The effect of Financial Literacy on Health Insurance Choice within the Netherlands

Steffie Witbreuk

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Steffie Witbreuk[1]

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Supervisor: Dr. V. Angelini

Abstract:

The Netherlands has a healthcare system of managed competition in which each individual is obliged to purchase health insurance at the private market. Liberty is an important value of this Bismarckian model where consumers are free to make fundamental economic decisions with respect to their health insurance. This paper will analyse three of these choices, (1) switch of health insurance provider, (2) uptake of a voluntary deductible, and (3) uptake of complementary insurance, and their relation to financial literacy. The effect of financial literacy on the health insurance decisions has been modelled by a Probit regression. The data has been obtained from the Longitudinal Internet Studies of Social sciences (LISS) panel. Evidence is provided that financial literacy has a positive effect on switching behaviour and the uptake of complementary insurance. A negative relation is found between the uptake of a voluntary deductible and financial literacy.

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[1] Student number: S2361183 | E-mail: s.witbreuk@student.rug.nl

1. Introduction

On January 1, 2006, the Dutch government enacted the Health Insurance Act (HIA). This included a system of managed competition and the new regulations mandate each Dutch citizen to purchase a basic insurance package at the private market. The coverage of this package is determined by the government. The new health insurance system is based on Enthoven's managed competition model (Enthoven, 1993), which is described in more detail in section 3. The most important value of this Bismarckian model is probably liberty: individuals are free to make fundamental economic choices with respect to their health insurance. These health insurance choices are the centre of this paper. In particular the three main choices individuals are ought to make will be analysed: (1) health insurance provider, (2) uptake of a voluntary deductible, and (3) the uptake of complementary insurance.

These three choices individuals make have a direct relationship with the overall healthcare expenditures (HCE) of the Netherlands. The HCE continue to increase substantially and are becoming a growing concern for both the government and residents. In the Netherlands, the GDP share of healthcare expenses increased from 7.1 to 10.5 percent between 2000 and 2016.[2] Many researchers devote the increasing HCE to the ageing population, which most Western countries experience (Carey, 2002; Jacobzone, 2003; de Meijer, Koopmanschap, Bago d'Uva, & van Doorslaer, 2011). The ageing of the Dutch population stems mainly from decreasing fertility rates, the post-World War II baby boom generation, and increasing life expectancy in general. Another determinant for the increasing healthcare costs are the rapid introduction and utilization of new medical technologies (de Meijer, O'Donnell, Koopmanschap, & van Doorslaer, 2013). As a third determinant, the existence of large-scale health insurance schemes is mentioned by Chiappori, Durand and Geoffard (1998). They explain that these large-scale schemes result in a divorce between the amount consumed by each agent and the cost she actually bears. Agents are often not responsible for the payment of healthcare, and therefore do not know the costs involved. They may act if healthcare is a free product, which results in moral hazard. If the growth of HCE continues as such, expectations are that one third of the Dutch GDP will be dedicated towards healthcare in 2050 (Jacobs, 2009). The increasing growth of HCE have profound implications on both health and economic policy. The first cause, ageing, is beyond the control of the government. The increasing medical technologies could be tackled, however, this stands in contrast with the common agreement

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that technological developments must be enforced. Therefore the last argument provides the best openings to counter the effect of increasing HCE. Chiappori et al. (1998) call this the 'moral hazard' explanation, which is best countered with the introduction of deductibles and co-payments. In addition, making the health insurance market more efficient will reduce HCE as well. In the Dutch market, agents can attribute to this by being active and critical consumers, examining market changes carefully, and act on it by switching health insurer if that will increase their welfare.

The consumer is able to switch his or her health insurance plan at the end of each calendar year. This creates competition into the health insurance market, and force insurers to strive for good prices and to provide good quality of care. Moreover, it is intended to make the health insurance market more efficient, thereby decreasing the overall HCE. When the insurance company is chosen, consumers can decide to voluntarily increase their deductible. The deductible are the out-of-pocket expenses an individual must make before insurance takes over. In return for this increased financial risk individuals receive a premium rebate. The voluntary deductible is also an instrument used by policymakers to reduce HCE. Because the financial burden is partly shifted from the insurers to the insured, individuals have less incentives to utilize (unneeded) healthcare. Next to the basic health insurance, individuals can purchase complementary insurance at a private market as well. Complementary insurance is bought to cover for example, among others, eye care, dental care, and physiotherapy. This market is not regulated by the government, and insurers are free to set their own coverages and premiums.

Van Ophem and Berkhout (2009) find that the Dutch insured do not make a choice based on the arguments as intended by the policy makers, i.e. making people more aware of the healthcare costs and reducing overall HCE. This paper investigates the determinants in making above described health insurance choices in the Dutch situation. By finding the determining factors of making health insurance choices, policy makers might be able to steward individuals to make the choices as they have intended. A lot of studies have focussed on the determinants in making health insurance choices, of which most were found in behavioural explanations or related to socio-demographic factors (Mosca & Schut-Welkzijn, 2008; Victoor, Delnoij, Friele, & Rademakers, 2012; van Winssen, van Kleef, & van de Ven, 2016; van Winssen, 2016). Only little research relate consumer knowledge to the issue. This paper contributes in that direction by examining the effect of financial literacy on making health insurance choices. Financial

literacy has proven to play a substantial role in making economic choices in other markets as well, like the stock market and for retirement planning (van Rooij, Lusardi, & Alessie 2011a; Lusardi and Mitchell, 2009). This study will contribute to the existent literature by investigating whether financial literacy is also a prominent factor in the Dutch health insurance market. In order to answer this question I will use data from the Longitudinal Internet Studies of Social sciences (LISS) panel. The main explanatory variable is financial literacy which is subtracted from a study in 2011. The health insurance choices are detracted from a year later (2012) because the insured make their choices at the end of the previous year. The relation between financial literacy and health insurance choice is studied with the help of three hypotheses:

     (1) Financial literates have a higher tendency to switch health insurers

     (2) Financial literates have a higher tendency to opt for a voluntary deductible

     (3) Financial literates have a higher tendency to take out complementary insurance

Hence, I assume a positive relationship between financial literacy and each of health insurance choices. The results validate two out of the three hypotheses. Basic financial literacy is associated with a higher probability to take out complementary insurance, and advanced financial literates are more prone to switch health insurer. Interestingly, both basic and advanced financial literacy depicts a significant negative relationship with deductible choice. This can be explained by the risk preferences of individuals or other unobserved heterogeneity.

     This paper is organised as follows. Section 2 gives a brief overview of the Dutch health insurance system. Section 3 provides some background information on the three health insurance choices and their relation to financial literacy. With this information the three hypotheses are formed. Section 4 describes the methodology together with the econometric approach. Section 5 describes the data. Section 6 reports the empirical evidence and section 7 discusses and concludes.

2. The Dutch Health Insurance Market

2.1. The old system

Prior to the 2006 reform the Netherlands had a complex, mixed public and private health insurance system. Individuals earning less than a legally specified income level, were compulsory insured under the Sickness Fund Act (ZFW). The Sickness Fund Act covered about 65 percent of the population and was mainly financed via general taxation and employer contributions. Premiums for this insurance were relatively low and community rated and the

coverages were standardized with kind benefits. The rest of the population could voluntarily buy health insurance from the private market. In the private market, the premium directly paid to the insurer had to fully cover the costs, and insurers bore all the risk. Therefore the market was characterized by risk-rating (e.g. on health and age) and high premiums, depending on the degree of coverage. In total approximately 2 percent of the population was uninsured (Bolhaar, Lindeboom, & van der Klaauw, 2015).

2.2.   The new system

On January 1, 2006, the Dutch government enacted the Health Insurance Act (HIA). This included a system of managed competition where each individual is obliged to buy health insurance from the private market.[3] Children under 18 are freely co-insured with one of their parents. With the new system, the distinction between the Sickness Fund insurance and private insurance disappeared. Insurance companies have to offer the same basic health insurance package to everyone and the coverage is determined by the government. They are free to set their own price for the basic insurance package, and that way they can compete with each other. The private insurance market follow a managed competition model described by Enthoven (1993), including four key features:

(1) *Minimum standards*: every insurance contracts is required to meet a minimal standard of care. In the Netherlands this is the basic health insurance package, determined by the Dutch Government.

(2) *Open enrolment*: Insurers are obliged to accept any individual who wish to purchase health insurance (for the basic health insurance)

(3) *Community rating*: insurers cannot charge different premiums based on an individual's risk profile. Hence, risk-rating is not allowed for the basic health insurance package.

(4) *Compulsory participation*: each legally living or working individual of the Netherlands is obliged to purchase basic health insurance.

An important value of this Bismarckian model is solidarity: the healthier people in the population with low medical expenses subsidize the care for the sick.[4] The coverage of the

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[3] Some groups are excluded, like persons serving in the military, detainees, and objectors on religious grounds
[4] The Bismarck model is named after Otto von Bismarck, a Prussian politician and statesman. The Bismarck model share a few key traits: universal insurance, community rating, and regulated private health care provision. See Hassenteufel & Palier (2007) for an extensive overview.

health insurance is financed through income taxes and individual premiums, both having almost an equal share in the insurers' revenues. Since insurers are obliged to accept everyone and price discrimination is prohibited, they have a financial incentive to select on risk. Even though risk selection is officially not allowed, insurance companies do try to attract low-risk individuals. Examples of tactics to attract the low risk are: advertising specifically to certain low-risk groups, closing offices in high-cost regions, and selectively reminding high-cost customers that they are allowed to switch health insurers (van de Ven et al., 2003).[5] Consequently, other insurers might end up with only high-risk individuals. To prevent market failure as a result of this, the Risk Equalization Fund has been set up. The Risk Equalization Fund manages the income-related premiums and distribute them to the health insurers based on the risk profiles of their portfolios. The Dutch health insurance system includes risk equalization with both ex-ante and ex-post compensation. A calculation is made upon the expected costs of an insurer's portfolio and funds are distributed accordingly. Ex-post compensation further reduces inequalities if the ex-ante calculation proved not to be perfect. A health insurance company with more high-risk individuals in their portfolio will therefore receive more funds than another insurer with mainly low-risk individuals. The objective is to make consumers equally attractive for health insurers and to eliminate the financial incentives of risk selection.

In addition to the mandatory basic health insurance, individuals can also buy complementary insurance at the private market. Via the complementary insurance, individuals can insure themselves for healthcare not covered by the basic package. These healthcare services include, among others, alternative medicines, pharmaceuticals, physiotherapy, dental care, and eye care. The health insurers are entirely free to determine the composition of these plans meaning that the government has zero involvement in the complementary insurance market. The uptake of complementary insurance is purely voluntarily, and risk-rating is allowed by insurers. They are allowed to deny certain consumers based on their risk-profile, or to charge higher premiums. For the insured it is allowed to take out complementary insurance with a health insurer other than that of their basic insurance.

