduced. Next to that part of the respondents are already retired and hence do not have an expected retirement age. Moreover there are respondents that do not know or do not want to reveal at which age they want to retire. So the total number of respondents which are used for the regressions is 866. In table A the number of households that responded to the questionnaires is shown. In table B the number of respondents that answered a particular question is shown. In the left column the names of the variables are as in the DHS datafile and questionnaires. In the right column the names of the variables that are used in this paper are shown, because this gives a description of the meaning of the variables. Below table B all different variables will be further discussed.

Table A: *Number of households per questionnaire.*

Datasets	Number of households
General information on the households	4587
Health and income	2227
Household and work	2322
Assets and liabilities	2123
Accommodation and mortgages	1766
Aggregated data on income	2227
Weights	2165

Table B: *The number of non-NAs for each variable used in this paper.*

Variables as named in the DHS datafile	Number of observations	Variables renamed as in this paper
Lftpens & lftpens_mnd	1163	Expected retirement age
idink	2164	Log(Income)
pens	2189	Log(Second pillar)
spa131	1065	Log(Savings)
kans2a	1176	Chance 80
gez3	2227	Health
wo1	1766	Housing
decil	2165	Income decile
kk	1771	Grandchildren
burgst	2322	Relationship
ws031	2245	Pension overview
geslacht	4582	Age
gebjaar	4587	Gender
oplmet	4578	Education

Next all the different variables that are used in the regression will be discussed. The
dependent variable used in the regressions is the expected retirement age. In the DHS dataset
this corresponds with the variable lftpens and lftpens_mnd, where respondents answered the
following question: "At what age do you expect to retire, or to make use of the early

retirement arrangement?". The respondents had to answer their expected age and month in whole years and months. From those variables the expected retirement age was constructed by dividing the lftpens_mnd through 12 and adding that to the lftpens variable.

The next variable used in the regression is logarithm of household income. For constructing this variable the idink variable from the dataset is used, which represents the net disposable income for a household. The logarithm of income is used, which gives the influence on the expected retirement age from the difference in income in percentage point, which is commonly used in previous research. Logarithms of income are used to get the difference in percentage points, which is easier to compare than with absolute income differences. Next to that the division in income cohorts is given by the variable decile. Because for some regression the respondents are split between income groups, this is an important variable. The variable in the dataset from the DHS is decil, which ranks the income groups from 1 to 10, where 1 is the lowest income decile and 10 the highest income decile.

Another variable that is used in the regressions is the logarithm of the second pillar annuity. This variable is derived from the variable pens, which is the money gathered for an annual second pillar annuity plan. Also the logarithm of savings is used in the regression. This variable comes from the variable in the dataset spa131, which represents the balance of the bank account on December 31st, 2017. For both these variables to bridge the gap between retirement age and statutory retirement age the logarithm is used because this is regular in previous research. For both the logarithms, savings and second pillar pensions, 1 is added to savings and second pillar pensions. This will prevent that some results become invalid and hence there could be as many regressions as possible.

Next we look at the chance someone will reach the age of 80. The respondents had to indicate on a scale from 0 to 10 whether they thought they would reach the age of 80. This scale should reflect differences in life expectancy between different groups. The actual life expectancy could be estimated by the self-estimated life expectancy (van Solinge & Henkens, 2010). Because as stated in the introduction low income groups are likely not to reach this age, while high income groups will on average reach this age. Moreover most respondents answered the question about how they estimate the chance to reach 80 instead of another age.

Then there is the health variable, which is a self-indication of the personal health. The respondents had to answer by question gez3, whether their health is 1 excellent, 2 good, 3 fair, 4 not so good or 5 poor. The health variable could be an indicator whether people are able to work until their retirement age.

Next housing could be an explanatory variable which could explain the difference in expected retirement age. The question by wo1 is: "Are you the tenant, subtenant, or owner of your current accommodation?". For the regression the variable housing is changed, where owning a house is 1 and renting a house is 0.