Customers are also able to collectively insure themselves instead of individually. A collective health insurance is an insurance taken out by a large group of people, for instance an

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[5] This is for example done by health insurer "Promovendum" in the Netherlands, they advertise themselves with: "The health insurer for higher educated people". Van Kleef et al. (2012) find that highly educated individuals have, on average, €400 lower healthcare costs per year.

insurance especially for employees of a certain company or members of a sports club. Since the collective insurance is offered to a large group of people, the insurer can offer a premium rebate, the so-called collective discount. This creates an incentive for many people to collectively insure themselves. Note that employees are not obliged to take the collective insurance if its employer has a collective agreement with a health insurer, they are always free to choose any health insurer. The Dutch insured are free to change their insurance contract or to switch from insurer at the end of each calendar year. If no action is taken, their current contract is automatically extended for another year.

In 2008, the compulsory deductible was introduced in the healthcare system to reduce moral hazard – the change in health behaviour and health consumption resulting from the fact that the insurer reimburses (part of) the costs. From 2006 to 2008 the system had a no-claim policy, where individuals retrieved a maximum of €255 if little or no healthcare services were utilized. The deductible are the out-of-pocket expenses an individual must make before insurance takes over. It is an instrument used by policymakers to reduce overall healthcare expenditures, the financial burden is partly shifted from the insurer to the insured. Consumers have a financial incentive to only use healthcare if it is strictly needed, and unneeded overuse is restricted. Besides the compulsory deductible, individuals can also opt for a voluntary deductible in return for a premium rebate. This voluntary deductible ranges from €100 to €500 per year.

Summarizing, the Dutch insured have a lot of freedom with regards to their health insurance. First they can choose at which health insurance company they want to insure themselves. Second, if they are not satisfied with the quality or want a lower premium, they can switch between health insurers at the end of each year. In addition to the compulsory basic insurance, they can also take out complementary insurance of which the choice is almost unlimited. More than 1300 different policies existed in 2012 (NZa, 2012). Moreover, they can also voluntarily adjust their own financial risk in exchange for a lower premium by opting for a voluntary deductible. Probably the most important value of this Bismarckian model is liberty: customers are free to make fundamental economic choices, like which hospital to visit or which insurance contract to take.

2.3. Health insurance market 2012

The basic health insurance package includes almost all curative care like GP visits, hospital stay, maternity care, and specialist care.[6] The average premium for the basic health insurance in 2012 was €1,226. This includes the possible discounts provided by collective insurances. In addition to this premium, the insured also pay an income-related premium. The so-called Healthcare Insurance Act contribution (Zvw contribution). This is usually withheld from one's income strip by the employer or social security institution. Depending on someone's position, this contribution amounts to 5% or 7.1% of someone's income in 2012, with a cap of € 50,065. The Zvw contribution is collected by the Risk Equalization Fund, and redistributed to the health insurers. In 2012, the market consisted of 26 different health insurers managed by 9 larger concerns (NZa, 2012).[7] Four of these concerns form an oligopoly of the Dutch health insurance market: Achmea, CZ, VGZ, and Menzis, with a combined market share of almost 90% in 2012. The compulsory deductible was set at €220, health care expenditures are paid out-of-pocket until the threshold of €220 is reached. As explained above, the insured can voluntarily increase their deductible, making the maximum possible deductible equal to €720. In return for accepting a higher deductible individuals receive a premium rebate. The average premium rebate in 2012 is €229 for the maximum voluntary deductible of €500. Hence, the actual deductible, or out-of-pocket expenses, equals €491 per calendar year, instead of €720.[8] In the Netherlands, individuals are also able to collectively insure themselves instead of individually. In 2012, more than 67% was collectively insured of which sixty percent through an employer's collective (NZa, 2012).

3. Literature review

Financial literacy has proven to play an important role in making various economic decisions. Van Rooij et al. (2011a) showed that financial literacy is an important determinant for stock market participation. Furthermore, Lusardi and Mitchell (2011) showed that financial literacy play an important role in retirement planning. In this paper I want to relate financial literacy to health insurance choices people make within the Netherlands. Hoerl et al. (2017) investigate the predictive power of knowledge in making health insurance choices in the United States.

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[6] For an extensive overview of the basic health insurance package (2018), please consult:
https://www.zorginstituutnederland.nl/Verzekerde+zorg/b/basispakket-zorgverzekeringswet-zvw
[7] Please consult Appendix A for an overview of the concerns and health insurers of 2012.
[8] The deductible with the maximum voluntary deductible of €500, equals €720, for which the insured receive a premium rebate of €229 on average. Therefore, the actual out-of-pocket expenses are equal to €720 - €229 = €491.

They used financial literacy and health literacy as determinants for being uninsured under the Affordable Care Act. They found that higher financial literacy and health insurance literacy were associated with a greater probability of being insured. Moreover, a lack of understanding predict who remains uninsured. This was also found by Gousia (2014) for the private long-term care insurance market for several European countries. These researches indicate that financial literacy has an influence when it comes down to health insurance choices. In the Dutch market, having health insurance is mandated, and thus financial literacy cannot be used to predict who remains uninsured. However, we can investigate whether this predictive power of financial literacy holds true for the choices the Dutch insured make. When making complex choices of health insurance it is important to understand the financial consequences of these choices. Financial literates are expected to better understand these consequences, and consequently, are more proficient in evaluating the trade-offs concerned. To the best of my knowledge no previous research exists on the role of financial literacy in the Dutch health insurance market. In the following sections I will use existing literature to relate financial literacy to the health insurance choices the Dutch make, and form my hypothesis accordingly. First, the switching of health insurer will be discussed. Second, the relation between financial literacy and the voluntary deductible uptake is debated. Lastly, the uptake of complementary insurance and its relation to financial literacy is discussed.

3.1.   Switching of health insurer & financial literacy

The Dutch insured are free to change their insurer and insurance plan every calendar year. The idea is that the insured switch of health insurer anytime they are not satisfied with their health insurance plan or the amount of premium they have to pay. This creates competition into the health insurance market, and force insurers to strive for good prices, to enhance efficiency, and to provide good quality of care. In practice, most Dutch consumers avoid to take on this active role of critical consumer, which might result in a less efficient health insurance market (Lako, Rosenau & Daw, 2011). Individuals are expected to optimally exploit their freedom of choice, yet this freedom of choice also has its disadvantages: the large amount of choice can overwhelm the consumer and ultimately have the opposite effect and leave people indecisive (Schwartz, 2004). As choice increases, also the cognitive burden increases making it more difficult to make a rational decision (Peters, Dieckmann, Nixon, Hibbard, & Mertz, 2007). The Dutch health insurance market is a complex and extensive system. With 26 different health insurers, and

more than 1300 different insurances, the choice and information is almost unlimited (NZa, 2012). Agnew and Szykman (2005) report that people with less financial knowledge report greater levels of information overload when making investment decisions. People who experience higher levels of information overload are less confident in their choice and tend more often to the status quo (Mitchell and Lusardi, 2011). In this case the status quo is remaining insured at a person's current health insurer. Thus, the large amount of health insurance plans available might result in information overload in the Dutch health insurance market. This great amount of choice can overwhelm consumers and leave them indecisive. However, financial literates are found to better cope with information overload, and are still able to make informed decisions. Combining these findings leads to the assumption that financial literacy has a positive effect on switching behaviour. Besides the scale of choice consumers face difficulties with, many of them also simply lack the knowledge about the health insurance system to make informed health care decisions (Lubalin & Harris-Kojetin, 1999).

Moreover, Lako et al. (2011) investigated the determinants of switching behaviour in the Netherlands. They found that financial incentives like reduced transaction costs, lower prices, but also the hope for better quality care, have motivated most individuals to switch health insurers or plans. Policymakers implemented the managed competition system in the Dutch health insurance market to control the prices. Insurers compete on prices of the basic health insurance set by the government and consumers are expected to act as critical purchasers, carefully comparing the products in the market and making informed decisions. In practice, consumers often fail to take on this critical role and fail to switch plans on the basis of critical assessment of information about the price, quality, and patient satisfaction (Lako et al., 2011). Van Rooij et al. (2011a) indicate that financial literacy is related to which type of consumer one is. For instance, they show that financial literates more often refer to other sources than their relatives for making important financial decisions. In addition, they consult the internet to search for better prices or consult professional financial advisers. This indicates that higher financial literacy is related with a better critical reflection of the implications of making a financial decision. Relating these findings to the decision of switching health insurers, financial literates are expected to make better informed decisions. Moreover, I believe that financial literates are more interested in making financial decisions and act more actively to price changes in the market.

Concluding that higher financial literacy is associated with making more informed decisions, being more interested in making financial decisions and search more actively for financial benefits, and that financial literates feel less overwhelmed by the information available, I form my first hypothesis:

H₁: Financial literates have a higher tendency to switch between health insurers

3.2. The voluntary deductible & financial literacy

Health insurance plans in the Netherlands are featured with a compulsory deductible to reduce moral hazard – the change in health behaviour and health consumption resulting from the fact the insurer reimburses (part of) the costs. In 2012 this compulsory deductible was set at €220 per calendar year, meaning that health care expenditures are paid out-of-pocket until the threshold of €220 is reached. Besides the compulsory deductible, individuals can also opt for a voluntary deductible in return for a premium rebate. This voluntary deductible ranges from €100 to €500 per year. Voluntary deductibles are introduced to further reduce moral hazard. Excluded from the deductible are expenses for the GP, maternity care, and healthcare for children, these expenses are fully covered. In 2012, only 6 per cent of the Dutch insured opted for a voluntary deductible (NZa, 2012). Comparing this to Switzerland, which has a similar health insurance system also featuring deductibles, this is relatively low as 56 per cent of Swiss insured opted for a voluntary deductible in 2014 (van Winssen, 2016). This low percentage raises the question what might explain the (low) voluntary deductible uptake within the Netherlands. Economic theory assumes that consumers are rational, and only opt for a voluntary deductible if their expected costs (higher potential out-of-pocket expenses) are lower than their expected benefits (the premium rebate). This is solely the case for the low-risk individual with little healthcare costs, and they are expected to self-select a voluntary deductible. This phenomena is also called adverse selection (Akerlof, 1970). However, previous research suggest that even the low-risk individuals are reluctant to choose a voluntary deductible (van Ophem and Berkhout, 2010; van Winssen, van Kleef, & van de Ven, 2015).

An insured's decision to opt for a voluntary deductible can be affected by several determinants, like personal characteristics (age, gender, income etc.), risk aversion, limited knowledge regarding health insurance plans, and the financial profitability of the voluntary deductible. Van Winssen et al. (2015), analysed the financial profitability of opting for a

voluntary deductible which depends on the (higher) out-of-pocket expenses and on the premium rebate received. The voluntary deductible is financially profitable if the out-of-pocket expenses, after the compulsory deductible has been "consumed", do not exceed the premium rebate. The authors provide evidence that for 48 per cent of the Dutch insured it would have been financially beneficial to have the maximum voluntary deductible of €500 in their health insurance plans of 2014, where only 11 per cent of the insured actually chose a voluntary deductible. An important factor for this result could be risk- or loss aversion, since uncertainty exists about future healthcare expenditures. Gorter and Schilp (2012) provide evidence that more risk tolerant individuals are significantly more likely to opt for a positive voluntary deductible. This is in contradiction with standard expected utility theory, which assumes that people are approximately risk neutral over small stakes.

Another explanation for the limited uptake of the voluntary deductible is limited knowledge of the insured regarding deductibles in health insurance plans (Reed et al., 2009). This paper will extend this last determinant by not taking individuals' "health insurance literacy" into account, but rather focus on individuals' financial literacy. In case of the voluntary deductible, consumers gain the direct benefit of lower premiums but bear the risk of higher out-of-pocket expenses. Financial illiterates might not be able to discriminate among these different plans and face difficulties with making these trade-offs. Additionally, the "no voluntary deductible" is the default option, and I expect that these consumers tend to this status quo because of their lack of financial knowledge. Van Winssen et al. (2015) provided evidence that most individuals do not opt for a voluntary deductible in their insurance plans, even when it is financially beneficial to them. Also this leads to the assumption that not all individuals are able to evaluate the financial consequences of opting for a voluntary deductible. Though, financial literates are expected to identify these financial gains and therefore be more likely to be in the group with a voluntary deductible. According to these theories I formed my second hypothesis:

H_2: *Financial literates have a higher tendency to opt for a voluntary deductible*

3.3. The complementary insurance & financial literacy

Another health insurance choice individuals are ought to make, is the uptake of a complementary insurance. Where the basic health insurance is mandatory and community

rated, the complementary insurance is a voluntarily choice and insurers are allowed to risk-rate the premiums. Adding complementary insurance to one's health insurance plan will increase the coverage and further protect individuals against unpredictable financial risks. Healthcare services covered by the complementary insurance include, among others, alternative medicines, pharmaceuticals, physiotherapy, dental care, and eye care. The Dutch complementary insurance market is rather peculiar in terms of economic theory. Optimal designs of health insurance a) protect individuals against unpredictable high financial risks and otherwise unaffordable healthcare services, b) include first-dollar cost sharing, and c) providing a cap on out-of-pocket expenses (van Winssen, van Kleef, & van de Ven, 2016). The Dutch complementary health insurance deviates strongly from this optimal design, but nevertheless almost 90 per cent of the insured took out complementary insurance in 2012 (NZa, 2012). It is therefore interesting to examine the potential explanations for the high uptake of the complementary insurance. One could argue that financial literates might be able to identify these market imperfections, and therefore be less inclined to take out complementary insurance. However, since there is such a large uptake, one might also argue that differences in financial literacy does not explain this large uptake. Individuals may just exert herd behaviour: taking out complementary insurance because their friends and family do so.

Though, the uptake of complementary insurance has been decreasing in recent years. De Nederlandsche Bank (DNB) made the following statement in 2017: "Complementary voluntary health insurance is threatening to operate at a loss and to lose its added-value as a result of changes in consumer behaviour. Policyholders only buy complementary insurance when they expect to use the specific type of health care covered by that insurance, which leads to the risk that in the long run such care becomes uninsurable for a reasonable fee" (DNB, 2017, p. 4-5). This would suggest that the Dutch complementary insurance market is characterized with adverse selection and moral hazard. For example, if an individual knows that it needs to see a physiotherapist for nine times next year, it is cheaper to buy complementary insurance than paying those councils separately. Financial literates are expected to be more aware of this profitability, or at least be more interested in finding out whether this profitability exists. With this in mind, they might be more tending to take out complementary insurance.[9] Gousia (2014) studied the effect of financial literacy on the probability of holding a private insurance contract.

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[9] To really investigate the effect of financial literacy on this adverse selection theory, analysis on panel data would be more suitable.

Using data from the European survey SHARE, she found evidence that financial literacy has a strong relationship with demand for private long-term care insurance for several European countries.[10] Moreover, low levels of financial literacy among the elderly is associated with lower coverage rates. Though this effect was only estimated among the older population, it is likely that financial literacy also positively affect insurance demand among other age groups. Financial literates better understand the value of insurance and will therefore demand higher coverage. This was also found by Dalkilic and Krikbesoglu (2015) who related financial literacy to insurance awareness. They conducted a research on perceptions of insurance in general amongst Turkish university students. They showed that individuals with higher financial literacy find insurance more useful, more necessary, and a less waste of money.

According to this theory and to the adverse selection problem stated by the DNB, I formed my third hypothesis:

H_3: *Financial literates have a higher tendency to take out complementary insurance*

Hence, I assume a positive relationship between financial literacy and all the three health insurance choices.

4. Methodology

This section describes the methodology used to estimate the three healthcare choices. In case of the voluntary deductible, only the choice of a voluntary deductible will be considered. Hence, the size of the deductible will be ignored[11]. Therefore, each health insurance choice is a variable with a binary outcome: the answer is either "yes" or "no". To study the effect of financial literacy on the decision regarding these health insurance choices, I make use of a probit model. Probit models are binary response models and estimate the response probability:

$$P(y_i = 1|X_i) = P(x_i'\beta + \varepsilon_i > 0|X_i) = \Phi(x_i'\beta) \qquad (1)$$

Where y_i is a binary dependent variable equal to 1 for a positive outcome, and equal to 0 otherwise. Φ is the cumulative standard normal distribution function. The conditional expected value of y_i, $E(y_i|X_i) = \Phi(x_i'\beta)$, always falls within the [0,1] interval and may be interpreted as

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[10] The countries Gousia (2016) studied are: Austria, Czech Republic, Denmark, France, Israel, and Italy

[11] Please consults section 4.2. for the rationale behind this decision.

the probability that the individual, given the values of the explanatory variables, tends to the positive outcome. The probit model can be derived from an underlying latent variable model, where y_i^* is an unobserved (latent) variable (Verbeek, 2012):

$$y_i^* = x_i'\beta + \varepsilon_i, \quad \varepsilon_i \sim NID(0,1) \qquad (2)$$

The latent variable y_i^* and the observed variable y_i are related in the following way:

$$y_i = \begin{cases} 1 \; if \; y_i^* > 0 \\ 0 \; if \; y_i^* \leq 0 \end{cases} \qquad (3)$$

When $y_i^* > 0$, the model predicts that the subject has a positive outcome ($y_i = 1$) and when $y_i^* \leq 0$ the model predicts that the subject has a negative outcome ($y_i = 0$).

4.1. Switching of health insurer

The choice of switching health insurer will be estimated with the following equation:

$$\Pr(S_i = 1) = F(FinLit_i, Health_i, Risk\_av_i, X_i) \qquad (4)$$

Where the dependent variable S_i is a binary variable of respondent i's switching choice for the year 2012. S_i is assumed to be a function F(·) of the variables in vectors $FinLit_i$, $Health_i$, $Risk\_av_i$ and X_i. The functional specification of F in equation (4) will be modelled by means of above described probit model, where y_i is equal to 1 if the subject has switched health insurer in 2012, and equal to 0 otherwise. As explained earlier, everyone that switched to another health insurer, including labels within the same concern, are considered switchers. I will now describe the explanatory variables in equation (4). The dependent variable "Switch" is equal to 1 if the insured switched health insurer between 2011 and 2012, and zero otherwise. The explanatory variables are all observed in 2011 because health insurance decisions are made ex-ante. An exception is the risk aversion variable, because the data is subtracted from a one-time project of the LISS Panel in 2009. Hence, I make the assumption that risk-aversion remained constant over the two year time-period. $FinLit_i$ is a vector of two financial literacy indices: basic financial literacy and advanced financial literacy. The creation of these indices is explained in section 5.

The vector $Health_i$ includes three variables regarding an individual's health or healthcare demand. Self-assessed health is used as the individual's health measure. Because it is a subjective measure, self-assessed health has the advantage of reflecting information only known to the consumer. Consequently, private information on which insurance choices are likely made are incorporated into the model. To measure self-assessed health the following question was proposed to the subjects: "How would you describe your health in general?", with five response categories ranging from poor to excellent. Individuals that report bad to moderate health are less inclined to switch health insurer (Hendriks, de Jong, den Brink-Muinen, & Groenewegen, 2009). Moreover, a dummy variable for being chronically ill is included to control for an individual's health status. Additionally, a dummy variable for being collectively insured is included as individuals with a collective insurance are less inclined to switch health insurer, because the received premium rebate will be forgone. Lako et al. (2011) explain that most individuals decide to switch health insurer based on financial incentives. Therefore it seems logical to include the premium individuals paid in 2011 as a control variable. A high premium in 2011 is likely to positively affect the switch ratio. However, over a quarter of my sample has missing information with regards to the premium paid. In order to retain as much information as possible, I decided not to include the premium as a control variable. The variable of interest is financial literacy, and it is unlikely that financial literacy is affected by the premium that individuals pay. Furthermore, the health insurance concerns will be included as a control variable for unobserved heterogeneity between the different insurance companies, which might have an effect on switching behaviour.

The second vector of explanatory variables in Equation (5), $Risk\_av_i$, includes the variable of risk aversion plus a dummy variable in case a subject denotes inconsistent risk preferences. These inconsistent risk preferences are described in section 5. Risk aversion is an important factor when it comes down to insurance choices. Gorter and Schilp (2012) even provide evidence that for a small-scale risk as the deductible choice, risk aversion plays a significant role. Expected utility theory predicts that for small stakes, such as described health insurance choices, risk preferences do not play a role. Gorter and Schilp (2012) proved the opposite. The final vector of explanatory variables in Equation (4) is X_i, which controls for personal characteristics like age, education, gender, and income. Hendriks et al. (2009) compare switching behaviour between different groups. They found that women, older people, people

with a lower education, and people who reported a bad or moderate health are less inclined to switch their health insurer.

Table B1 in the appendix present the descriptive statistics of all variables in equation (4).

4.2. Voluntary deductible

I decided to only consider the choice for a voluntary deductible or not and the size of the voluntary deductible will be ignored. In total only 382 of the subjects opted for a positive voluntary deductible, and the smallest group is the voluntary deductible of €400, with only 14 observations. To make reliable estimations on such a small sample is very unlikely. Therefore, I decided to create two groups only: having a positive voluntary deductible and not having a voluntary deductible. This way I can extract more information of all subjects. To investigate the importance of financial literacy in opting for a voluntary deductible, I estimate the following model of deductible choice:

$$\Pr(D_i = 1) = H(FinLit_i, Health_i, Risk\_av_i, X_i) \qquad (5)$$

Where the dependent variable D_i is a binary variable of respondent i's deductible choice for the year 2012, equal to 1 if the subject has a positive voluntary deductible and 0 otherwise. D_i is assumed to be a function H(·) of the variables in vectors $FinLit_i$, $Health_i$, $Risk\_av_i$ and X_i. The functional specification of H in equation (5) will be modelled by means of above described probit model (equation 1), where y_i is equal to 1 if the subject has a positive deductible, and equal to 0 if it does not have a voluntary deductible. I will now describe the explanatory variables in equation (5). The vectors $FinLit_i$, $Risk\_av_i$, and X_i still include the same variables as explained above.