Then having grandchildren is discussed, which is the renamed variant of kk in the DHS dataset. Grandchildren gives 1 if someone has grandchildren and gives 0 if someone does not have grandchildren. Another variable is whether someone is in a relationship. This variable, derived from burgst, gives 1 if the respondent is married or registered partnership with a community of property or a marriage settlement or are living together without being married. But gives 0 if the correspondents divorced from their spouse, are widowed or never married. The next variable is whether your pension fund sends on a pension overview. When the respondents received a pension overview, variable ws031 in the DHS data, the value is 1 and otherwise 0.

At last we look at some other variables of the respondents. First the age of the respondents is derived from the variable gebjaar, which states the birth year of the respondent. Because this survey is about 2018, the age is calculated by subtracting the birth year from 2018. The next variable is the gender of the respondent, named geslacht in the DHS dataset, which gives 1 if the respondent is a man and 0 if the respondent is a woman. The last variable that is used in this paper is the level of education. This oplmet variable represents the highest level of education someone completed. This variable has value 0 if someone has never received education, 1 if someone went to special education, 2 if one's highest completed level of education in primary school, 3 if this level is pre-vocational education, 4 if the highest finished level is pre-university education, 5 if senior vocational training or training through apprentice system is highest completed level of education. If the highest finished level of education is vocational colleges the education level will be 6 and be 7 if the highest completed education is university education.

In table C there is a descriptive table of all the variables. This will give a general overview in the range of the values each variable can take. Table C also gives an average and a standard deviation for each of the variables. Below that, there will be table D, which gives the correlation between all variables used in this paper. In this correlation matrix there are some striking results. As an example there is a negative correlation of -0.25 between health conditions and the probability someone reaches the age of 80. While a bad health condition is more likely with a lower chance of a longer life. But this data suggests that with bad health the chance of reaching 80 years increases. The numbers from table C and D are based on the 866 observations used in the regressions.

Table C: Descriptive table

	Expected retirement age	Log (Income)	Log (Second pillar)	Log (Savings)	Chance 80
Mean	66.61	10.25	0.33	4.67	6.02
Standard deviation	3.87	0.67	1.68	4.52	2.08
Minimum	50	6.42	0	0	0
Maximum	85	12.12	10.92	11.66	10

	Health	Housing	Decile	Grandchildren	Relationship
Mean	2.11	0.75	5.51	0.42	0.69
Standard deviation	0.69	0.43	2.83	0.49	0.46
Minimum	1	0	1	0	0
Maximum	5	1	10	1	1

	Pension overview	Age	Gender	Education
Mean	0.75	48	0.51	4.89
Standard deviation	0.43	13.99	0.50	1.40
Minimum	0	18	0	0
Maximum	1	67	1	7

Table D: *correlation matrix*

	Retirement age	Income	Second pillar	Savings	Chance 80	Health	Housing	Decile	Grandchildren	Relationship	Pension overview	Age	Education
Retirement age	1.00	-.01	.03	.01	.03	-.04	-.03	-.04	-.07	-.05	-.14	-.06	.02
Income	-.01	1.00	.00	.09	.04	-.13	.37	.93	.17	.33	.14	.08	.08
Second Pillar	.03	.00	1.00	-.04	.09	.09	-.02	.02	.08	-.04	-.01	.18	-.05
Savings	.01	.09	-.04	1.00	-.02	-.10	.11	.07	.00	-.05	.13	.01	.14
Chance 80	.03	.04	.09	-.02	1.00	-.25	.02	.03	-.03	.01	.01	.06	.00
Health	-.04	-.13	.09	-.10	-.25	1.00	-.15	-.10	.11	-.13	-.01	.07	-.11
Housing	-.03	.37	-.02	.11	.02	.15	1.00	.38	.23	.38	.19	.15	.06
Decile	-.04	.93	.02	.07	.03	-.10	.38	1.00	.17	.34	.14	.05	.09
Grandchildren	-.07	.17	.08	.00	-.03	.11	.23	.17	1.00	.12	.17	.46	-.08
Relationship	-.05	.33	-.04	-.05	.01	-.13	.38	.34	.12	1.00	.12	.12	-.04
Pension overview	-.14	.14	-.01	.13	.01	-.01	.19	.14	.17	.12	1.00	.16	.05
Age	-.06	.08	.18	.01	.06	.07	.15	.05	.46	.12	.16	1.00	-.09
Gender	.00	.02	-.04	.02	-.02	-.03	.00	.03	.01	-.03	.03	.00	-.01
Education	.02	.08	-.05	.14	.00	-.11	.06	.09	-.08	-.04	.05	-.09	1.00