The vector $Health_i$ includes the variable self-assessed health and a dummy variable for being chronically ill. It is very likely that a person suffering from a chronic decease has higher healthcare expenditures, which will in turn affect his deductible choice. Another important factor regarding the choice of a deductible is healthcare demand. Previous research (van Ophem & Berkhout, 2009; Gorter & Schilp, 2012) use GP visits as a proxy for healthcare demand, although they neither require out-of-pocket expenses nor affect the deductible. Explanation for this is that other variables than GP visits are often not available and GP visits do increase the probability of other healthcare use and thus out-of-pocket expenses. However, my data also includes variables on other types of healthcare demand like prescription drugs and use of medical specialists: healthcare expenses that actually concerns the voluntary deductible.

Therefore, these two types of healthcare will proxy as healthcare demand variables. Descriptive statistics on the explanatory variables can be found in table B2 in the appendix. Consistent with the hypothesis, I assume that the effect of financial literacy is positive. Higher financial literacy will increase the probability of opting for a voluntary deductible. The sign of health care demand and risk aversion is assumed to be negative.

4.3. Complementary insurance

The model specification of the complementary insurance is again similar to above described models:

$$\Pr(C_i = 1) = G(FinLit_i, Health_i, Risk\_av_i, X_i) \qquad (6)$$

Where C_i is the dummy variable for taking out complementary insurance in 2012. The vectors $FinLit_i$, $Risk\_av_i$ and X_i are the same as described above. The vector $Health_i$ still includes the variable self-assessed health, and the chronically ill dummy. However, GP visits will be excluded from the model because GP visits are unlikely to play a role in the choice of complementary insurance. Unfortunately the dataset does not specify the type of complementary insurance a subject has taken out. Where the basic insurance is already quite extensive in the Netherlands, the complementary insurance often includes extra care such as physiotherapy, dental care, and eye care. In 2012, 76% of all complementary insurances included some type of dental care (NZa, 2012). Therefore I included the variable dentist visits in the $Health_i$ vector as a determinant for opting for complementary insurance. Since complementary insurance is often taken out collectively as well, I will include a dummy variable equal to 1 as a control variable if an individual is collectively insured. The descriptive statistics are reported in table B3 in the appendix.

5. Data

This section elaborates on the data that will be used in the continuation of this paper. In section 5.1 the Longitudinal Internet Studies for the Social sciences (LISS) panel and the sample selection will be described. Section 5.2 to 5.4 elaborates on the dependent variables: the voluntary deductible, complementary insurance, and the switch of insurer. Section 5.5 discusses the operationalization of financial literacy, the main explanatory variable of this study. Section 5.6 provides the formation of the risk aversion variable, and lastly, section 5.7 gives a small

description on the control variables. Appendix B provides tables with descriptive statistics on all the variables.

5.1.   LISS Panel

The LISS panel consists of 4500 households, comprising 7000 individuals. The panel is based on a true probability sample of households drawn from the population register by Statistics Netherlands. The survey is administered online and household members are asked to complete online questionnaires every month. Computers and internet access are provided to the households without, in order to prevent selection-bias. Panel members are paid for each completed questionnaire. The data of the LISS panel are freely available for researchers.

In total I make use of five different studies of the LISS panel: Health wave 5 (2011), Health wave 6 (2012), Financial Literacy (2011), Risk Aversion (2009),[12] and the background variables (November 2011). Table B1 in the appendix shows an overview of the sample selection. The Health study of 2012 is used to detract the dependent variables of this paper: switch of health insurer, voluntary deductible uptake, and complementary insurance uptake. These choices are made ex-ante, in the period November – December of the preceding year to be exact. The financial literacy study was a one-time project and is conducted in August 2011. Therefore I decided to investigate the health insurance choices of 2012. The financial literacy corresponds to the financial knowledge of the subjects during the time they decided on their health insurance for 2012.[13] The explanatory variables are observed in the Health study of 2011 because subjects are expected to make their choice based on their current health status and healthcare demand. Since the study for measuring risk aversion is conducted in 2009, and the other studies 2 to 3 years later, most observations are lost after this merge. After combining these datasets I have all relevant information on 2,062 individuals. The descriptive statistics on all variables can be found in appendix B.

5.2.   Switching of health insurer

In the Netherlands, individuals are obliged to take out health insurance in a regulated private health insurance market. The market is characterized by an oligopoly of four large concerns:

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[12] The actual name of the study is "Measuring Higher Order Risk Attitudes of the General Population", study unit number 38 of the LISS panel. These study units can be found at:
https://www.dataarchive.lissdata.nl/study_units/view/1
[13] I assume that financial literacy remains constant during this small time-period.

Achmea, CZ, Menzis, and VGZ. Together with five other concerns they monitor 26 different health insurance labels which are considered as unique health insurers in this paper. Figure 1 depicts the health insurance market in 2012, wherefrom it can be seen that the oligopoly almost controls 90% of the market (NZa, 2012). One sees a similar market form when comparing the sample distribution to the population distribution.

Figure 1: Market share of the four largest health insurance concerns (2012)
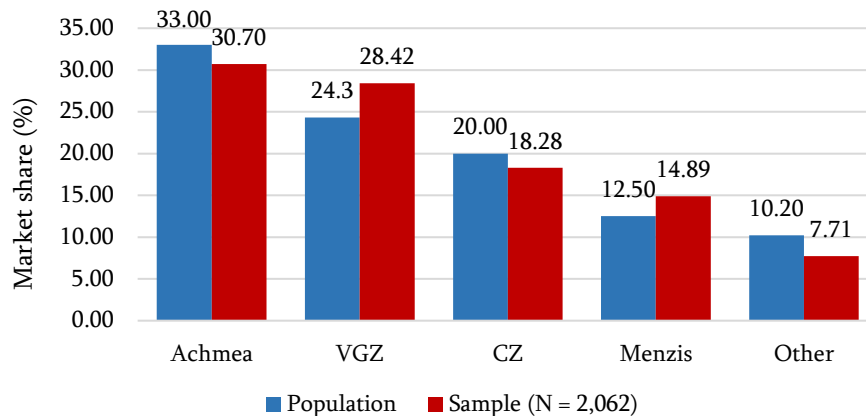
Individuals are free to switch between health insurers each year. In the Health study of the LISS panel, individuals are asked about their current health insurer. To indicate whether an individual switched of health insurer, I compared the observations of 2011 and 2012. I created a dummy variable equal to 1 if an individual reported another health insurer in 2012 and 0 otherwise. Worth to mention is that some health insurers ceased to exist in 2012 or before, these health insurers were taken over by another insurance company or label. If an individual was insured by such an insurer in 2011 and in 2012 by the overtaking company/label, I reported them as no switchers.[14] In 2012 only 189 of the individuals reported another health insurer compared to 2011, indicating a switch ratio of 9.2%. Figure 2 presents the switch ratio of health insurer between 2011 and 2012. In the population distribution, individuals that switched between labels but within the same health insurance concern, are reported as "no switchers". In contrast, I considered an individual switched if they changed labels as well. This might explain the discrepancy between the population ratio and the sample ratio. Unfortunately, the data does not provide information on whether the subjects have changed their health insurance

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[14] An example is health insurer "Trias" which ceased to exist as an independent label at the first of January, 2012. The policyholders were placed under VGZ.

plans. Therefore, only switching behaviour between insurers will be considered. Descriptive statistics of the switch ratio can be found in table B3 in the appendix.

Figure 2: Switch ratio 2011/2012
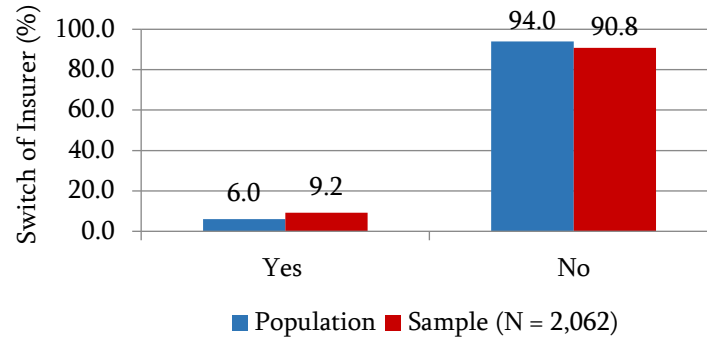
5.3. Voluntary deductible

In the Health study of the LISS Panel individuals are asked if they have opted for a voluntary deductible. The survey was taken in November 2012. Figure 3 presents the sample distribution of deductible choice. For comparison reasons, I have included the population distribution of 2012 (NZa, 2012). A drawback of the survey is that subjects are able to select a "don't know" option, of which 264 subjects made use. Individuals are allowed to change their health insurance (plan) at the end of each year, but are not obliged to do so, nor to confirm their current plan. If they remain passive, their current health insurance contract is automatically extended for another year. This explains the high proportion of "don't know" answers in the data. It is very likely that a subject does not recall its choice once made. I compared the "don't know" observations of 2012 to the deductible choice made in 2011. If the subject did know their voluntary deductible in 2011, but not in 2012, and moreover, did not change its health insurer, I assumed passivity. Hence, I assumed that the deductible remained the same for individuals that did not change their health insurer. This reduces the "don't know" answer by 108 observations, to 156. Please consult table B2 in the appendix for the entire sample distribution of the voluntary deductible .The difference between the two samples in figure 1 are these "don't know" answers. In the continuation of this paper, the smaller sample of 1,906 will be used for estimation. The sample fraction of people choosing no voluntary deductible (80%) is substantially lower than the population (94%).[15] A possible explanation for this difference is

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[15] The difference between the population mean and the sample (N = 1,906) mean is statistically significant at the 1% level

that my sample contains a large fraction of household heads (60%). Household heads often make financial decisions on behalf of the entire household, and are likely to be more interested in financial issues such as the deductible choice. Therefore it is possible that they sooner refrain from the status quo, and have a higher tendency to opt for a voluntary deductible.