4. Methodology

In this section the different regressions are being explained. First the univariate regressions are being reported. This means expected retirement age is regressed on each variable. So for example expected retirement is regressed on the logarithm income, which gives:

$$\text{expected retirement age} = \alpha_0 + \beta_0 * \log(\text{income}) + \varepsilon$$

In the other regressions the logarithm of income will be replaced by the other explanatory variables.

Next there will be a multivariate regression in which all different explanatory variables are combined in one equation:

$$\text{expected retirement age} = \alpha_0 + \beta_0 * \log(\text{Income}) + \beta_1 * \log(\text{Second pillar annuity}) + \beta_2 * \log(\text{Savings}) + \beta_3 * \text{Chance 80} + \beta_4 * \text{Health} + \beta_5 * \text{Housing} + \beta_6 * \text{Grandchildren} + \beta_7 * \text{Relationhip} + \beta_8 * \text{Pension overview} + \beta_9 * \text{Age} + \beta_{10} * \text{Gender} + \beta_{11} * \text{Education} + \varepsilon$$

The goal of this equation is to find whether the other variables affect the results of the determinants of the expected retirement age.

Next the respondents are divided in income groups. The first groups are the respondents with the lowest 30% of income. The high-income groups contain respondents with the 30% highest incomes. There is also a middle-income group with respondents with income between the low and high income groups. In this part could be concluded whether the determinants of expected retirement differ among the different income groups. The literature review showed for example that the difference in expected retirement age between low and middle income was bigger than the differences between middle and high income (Montalto, Yuh & Hanna, 2000).

5. Results

The first results follow from the univariate regression as described in the method section. In table E all the different univariate regressions are shown. The values of R-squared in all these univariate regressions are quite small, this means that the variance of the dependent variable, the expected retirement age, cannot accurately be explained by the explanatory variables. The R-squared for receiving a pension overview is 0.019, while the R-squared for the other variables are much smaller. There are 866 observations used for all different univariate regressions.

In the first regression expected retirement is regressed on the logarithm of income. Income has a small positive effect on the retirement age, which means if income increases the expected retirement age increases as well. However the univariate effect of income on the expected retirement age is not significant on a 5% level and hence the actual signal could be negative as well. The literature was also inconclusive whether there would be a significant effect of income on retirement. Some literature suggested that high income would make it easier to bridge the gap between the retirement age and the statutory retirement age. While on the other hand there are more low-income individuals that are not able to work to the statutory retirement age.

Next we look at the effect of the second pillar annuities on the expected retirement age. There is a small negative but insignificant effect. According to the literature the effect of literature would be negative but in contrast to this result the effect is significant. This could maybe be explained by the relatively big share of respondents that answered that they have 0 euros of second pillar annuities in retirement.

Third we look at the effect of the logarithm of saving on the actual retirement age. The literature suggests that there should be a negative effect of savings on retirement. The example of getting an inheritance, which is a shock in savings, shows there would be a significant negative effect of savings on the actual retirement age. However in this dataset the expected retirement age is regressed on the savings at one point in time and that results in an univariate regression with a positive but insignificant effect.