Figure 3: Distribution of voluntary deductible choice in 2012
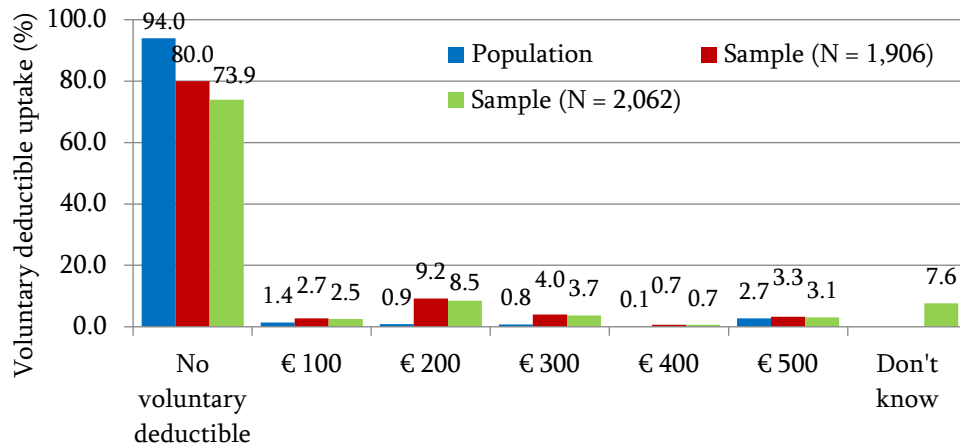
From figure 3 it can be seen that only a small proportion of the sample opts for a voluntary deductible. Splitting this into the different options of the voluntary deductible results in very small categories. As explained in section 4, I have therefore decided to analyse whether a subject opts for a positive voluntary deductible and not the type of voluntary deductible in question. In total, 20 per cent of the subjects chose a positive voluntary deductible in 2012, of which the largest share was the voluntary deductible of €200 (9.2%). This is different to the population distribution, where the maximum voluntary deductible of €500 was the most popular choice. It is impossible to explain where this difference is coming from. In the question posed to the subjects, the compulsory deductible of €220 was explicitly mentioned, therefore it is unlikely that the subjects mistook the voluntary deductible for the compulsory deductible of €220. Please consult table B2 and B3 in the appendix for descriptive statistics on the voluntary deductible uptake.

5.4.   Complementary insurance

Where basic health insurance is mandatory in the Netherlands, complementary insurance is optional. Often these complementary insurance includes, amongst others, dental care, physiotherapy, and eye care. In my sample nearly eighty per cent took out complementary

insurance in 2012. Figure 4 presents sample distribution of complementary insurance choice, the population distribution has been added for comparison reasons. Nearly 80% indicated having a complementary insurance in 2012.

Figure 4: Distribution of complementary insurance 2012
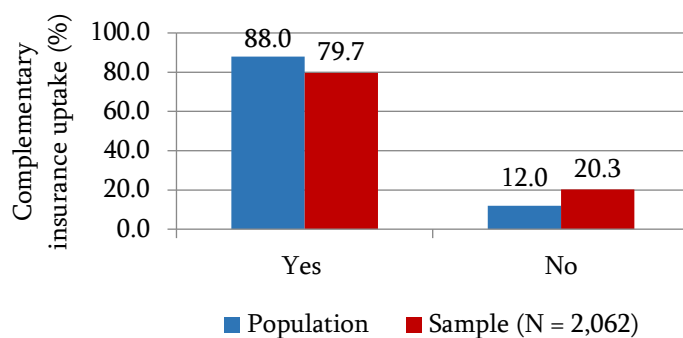
Yet again the population distribution is quite different from the sample distribution. This difference might result from response bias: the "don't know" option was not proposed to the subjects and individuals might not recall whether they have a complementary insurance or not. Because there is such a large uptake of complementary insurance, subjects might just not realize they have complementary insurance in their insurance plans and perceive it as standard insurance. Please consult table B3 in the appendix for the descriptive statistics on taking out complementary insurance.

5.5. Financial literacy

In an August 2011 study of the LISS Panel, individuals were asked to fill in a survey of financially oriented questions. The purpose of this study is to examine the financial literacy of the individuals. In this thesis I want to investigate whether financial literacy can be related to the health insurance choices the Dutch make. The study for financial literacy was conducted in August 2011 where the personal characteristics are observed in November 2011. Though the personal characteristics are available for every month, I decided to detract them from November 2011, as this is the month people start making health insurance choices for the next year. I make the assumption that financial literacy has not changed over this small time period. The financial literacy is measured with the help of four multiple choice questions regarding interest compounding, money illusion, diversification, and bond prices. In appendix C the exact

wording of the questions can be found.[16] Responses to these questions are reported in table 1. The first two questions are answered correctly by most respondents (89.9% and 79.4% respectively). However, the proportion of correct answers decreases substantially for the latter two questions, 44.3% and 20.2% respectively. This suggests that the first two questions are more basic financial questions and the latter two questions are more advanced. In table 2 a summary of responses is reported to all four questions. Only 13% of the respondents were able to answer all four questions correctly.

Table 1: Financial Literacy (in %)

	Interest Compounding	Money Illusion	Diversification	Bond Prices
Correct	89.91	79.39	44.28	20.22
Incorrect	5.29	9.89	15.52	33.85
Do not know	3.78	9.51	39.09	45.15

The number of observations are 2,062. Categories do not sum up to 100% because of refusals.

Table 2: Summary of responses (in %)

	None	One	Two	Three	All	Mean
Correct	5.33	13.24	36.86	31.43	13.14	2.34
Incorrect	49.95	37.05	11.54	1.41	0.05	0.65
Do not know	42.24	28.13	22.26	4.61	2.76	0.98

The number of observations are 2,062. The mean does not add up to 4 because of refusals.

To create indices for financial literacy, the methodology of van Rooij et al. (2011a) will be followed: performing a factor analysis on the financial questions of the study. Van Rooij et al. (2011a) relate financial literacy to stock market participation. In their study they make use of a set of 16 questions which they categorize in 5 basic questions and 11 advanced questions after factor analysis. Subsequently, they perform another factor analysis on the two sets separately in order to create two types of literacy indices: basic knowledge and more advanced financial knowledge. Following their methodology I create two dummy variables for each question. One dummy for the question being answered correctly and one if the respondent did not know the answer. It is important to take into account the "do not know" responses, as such responses portray those who know the least (Van Rooij et al., 2011b). Moreover, I create eight dummies in total.

Performing the factor analysis indicates that there are four different factors underlying the individuals' responses. The Kaiser-Meyer-Olkin test of sampling accuracy (KMO = 0.686) indicated that the sample is suitable for factor analysis. According to Kaiser's criterion, only

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[16] The questions were originally posed in Dutch

factors with an eigenvalue greater than 1 should be taken into account (Kaiser, 1960). When plotting the eigenvalues after factors together with the mean I find that only two factors should be included. From here I deviate from the method by van Rooij et al. (2011a). Because my sample only includes four questions and I want to retain as much information as possible, I perform a joint factor analysis on my total set of questions. Van Rooij et al. (2011a) performed a separate factor analysis on their two subsets of questions. When performing a second factor analysis with the principal component method, I obtain two factors for the four questions. In table 3 the specific factor loadings are reported. One observes that the first two questions, which are perceived as easier, are heavily loaded on the first factor. The latter two questions, which are perceived as more advanced questions, are more heavily loaded on the second factor. From here I construct two financial literacy indices: one index for basic financial knowledge and one index for more advanced financial knowledge. The factor scores are predicted by use of the Bartlett (1937) method. As can be seen from table 3 the correct answers are negatively loaded, whereas the do not know answers are positively loaded. This indicates that the loaded items measures the opposite pole of our index, thus financial illiteracy. To solve for this problem I take the negative of the factor scores to obtain a measure which is increasing with the degree of financial literacy. After, I have rescaled the factor scores from 0 to 1.

Table 3: Factor loadings

	Factor 1		Factor 2	
Question	Correct	Do not know	Correct	Do not know
Interest compounding	-0.75	0.81	-0.01	0.05
Money illusion	-0.69	0.76	-0.24	0.23
Diversification	-0.14	0.18	-0.78	0.80
Bond prices	-0.01	0.09	-0.63	0.72

Financial literacy is measured with the help of only four questions. It is questionable in how far these questions can proxy for the financial knowledge of individuals. In contrast, the study of van Rooij et al. (2011a) use a set of 16 questions. To verify that the financial literacy indeed measures financial knowledge, I report the relationship between the financial literacy indices and a subjective measure of financial knowledge. In the study subjects are asked to score their understanding of financial matters on a scale from 1 to 7. This questions is proposed before the other questions, thus subjects have to assess their own knowledge before they answer the literacy questions. Van Rooij et al. (2011a) created strict quartiles of the literacy indices to depict the relationship between objective and subjective financial literacy. In my case, this is not a

favourable approach because the scores are rather clustered. Therefore I perform an ordered probit regression instead. Please consult table D1 in the appendix for the results. I find a positive and significant effect of the obtained financial literacy indices on the self-assessed literacy. Furthermore, when controlling for socio-demographic factors the effect remains significant. Running a simple OLS indicate that demographics such as education, age, and gender significantly affect the obtained literacy indices.[17] These results verify that the constructed indices serve as a good proxy for financial knowledge.

Table 4 shows the distribution of basic financial knowledge across education, age, gender, and the health insurance choices. Because the factor scores are rather clustered, and more than 75% of my sample answered both first two questions correctly, I divided the basic financial literacy into two groups being equal to "low" if the factor score is lower than the 25th percentile and being equal to "high" otherwise. For every subgroup the Pearson chi-statistic is reported, which tests the null hypothesis whether the distribution of financial literacy is independent of the subgroup. There is a strong association between education and financial literacy. The proportion of individuals with high basic financial literacy is increasing with education. For age the distribution of basic financial literacy is quite similar among the different age groups. A greater proportion of males is in the high category compared to females, suggesting that males might have better basic financial knowledge. Interesting is the distribution of basic financial literacy across the voluntary deductible distribution. A greater proportion of individuals having no voluntary deductible is categorized in the high level (78.3), compared to the proportion of individuals with a voluntary deductible (70.4). The Pearson chi-statistic indicates that the distribution of basic financial literacy is dependent on the deductible choice (p=0.000). In the first hypothesis I assumed financial literacy to have a positive effect on deductible choice. However, the observed distribution suggests that higher basic financial literacy is possibly related with a lower voluntary deductible uptake. We should keep this in mind when proceeding to the analysis. For the complementary insurance the patterns are in line with my hypothesis, a greater proportion is categorized in the high category. Basic financial literacy is slightly higher among the group of switchers. Table 5 reports the advanced financial literacy across these subgroups. The division of advanced financial literacy categories is based on its median. Once more, education reports a strong pattern with regards to financial literacy. For age it seems that financial literacy is first increasing and decreasing after the age of 55 has

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[17] Please consult table D2 in the appendix for the results of this estimation.

been reached. The most financially knowledgeable individuals are in the age category of 25 – 34 years, of which 57.4% is in the higher advanced financial literacy group. A great discrepancy is noticed between females and males. Where more than 60% of the males is in the higher advanced literacy category, only 36% of the females is placed in the higher group. The null hypothesis of these demographics to be independent of advanced financial literacy is rejected for each of the demographic subgroups. This suggests that these variables are related to financial literacy, and therefore will be included in the proceeding analysis. For the voluntary deductible, advanced financial literacy seems to slightly higher amongst the group of having no voluntary deductible. Interesting is that the proportion of don't know answers is lower amongst the group of higher financial literates. As one expects, higher financial literacy is associated with being more aware of financial decisions, and better recall their choices made. For complementary insurance no pattern seems apparent with respect to advanced financial literacy. The proportion of the groups with and without complementary insurance is almost the same. For switching health insurer the proportion of high advanced financial literacy is substantially larger for the switchers. Of everyone that switched health insurer, 57.7% belongs to the high advanced financial literacy group, compared to 46.8% of the no switchers.