Next the effect of the chance to reach the age of 80 on the retirement age will be discussed. The effect of a higher life expectancy on retirement is positive, but according to this data

insignificant. The literature also shows a positive relationship between life expectancy and the retirement age, mainly because people with a lower life expectancy want to retire early due to a shorter time in retirement. However this relationship cannot be concluded on this data.

The next explanatory variable that could explain the expected retirement age is the self-estimated health condition. According to the DHS data the effect of health on the retirement age is negative but not significant on a 5%-level.

The sixth variable that could explain expected retirement age in the univariate regressions is housing. The insignificant effect that is found in the DHS data is that having a house leads to earlier retirement.

Next the effect of having grandchildren on the retirement age is determined. There is a 5% significant effect of having grandchildren on the retirement age. People who have grandchildren retire on average 4 months earlier than people that do not have grandchildren. This could be explained by the desire to retire early in order to spend more time with the grandchildren.

Then could be concluded that there is an insignificant univariate effect of relationships on expected retirement age. A negative effect would imply that being in a relationship leads to early retirement, however this effect is not significant on a 1% and 5% significance level.

Then the univariate regression of expected retirement on receiving a pension overview will be discussed. Receiving a pension overview will on average lead to an earlier retirement on a 1% significance level of almost 1 year and 3 months. This is in line with research where receiving a pension overview and being able to read it leads to better quality in retirement planning and saving (Mitchell, 2017).

At last we look to the univariate regression of expected retirement on respectively age, gender and education level. None of those variables has a significant effect on the expected retirement age on a 1 or 5% significance level.

Next the multivariate regression, in which all the different variables, will be used. In this regression that is shown in table E, the only explanatory variable that is significant on a 1% significance level is receiving a pension overview.

All the financial determinants of the expected retirement age are still not significant. The positive coefficients of the logarithm of income and savings are larger in this multivariate regression than in the univariate regression. The coefficient of the logarithm of savings is slightly higher than in the univariate regression.

Next the self-estimated health condition is not significant in this multivariate regression. So there cannot be determined whether the coefficient of the self-estimated health conditions deviates from 0 with a 1 of 5% significance level.

The multivariate regression for the different economic groups are also discussed in table E. A notable result from these regressions is that the effect of the logarithm of income on the expected retirement age is much higher for the lower income groups. However the result is still not significant on a 1% or 5% significance level. But it could be that for people in the low income group if income increases the expected retirement age increases as well. While in the middle- and high-income group there is no indication of such an effect of income on the expected retirement age.

One of the significant determinants of the expected retirement age is receiving a pension overview for the middle-income group. If someone in the middle-income group receives a pension overview this person is expected to retire 1 year and 11 months earlier. So receiving a pension overview has a negative significant effect on the expected retirement age on a 1% significance level.

The other significant effect in this multivariate regressions per income group is the self-indicated chance someone will become 80 years old for the low income group. There is a 5% significant effect, which implies that people in the low income group who indicate they will live longer will 3 months later on average.

Table E: *Univariate and multivariate regressions of explanatory variables to explain expected retirement age.*

Variables	Univariate	Overall	Low	Middle	High
Intercept		66.756** (2.315)	56.436** (5.704)	63.164** (11.156)	70.308** (7.662)
Log(Income)	-.037 (.198)	.120 (.220)	.923 (.566)	.613 (1.098)	-.119 (.679)
Log(second pillar annuity)	.069 (.078)	.085 (.080)	-.156 (.215)	.157 (.116)	.102 (.121)
Log(savings)	.009 (.029)	.018 (.030)	.093 (.066)	.008 (.046)	-.047 (.045)
Chance 80	.062 (.063)	.042 (.066)	.318* (.132)	-.050 (.107)	-.127 (.101)
Health	-.246 (.190)	-.190 (.203)	.185 (.417)	-.372 (.311)	-.136 (.345)
Housing	-.263 (.303)	.046 (.350)	.497 (.636)	-.298 (.565)	-.567 (.734)
Number of grandchildren	-.327* (.152)	-.172 (.176)	-.688 (.390)	-.137 (.265)	.291 (.287)
Relationship	-.388 (.285)	-.282 (.318)	-.833 (.390)	-.054 (.482)	-.250 (.591)
Pension overview	-1.225** (.301)	-1.167** (.314)	-.534 (.628)	-1.949** (.488)	-.157 (.547)
Age	-.016 (.009)	-.006 (.011)	.009 (.024)	-.014 (.016)	-.022 (.019)
Gender	.008 (.263)	.036 (.262)	-.204 (.569)	.421 (.403)	-.162 (.406)
Education	.058 (.094)	.040 (.096)	-.021 (.225)	.143 (.146)	.008 (.144)
R^2		.02727	.08041	.06523	.02605
Number of observations	866	866	236	389	241