The descriptive statistics of table 4 and table 5 already reveals some of the effects we want to estimate. For the voluntary deductible choice the opposite relation is observed compared to the stated hypothesis. Financial literacy seems to be higher across the no voluntary deductible groups. For complementary insurance, basic financial literacy is indeed higher for they group that has taken out complementary insurance. Advanced financial literacy does not show a pattern between those groups. For switching health insurer, basic financial literacy and advanced financial literacy are both higher among the group of switchers.

Table 4: Basic financial literacy across demographics and health insurance choices

Education[18]	Basic financial literacy			
	Low	High	Mean	N
Primary school	41.6	58.4	1.58	178
Secondary education	36.0	64.0	1.64	556
Higher secondary education	20.2	79.8	1.80	178
Vocational education	25.6	74.5	1.74	462
Higher vocational education	14.3	85.7	1.86	503
University	5.4	94.6	1.95	186
	Pearson chi2(5) = 133.732	(p=0.000)		2,062

Age	Basic financial literacy			
	Low	High	Mean	N
18 - 24 years	29.6	70.5	1.70	132
25 - 34 years	26.1	73.9	1.74	176
35 - 44 years	26.7	73.3	1.73	300
45 - 54 years	27.2	72.9	1.73	372
55 - 64 years	23.1	76.9	1.77	528
65 years and older	22.0	78.0	1.78	555
	Pearson chi2(5) = 6.674	(p=0.246)		2,062

Gender	Basic financial literacy			
	Low	High	Mean	N
Male	17.3	82.7	1.83	1,011
Female	31.8	68.2	1.68	1,052
	Pearson chi2(1) = 58.337	(p=0.000)		2,062

Voluntary Deductible	Basic financial literacy			
	Low	High	Mean	N
No voluntary deductible	21.7	78.3	1.78	1,525
Positive voluntary deductible	29.6	70.4	1.70	382
Don't know	42.3	57.7	1.58	156
	Pearson chi2(2) = 38.142	(p=0.000)		2,062

Complementary Insurance	Basic financial literacy			
	Low	High	Mean	N
Yes	23.1	76.9	1.77	1,645
No	31.1	68.9	1.69	418
	Pearson chi2(1) = 11.418	(p=0.001)		2,062

Insurance switch	Basic financial literacy			
	Low	High	Mean	N
Yes	23.3	76.7	1.77	190
No	24.9	75.1	1.75	1,873
	Pearson chi2(1) = 0.236	(p=0.627)		2,062

[18] Individuals are categorized based on their highest achieved diploma, except for students, they are categorized based on their current education level. Individuals without any education are placed in the primary education category. The levels of education correspond in the presented order to the following levels in the Dutch education system: primary school, vmbo, havo/vwo, mbo, hbo, and university.

Table 5: Advanced financial literacy across demographics and health insurance choices

Education	Advanced financial literacy			
	Low	High	Mean	N
Primary school	73.0	27.0	1.27	178
Secondary education	67.1	32.9	1.33	556
Higher secondary education	50.6	49.4	1.49	178
Vocational education	50.8	49.2	1.49	462
Higher vocational education	40.0	60.0	1.60	503
University	26.3	73.7	1.74	186
	Pearson chi2(5) = 160.963	(p=0.000)		2,062

Age	Advanced financial literacy			
	Low	High	Mean	N
18 - 24 years	63.6	36.4	1.36	132
25 - 34 years	42.6	57.4	1.57	176
35 - 44 years	50.3	49.7	1.50	300
45 - 54 years	50.3	49.7	1.50	372
55 - 64 years	51.9	48.1	1.48	528
65 years and older	55.1	44.9	1.45	555
	Pearson chi2(5) = 16.236	(p=0.006)		2,062

Gender	Advanced financial literacy			
	Low	High	Mean	N
Male	39.8	60.2	1.60	1,011
Female	64.2	35.8	1.36	1,052
	Pearson chi2(1) = 122.570	(p=0.000)		2,062

Voluntary Deductible	Advanced financial literacy			
	Low	High	Mean	N
No voluntary deductible	51.1	48.9	1.49	1,525
Positive voluntary deductible	51.3	48.7	1.49	382
Don't know	65.4	34.6	1.35	156
	Pearson chi2(2) = 11.708	(p=0.003)		2,062

Complementary Insurance	Advanced financial literacy			
	Low	High	Mean	N
Yes	52.2	47.8	1.48	1,645
No	52.2	47.9	1.48	418
	Pearson chi2(1) = 0.001	(p=0.972)		2,062

Insurance switch	Advanced financial literacy			
	Low	High	Mean	N
Yes	42.3	57.7	1.58	190
No	53.2	46.8	1.47	1,873
	Pearson chi2(1) = 8.178	(p=0.004)		2,062

5.6. Risk aversion

An important determinant of insurance choices is of course risk aversion. Individuals that are more risk-averse will demand more coverage. With help of an additional study of the LISS panel, I created an index for risk aversion. The LISS Panel conducted a study on risk aversion in 2009. A variety of five games were proposed to the subjects where they had to choose between a gamble and a certain outcome. In each game the outcome of the gamble remained the same, receiving either €65 or €5 with an equal probability of 0.5. However, the received certain amount differed each game ranging from €20 to €45 in steps of €5. Table 6 lists the choices individuals could choose from; [65_5] is the notation for the gamble between €65 and €5 both with a probability of 0.5 and option 2 depicts the save outcomes in euros. The last column reports the sample percentage that opted for the save outcome (option 2) per game. The five games were presented to the respondent in their original order (ascending) or in mirrored form (descending).

Table 6: List of choices

	Option 1	Option 2	%
Game 1	[65_5]	20	50.36
Game 2	[65_5]	25	58.75
Game 3	[65_5]	30	70.09
Game 4	[65_5]	35	78.57
Game 5	[65_5]	40	82.60

Subjects were randomly assigned to four different treatment conditions: a real normal stakes group, a real low stakes group, a hypothetical normal stakes group, and a hypothetical high stakes group. Under the real-conditions the payoff amounts were low to normal, and the subjects were informed they could actually earn/win money with a chance of 1 out of 10. Under the hypothetical conditions the payoff amounts were normal to high and prizes were neither promised nor awarded. For the five games I used to measure risk aversion the payoffs only differed for the hypothetical high stakes group, these were multiplied with a factor of 150.

I construct a measure of risk aversion by simply adding the number of save outcomes a subject has chosen. The measure ranges from 0 to 5, increasing with risk aversion. One problem with this study is that no indifference option is given, i.e. subjects must make a choice between option 1 and option 2. Accordingly, this might also be the reason that some individuals report inconsistent series. With inconsistent I mean series with more than one switching point, or where an individual prefers the save outcome when the certain payoff is low and the gamble

when the save outcome is high. From my sample 15.2 per cent has given an inconsistent sequence of choices. Table 7 shows the proportion of the sample for each number of save choices. In the reduced sample, the respondents that made inconsistent choices are removed.

Table 7: Risk aversion

Number of save choices	Risk category	Full sample (%)	Reduced sample (%)
0	Risk loving	9.55	11.27
1	Risk neutral	6.26	5.21
2	Somewhat risk averse	14.06	11.16
3	Risk averse	15.86	12.99
4	Highly risk averse	13.00	10.70
5	Extremely risk averse	41.27	48.68
Observations		2,062	1,748

The inconsistent series might result from indifference. Switching more than once from the save outcome to the risky outcome could be explained by the fact that individuals are simply indifferent between the risky and save outcome. Choices rather reveal weak preference than inconsistency in that case (van Leeuwen, n.d.). To control for inconsistency I create a dummy variable equal to one if the respondent reported an inconsistent sequence and zero otherwise. Another possibility for inconsistency could be reluctance in answering the questions, or moreover, answering without really giving thought about the answers. In that case, individuals who report inconsistent series, are also likely to have put less effort and time into the survey. However, comparing the duration of the survey in seconds between the groups does not verify this argument.[19]

5.7. Other control variables

Every month the LISS panel collects rich data from its panel members. The so-called background variables. As controls, I selected variables used in most economic research to control for heterogeneity between consumers. Key socio-demographic characteristics include gender, age, education, net monthly income and living together with a partner. In case an individual lives together with a partner, the household net income is taken. Of my sample, 146 respondents refused to state or did not know their net (household) income. For these

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[19] A simple t-test cannot reject the null hypothesis that the mean of duration is statistically different between subjects that reported inconsistent series, and individuals who did not. However, there is some difference between the real stakes and the hypothetical stake group whether they reported inconsistent series. The proportion of inconsistent series is slightly higher for the hypothetical stake group.

observations I imputed the net income by the principle mean imputation method, based on the individual's gender, occupation, education, age, and having a partner.[20] These background variables are all observed in November 2011, the period when individuals make their health insurance choices. Health insurers' premiums for the next year are normally revealed at the beginning of November, and from that point individuals are able enter new insurance contracts. The other control variables used in the analysis are related to individual's health or healthcare demand. These were already mentioned in the previous section. For an extensive overview and the descriptive statistics, please consult appendix B.

6. Estimation Results

This section presents the estimation results.

6.1. Switching of health insurer

Table 8 presents the average marginal effects of the probit model on switching health insurer.[21] Basic financial literacy reports a negative sign, however is not statistically significant. In accordance with my hypothesis, advanced financial literacy has a positive effect on switching health insurer. A one unit increase in advanced financial literacy increases the probability of switching with 4.32 percentage points on average (Model 1). A one unit increase would mean going from zero advanced knowledge to perfect advanced financial knowledge, since the index ranges from 0 to 1. Bearing in mind the mean of the dependent variable, which is only 9.2%, an increase in 4.32 percentage points can be considered large. In other words, an increase of 0.1 in advanced financial literacy would lead to a higher probability of being insured of 0.43 percentage points. Comparing this to the mean of 9.2%, we can conclude the effect is quite substantial.

In the second model I controlled for status quo bias: the possibility that the insured entered a collective once getting employed and did not leave since. The extent of this bias is likely to be associated with financial literacy. Individuals that are uncertain whether switching improves their finances may stick to the status quo. The following controls are included: being collectively insured and the health insurer concerns. The effect of financial literacy increases to 4.62 percentage points for a one unit increase, and remains statistically significant.

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[20] The imputed mean is statistically not different from the actual mean of net household income.
[21] The estimation results with the coefficients can be found in table E1 in the appendix.

Table 8: Probit results for switching health insurer: Average Marginal Effects.

	Probit (1)		Probit (2)	
Financial Literacy				
Basic financial literacy	-0.0145	(0.0339)	-0.0092	(0.0335)
Advanced financial literacy	0.0432 *	(0.0258)	0.0462 *	(0.0259)
Risk aversion				
Risk aversion	0.0027	(0.0039)	0.0025	(0.0039)
Inconsistent risk aversion	0.0187	(0.0194)	0.0151	(0.0191)
Health				
Self-assessed health (1-5)	0.0141	(0.0094)	0.0151	(0.0092)
Chronically ill (1 = yes)	0.0165	(0.0127)	0.0189	(0.0147)
Collective insurance (1 = yes)			-0.0417 ***	(0.0139)
Health Insurer (base level is Achmea)				
CZ			0.0144	(0.0205)
Menzis			0.0130	(0.0219)
VGZ			0.0250	(0.0180)
Other			0.0108	(0.0228)
Personal characteristics				
Female	-0.0117	(0.0127)	-0.0109	(0.0128)
Age (scaled)	-0.0135	(0.0204)	-0.0030	(0.0208)
Age^2 (scaled)	-0.0014	(0.0021)	-0.0023	(0.0021)
Partner	-0.0115	(0.0159)	-0.0116	(0.0158)
Education (base level is primary)				
secondary education	-0.0200	(0.0238)	-0.0184	(0.0237)
higher secondary education	0.0473	(0.0335)	0.0493	(0.0334)
vocational education	0.0045	(0.0252)	0.0040	(0.0249)
higher vocational education	0.0183	(0.0266)	0.0207	(0.0264)
university	0.0391	(0.0346)	0.0400	(0.0342)
ln (net income)	-0.0012	(0.0075)	-0.0005	(0.0075)
Summary statistics				
Log pseudolikelihood	-589.27		-582.71	
Pseudo R²	0.0672		0.0776	
χ²	79.44 ***		93.47 ***	
Percentage correctly predicted	90.83%		90.83%	
N	2,062		2,062	

Note: the dependent variable is switching of health insurer. Average marginal effects are reported of equation (4). Robust standard errors are reported in the parentheses; ***p<0.01 **p<0.05 *p<0.1 (two-sided test). Scaling on age: age = age/10 and age^2 = (age/10)^2

The collective insurance dummy is highly significant at the 1% level. Being collectively insured decreases the probability to switch health insurer by 4.17 percentage points on average.[22] Individuals gain from financial benefits when being collectively insured. They often receive a premium rebate, or additional insurance packages. Switching to another health insurer would likely result in leaving the collective, meaning the benefits are forgone. Even after controlling for status quo bias, the effect of advanced financial literacy remains significant. We can conclude that advanced financial literacy has an independent effect on switching behaviour. The risk aversion variables appear to be irrelevant for switching health insurers. This is not a strange result as switching health insurer is not a risky decision per se. From the vector *Health*, only being collectively insured enters the model significantly. Neither self-assessed health nor being chronically ill seem to have an effect on the choice to switch health insurer. This is not in line with existent literature, which reported that people in bad to moderate health are less inclined to switch health insurer (de Jong, van den Brink-Muinen, & Groenewegen, 2008; Hendriks et al., 2009).

Interestingly, none of the personal characteristics seem to be influencing the choice to switch health insurer. Empirical studies have found that switching health insurers in the Dutch market is more likely among younger and better educated people (Mosca & Schut-Welkzijn, 2007; de Jong et al., 2008). Testing the joint significance of age and age squared rejects the null hypothesis of both coefficients being equal to zero at the 1% level. Moreover, the marginal effects of age on switching health insurer are negative and statistically significant for each person older than 31 years.[23] Indeed, age is negatively associated with switching choice. Older people are expected to be more averse against switching because of uncertainty about continued coverage of health care (Hendriks et al., 2009). Moreover, well educated people are also more prone to switch health insurer as they probably have less difficulties with processing all relevant information on health insurers. This will reduce the transaction costs of switching. A possible explanation for the insignificant effects might be collinearity in the model. However, this is

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[22] This result could be biased upward, since being collectively insured is correlated with being in paid employment. Most collectives are employers collectives. However, including a dummy variable for being in paid employment does not result in a significant effect. Moreover, the effect of being collectively insured does not alter much. Therefore I have decided to leave the paid employment dummy out of the estimation.

[23] Obtained from studying the combined marginal effects of age on switching health insurer. Plotting the margins plot indicated that the age effects of a person younger than 32 are statistically not different from zero at the 5% level.

not the case because if I delete one or more of the variables likely to be associated with education, education is still left insignificant.[24]

6.2.   Voluntary deductible

Table 9 presents the average marginal effects of the probit model on deductible choice (Equation (5)).[25] The dependent variable is the voluntary deductible, and the proportion of "don't know" answers has been removed for estimation. This reduces the sample to 1,906 observations. The regression estimates report several interesting findings. First, financial literacy is negatively associated with opting for a voluntary deductible, and the results for basic and advanced literacy are statistically significant at the 5% and 10% level, respectively. The null hypothesis that the financial literacy indices are irrelevant to deductible choice cannot be rejected for both probit specifications.[26] An increase of one unit of basic financial literacy decreases the tendency of opting for a voluntary deductible by 11.5 percentage points on average (model 1). This seems remarkably high but one must realize the financial literacy indices range from zero to one: a one unit increase is very substantial. Further, the marginal effect of advanced financial literacy depicts a negative sign as well. A one unit increase in advanced financial literacy decreases the tendency to opt for a voluntary deductible by 6.46 percentage points on average. Both findings are in contradiction with the formed hypothesis that financial literates are more likely to opt for a voluntary deductible.

Interestingly, most personal characteristics are insignificant and thus appear unimportant to deductible choice. However, testing for the joint significance of age and age squared indicates that age is significant at the 10% level. Between age 46 and 72, age has a significant negative effect on deductible choice.[27] Getting older is likely to increase your healthcare demand and having a positive deductible will increase the chance of having higher out-of-pocket expenses. Moreover, having higher education increases the probability to opt for a voluntary deductible. This is interesting, as higher education levels are also associated with higher financial knowledge. Where the higher education levels have a positive effect, financial literacy appears to decrease the tendency to opt for a voluntary deductible. When removing the

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[24] Variables likely to be associated with education are: net income, financial literacy, and health.
[25] The estimation results with the coefficients can be found in table E2 in the appendix.
[26] A Wald test that the coefficients of the financial literacy indices are both equal to zero cannot be rejected at the 5% level.
[27] Obtained from studying the combined marginal effects of age on deductible choice. Plotting the margins plot indicated that the age effects outside the 46 – 72 range are statistically not different from zero at the 10% level.

financial literacy indices from the estimation, the marginal effect of having a university degree remains significant at the 5% level and it drops by almost 3 percentage points. Hence, it absorbs some of the negative financial literacy effects if the literacy indices are not included as independent variables.

Table 9: probit results for voluntary deductible uptake: Average Marginal Effects

	Probit (1)			Probit (2)		
Financial Literacy						
Basic financial literacy	-0.1154	**	(0.0494)	-0.1142	**	(0.0494)
Advanced financial literacy	-0.0647	*	(0.0358)	-0.0613	*	(0.0358)
Risk aversion						
Risk aversion	-0.0136	**	(0.0053)	-0.0142	***	(0.0054)
Inconsistent risk aversion	0.0309		(0.0249)	0.0299		(0.0248)
Health						
Self-assessed health (1-5)	0.0260	*	(0.0140)	0.0366	***	(0.0138)
Chronically ill	-0.0292		(0.0228)	-0.0515	**	(0.0217)
Medical specialist visits 2011	-0.0045		(0.0039)			
Prescription drugs (1 = yes)	-0.0597	***	(0.0214)			
Personal characteristics						
Female	-0.0147		(0.0184)	-0.0181		(0.0185)
Age (scaled)	0.0128		(0.0343)	0.0176		(0.0345)
Age^2 (scaled)	-0.0027		(0.0034)	-0.0038		(0.0034)
Partner	-0.0394	*	(0.0221)	-0.0415	*	(0.0221)
Education (base level is primary)						
secondary education	0.0027		(0.0328)	0.0039		(0.0328)
higher secondary education	0.0046		(0.0415)	0.0066		(0.0415)
vocational education	0.0423		(0.0352)	0.0413		(0.0351)
higher vocational education	0.0646	*	(0.0354)	0.0671	*	(0.0355)
university	0.1364	***	(0.0480)	0.1372	***	(0.0483)
ln (net income)	-0.0028		(0.0136)	-0.0014		(0.0136)
Summary statistics						
Log pseudolikelihood	-903.61			-908.28		
Pseudo R²	0.0537			0.0488		
χ²	86.83	***		76.31	***	
Percentage correctly predicted	79.91%			79.91%		
N	1,906			1,906		

Note: the dependent variable is the voluntary deductible choice. Robust standard errors are reported in the parentheses; ***p<0.01 **p<0.05 *p<0.1 (two-sided test). Scaling on age: age = age/10 and age^2 = (age/10)^2

Where general knowledge obtained via education positively affects the deductible choice, financial knowledge seems to have an independent negative effect on deductible choice. The variable risk aversion is significant at the 5% level and reports a negative sign. More risk-averse individuals will demand a higher coverage rate, thus lower out-of-pocket expenses, which justifies the negative sign.[28] The variable self-assessed health has its expected positive sign and the use of prescription drugs decreases the probability to opt for a voluntary deductible. In model 2 the variables medical specialist visits and prescription drugs are excluded, which likely causes an endogeneity problem. These variables proxy for healthcare demand and they have a direct effect on deductible choice. As the medical specialist visits and prescription drugs require out-of-pocket expenses, the relation is expected to be negative. The variables of medical specialist visits and prescription drugs are observed in 2011, where the deductible choice is observed in 2012. One might argue that the future choice for deductible does not affect the current healthcare demand, and reverse causality is not a problem here. However, individuals can still decide to demand more healthcare in the present because they know they are insured for the costs, now and in the future. Especially because individuals do not change health insurance plans regularly – future choice is probably the current choice – the problem of endogeneity even becomes more apparent. Still after excluding these variables, financial literacy reports negative marginal effects and remain significant.