Standard errors in parentheses
** = 1% significant, *=5% significant

6. Conclusion

In this paper the determinants for the expected retirement age are examined. In the univariate regression having grandchildren was significant on a 5% level. Receiving a pension overview is significant in the univariate regression on a 1% significance level. Both receiving a pension overview as having more grandchildren increases the chance of retiring earlier.

In the general multivariate regression only receiving a pension overview was significant on a 5% significance level. Where once again receiving a pension overview reduces the expected actual retirement age. In the separate multivariate regression for the different income groups could be concluded that for the low income group the expected retirement age the chance someone will become 80 years old, which is an indicator of life expectancy. In the separate multivariate regression for the middle group receiving a pension overview is causing earlier retirement on average.

There are however some recommendations for future research on this topic. First of all it would be better if the dataset would be bigger. Then it would be easier to determine which variables are significant. Hence more data makes the predictions more accurate and this would lead to better regressions.

Next the research could be improved by looking to certain households over time. Then shocks in the variable and the change in retirement planning could be evaluated. In this paper the effect of receiving an inheritance is discussed as a difference in savings. This would result in a difference in expected retirement age for a certain household with specific preferences. Then the change in expected retirement age really equals the effect of the particular variable on the expected retirement age.

7. References

Barban, N., De Luna, X., Lundholm, E., Svensson, I., & Billari, F. C. (2020). Causal effects of the timing of life-course events: Age at retirement and subsequent health. Sociological Methods & Research, 49(1), 216-249.

Bonenkamp, J. (2009). Measuring lifetime redistribution in Dutch occupational pensions. De Economist, 157(1), 49-77.

Bovenberg, L. (2014). Pensioeninnovatie in Nederland en de wereld: Nederland kampioen in pensioen. TPE-Digitaal, 8(4), 163-185.

Braveman, P. A., Cubbin, C., Egerter, S., Williams, D. R., & Pamuk, E. (2010). Socioeconomic disparities in health in the United States: what the patterns tell us. American journal of public health, 100(S1), S186-S196.

Brown, J. R., Coile, C. C., & Weisbenner, S. J. (2010). The effect of inheritance receipt on retirement. The Review of Economics and Statistics, 92(2), 425-434.

de Bruijne, M. & Streefkerk, M. (2018). Data management and preservation policy of the DNB Household Survey (DHS). CentERdata.

CBS (2020). Parade van Pen: de vermogensverdeling in 2018

CBS Statline (2019a). Levensverwachting; geslacht, leeftijd (per jaar en periode van vijf jaren). 10-05-2020:
https://opendata.cbs.nl/statline/#/CBS/nl/dataset/37360ned/table?ts=1589127454113

CBS Statline (2019b). Bevolking; geslacht, leeftijd en burgerlijke staat, 1 januari. 10-05-2020:
https://opendata.cbs.nl/statline/#/CBS/nl/dataset/7461bev/table?ts=1589127388769

CBS Statline (2019c). Gezonde levensverwachting; inkomensklasse. 10-05-2020: https://opendata.cbs.nl/statline/#/CBS/nl/dataset/80298ned/table?ts=1589126965807

Davies, E. M., Van der Heijden, B. I., & Flynn, M. (2017). Job satisfaction, retirement attitude and intended retirement age: a conditional process analysis across workers' level of household income. Frontiers in psychology, 8, 891.

Disney, R., Emmerson, C., & Wakefield, M. (2006). Ill health and retirement in Britain: A panel data-based analysis. Journal of health economics, 25(4), 621-649.

Eurostat (2020). Since 2007 rents up by 20.3%, house prices by 18.7%

Gommans, F. (2017). De rol van gezondheid bij langer doorwerken. CBS

Goudswaard, K. P. (2013). Blijft het Nederlandse pensioenstelsel bijzonder?. in: Jaarboek 2014, Koninklijke Vereniging voor de Staathuishoudkunde, Den Haag, pp. 19-25

Griffin, B., Hesketh, B., & Loh, V. (2012). The influence of subjective life expectancy on retirement transition and planning: a longitudinal study. *Journal of Vocational Behavior*, *81*(2), 129-137.

Henkens, K., van Solinge, H., & van Dalen, H. (2009). Beslissingen rond langer werken: de onzichtbare drempels voor een later pensioen. *Tijdschrift voor HRM*, *3*, 64-79.

Jijiie, A. S., Alonso-García, J., & Arnold, S. (2019). Mortality by Socio-Economic Class and Its Impact on the Retirement Schemes: How to Render the Systems Fairer. *Sydney: ARC Centre of Excellence in Population Ageing Research (CEPAR).*

van Kippersluis, H., van Doorslaer, E., & van Ourti, T. (2009). Inkomen alleen maakt niet gezond. Economisch-Statistische Berichten, 94(4551), 20-23.

Van der Klaauw, W., & Wolpin, K. I. (2008). Social security and the retirement and savings behavior of low-income households. Journal of econometrics, 145(1-2), 21-42.

Kok, L., Kroon, L., Lammers, M., Van Soest, A. & Ter Weel, B. (2017) Gevolgen flexibele AOW-leeftijd-Rapport-Kennisplatform Werk en Inkomen. SEO Economisch Onderzoek (on behalf of the Ministry of Social Affairs and employment).

McGarry, K. (2004). Health and retirement do changes in health affect retirement expectations? Journal of Human Resources, 39(3), 624-648.

van Meijl, H., Jansson, T., Banse, M., & Woltjer, G. (2009). The impact of modulation; modeling first and second pillar CAP policies.

Mitchell, O. S. (2017). Financial knowledge and key retirement outcomes: an overview of the issue. Journal of Pension Economics & Finance, 16(3), 273-276.

Montalto, C. P., Yuh, Y., & Hanna, S. (2000). Determinants of planned retirement age. Financial Services Review, 9(1), 1-15.

Nelissen, J. H. (1999). Mortality differences related to socioeconomic status and the progressivity of old-age pensions and health insurance: The Netherlands. European Journal of Population/Revue européenne de Démographie, 15(1), 77-97.

Smulders, P., Houtman, I., & van Den, E. S. (2009). Beleid Zwaar werk en vervroegd pensioen.

Van Solinge, H., & Henkens, K. (2010). Living longer, working longer? The impact of subjective life expectancy on retirement intentions and behaviour. European journal of public health, 20(1), 47-51.

Van de Werfhorst, H., & Van Hest, E. (Eds.). (2019). Gelijke kansen in de stad. Amsterdam University Press.

Woestenburg, D. (2020). Pensioenaansprakenstatistiek 2017, Verantwoording en beschrijving resultaten. CBS.

Van Zon, D. S., Bultmann, U., & Reijneveld, M. (2018). Met een flexibele AOW-leeftijd kunnen mensen waardiger met pensioen. Sociale Vraagstukken.

Zulkarnain, A., Ter Rele, H. & Zwaneveld, P. (2020). Kansrijk arbeidsmarktbeleid – Update uittreedleeftijd en AOW. Centraal Planbureau.