To verify the robustness of these findings, the model has been re-estimated with the use of self-assessed financial literacy and the total correct answers given instead of the constructed financial literacy indices. Again, the financial literacy indices report a negative and significant association with the voluntary deductible choice. The results of these estimates can be found in table F1 in the appendix. Though, it indicates that the constructed indices are a good proxy for financial knowledge, it still contradicts with the formed hypothesis. To further investigate the effect of financial literacy on the choice of the deductible, I estimate an ordered probit model where the separate deductible choices are modelled. The ordered probit model estimates the probability to opt for one of the categories in deductible choice. This ranges from the zero deductible to the maximum voluntary deductible of €500. It is possible that the effect of financial literacy differs for the different voluntary deductible choices. In table 10 the probability outcomes of financial literacy on opting for different deductible choices are

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[28] Note that risk aversion is measured in the year 2009. Individuals might have been more risk-averse during this year because it is in the highlight of the financial crisis. Therefore, the related coefficients should be interpreted with caution.

reported. I also included the zero voluntary deductible choice. In table F2 in the appendix the regression results of the entire ordered probit model can be found. From table 10 it becomes clear that basic financial literacy has a significant positive effect on the zero deductible choice. Hence, higher basic literacy is associated with a higher chance of not choosing a voluntary deductible. A one unit increase in basic financial literacy increases the probability of not choosing a voluntary deductible by 9.0 percentage points on average. Moreover, the average marginal effect of basic financial literacy on the positive deductible choices still have a negative sign, and are significant at a 5% or 10% level. These results verify that basic financial literacy is indeed associated with a lower tendency to opt for a voluntary deductible. Besides, the opposite relationship holds true as well: basic financial literacy is positively associated with not choosing a voluntary deductible. Advanced financial literacy also depicts negative signs for the positive deductible choices, though they are no longer statistically significant. Also, the effect of advanced financial literacy is not significant for the choice of no voluntary deductible.

Table 10: average marginal effects of financial literacy on the six voluntary deductible choices

	Pr(VD = €0)	Pr(VD = €100)	Pr(VD = €200)	Pr(VD = €300)	Pr(VD = €400)	Pr(VD = €500)
Basic financial literacy	0.0902	-0.0077	-0.0341	-0.0206	-0.0044	-0.0234
	(0.0446) **	(0.0040) *	(0.0172) **	(0.0103) **	(0.0025) *	(0.0117) *
Advanced financial literacy	0.0463	-0.0040	-0.0175	-0.0106	-0.0022	-0.0120
	(0.0346)	(0.0030)	(0.0133)	(0.0079)	(0.0018)	(0.0090)

Note: the dependent variable is voluntary deductible choice (VD). Robust standard errors in parentheses. ***p<0.01 **p<0.05 *p<0.1 (two-sided test)

6.3. Complementary insurance

In table 11 the average marginal effects of taking out complementary insurance are reported.[29] I will now discuss the first model. The financially literacy indices enter the model positively, though advanced financial literacy is not statistically significant. For basic financial literacy, a one unit increase will increase the chance of taking out complementary insurance by 13.83 percentage points on average. Risk aversion is not significant, which is somewhat strange as economic theory predicts that higher risk aversion is associated with higher insurance demand. The variables of Health have the expected signs, and are all strongly significant. Females are less likely to take out complementary insurance than comparable males. The marginal effects of age on complementary insurance reports an interesting finding. The positive effect of age indicates

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[29] The estimation results with the coefficients can be found in table E3 in the appendix.

that the probability of taking out complementary insurance increases with age. However, the negative value of age squared point out that this is only true up until a certain age, after which the probability decreases again. Older individuals demand more health care, and therefore one

Table 11: Probit results for complementary insurance uptake: Average Marginal Effects

	Probit (1)			Probit (2)		
Financial Literacy						
Basic financial literacy	0.1384	***	(0.0464)	0.1511	***	(0.0476)
Advanced financial literacy	0.0125		(0.0358)	0.0216		(0.0363)
Risk aversion						
Risk aversion	0.0043		(0.0052)	0.0047		(0.0052)
Inconsistent risk aversion	-0.0227		(0.0247)	-0.0136		(0.0246)
Health						
Self-assessed health (1-5)	-0.0356	***	(0.0134)	-0.0366	***	(0.0133)
Chronically ill	0.0421	**	(0.0214)	0.0434	**	(0.0213)
Collective insurance (1 = yes)	0.0743	***	(0.0181)	0.0793	***	(0.0182)
Dentist visits	0.0484	***	(0.0090)			
Personal characteristics						
Female	0.0432	**	(0.0178)	0.0581	***	(0.0175)
Age	0.0978	***	(0.0302)	0.1142	***	(0.0310)
Age^2	-0.0091	***	(0.0029)	-0.0105	***	(0.0030)
Partner	0.0256		(0.0221)	0.0291		(0.0224)
Education (base level is primary)						
secondary education	0.0463		(0.0342)	0.0538		(0.0362)
higher secondary education	0.0162		(0.0432)	0.0295		(0.0447)
vocational education	0.0403		(0.0358)	0.0507		(0.0378)
higher vocational education	0.0287		(0.0365)	0.0474		(0.0383)
university	-0.0313		(0.0466)	-0.0054		(0.0474)
ln (net income)	-0.0043		(0.0119)	-0.0037		(0.0120)
Summary statistics						
Log pseudolikelihood	-962.90			-984.89		
Pseudo R²	0.0737			0.0526		
χ²	121.50	***		99.27	***	
Percentage correctly predicted	79.63%			79.58%		
N	2,062			2,062		

Note: robust standard errors are reported in the parentheses; ***p<0.01 **p<0.05 *p<0.1 (two -sided test). Scaling on age: age = age/10 and age^2 = (age/10)^2.

would expect a positive sign for age squared as well.[30] This result could be explained by the fact that older individuals have a higher risk profile and demand more health care. Therefore, the premiums they have to pay increase as well, since risk-rating is allowed in the complementary insurance market. Counter-intuitively, increasing healthcare demand could therefore lead to lower health insurance demand. When premiums become too expensive or the insurance costs are larger than the expected benefits, the demand for health insurance might decrease. Having a partner, education, and net income do not have a significant effect on complementary insurance uptake.

In the second model dentist visits are excluded from the model because of potential endogeneity problems. There is likely a reverse causation between the uptake of complementary insurance and the number of dentist visits. Individuals might visit the dentist more often because they know they are insured for it. Even though the dentist visits are observed in 2011 and the complementary insurance uptake in 2012, this is not enough to eliminate the endogeneity problem. The insured visit the dentist more often if they know that their (future) health insurance covers for it, as many insured do not change their health insurance plans regularly (NZa, 2012). Their future choice for health insurance, here the complementary insurance uptake in 2012, might therefore still affect their current healthcare demand (dentist visits 2011). The effect of basic financial literacy is still robust when the potential endogeneity problem has been removed. It has increased to a marginal effect of 15.11 percentage points on the probability of taking out complementary insurance. Advanced financial literacy is still insignificant.

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[30] The combined marginal effects of age are not significant between the age levels 48 – 65. Hence, for any individual aged between 48 and 65 the marginal effect on complementary insurance is statistically not different from 0. After age 65, age has a significant negative effect on taking out complementary insurance.

7. Discussion and Conclusion

7.1. Discussion

I considered the role of financial literacy in making decisions in the Dutch health insurance market. Knowing the determinants for making health insurance decisions may have useful policy implications. Using data from the LISS panel I relate financial literacy to three health insurance choices the Dutch make: (1) switching health insurer, (2) uptake of a voluntary deductible, and (3) uptake of complementary insurance. I will now discuss my findings in the presented order.

7.1.1. Switching of health insurer

My first hypothesis stated that financial literacy is expected to have a positive effect on switching health insurer. From the results it seems that basic financial literacy does not have an effect on switching behaviour. However, advanced financial literacy indeed has a positive effect on switching behaviour. The insured are able to switch health insurer at the end of each calendar year to create competition into the market. Consumers are expected to act critically to price changes or coverage changes, which will enhance efficiency and increase the quality of care, thereby reducing the overall healthcare expenditures. Therefore, by investing in the financial literacy of individuals the efficiency of the healthcare market can be stimulated. It is hard to identify the mechanisms through which financial literacy affects switching choice. A potential mechanism is the presence of information overload in the Dutch health insurance market. Information overload creates uncertainty about making decisions, thereby obstructing individuals from making a choice (Agnew & Szykman, 2005). Moreover, it will result in status quo bias, where individuals tend to the default setting. Financial literates are less overwhelmed by information overload, and are better able to make informed decisions in such an environment (Mitchell & Lusardi, 2011). A measure to overcome information overload is reducing the amount of choice. In this case that would mean reducing the number of health insurers, or the health insurance packages they provide. Moreover, if policymakers want to stimulate switching behaviour within the Dutch health insurance market, they can consider simplifying the decision making process, hence offering less choice, in addition to improving (advanced) financial literacy. A second mechanism is that financially knowledgeable people are expected to be more interested in making financial decisions and are more active decision makers. Where the less financially sophisticated are just satisfied with having health insurance

at all and do not feel the need to change its policy once insured, financial literates might be more interested in finding out the (financial) benefits of switching.

A few limitations are worth noting. The first is the predictive power of the model. From table 8 one sees that the percentage correctly predicted is equal to 90.38%. Though this seems a really high score, it is only obtained from predicting the negative outcome, hence, the decision not to switch health insurer. The sensitivity of the model is zero per cent, meaning that it failed to predict the positive outcome (switching health insurer) for every case.[31] This is probably because of the relatively small sample size. The model predicts the choice to switch based on only 189 observations that indeed switched health insurer. The information obtained from this sample might not be representative for the general population. For further research a larger dataset is favourable to verify the robustness of the findings. Another limitation is the timeframe of the analysis. The study investigated switching choice of one year only. Various time effects might have influenced this choice which are not controlled for. The year 2012 is still in the aftermath of the financial crisis. Individuals might have been more prone to switching to search for financial benefits for instance. On the other hand, they also might have been less inclined to switch due to increased risk aversion. Analysing panel data can control for time effects, and also investigate whether financial literacy is related to switching more regularly, and not just one time.

7.1.2. Voluntary deductible

The effect of financial literacy on deductible choice is in contradiction with the formed hypothesis. Hence, a higher financial literacy is associated with a lower tendency to opt for a voluntary deductible. This effect is found for basic financial literacy as well as advanced financial literacy. I will now discuss the possible explanations for these findings. One reason might be that financial literates are more aware of the financial consequences of opting for a voluntary deductible, hence, the higher risk of greater out-of-pocket expenses. Because of this better awareness, it is possible that they are less likely to opt for a voluntary deductible as the results indicate. Individuals lacking financial knowledge might not fully understand the financial risk of having a higher deductible, and only opt for one as a reaction to the offered premium rebate. Furthermore, the negative relationship suggests that financial literacy is associated with a higher coverage rate regarding health insurance. The negative sign might

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[31] An outcome is classified as positive if Pr(Switch=1)≥0.5, which is the default setting.

imply that financial illiterates underestimate the value of insurance (Gousia, 2014). Moreover, opting for a voluntary deductible is not always an optimal choice. When an individual consumes more healthcare than the required compulsory deductible, thus more than €220, it is better not to increase the deductible. Unfortunately, the data does not allow me to investigate for which individuals the voluntary deductible is not an optimal choice. For that, I need information on the actual out-of-pocket expenses of each subject, and compare those to their deductible plans. If an individual had more out-of-pockets expenses with a voluntary deductible, than it would have had without a voluntary deductible, the choice was not optimal. I like to think that individuals with higher financial literacy would make less suboptimal choices. My current analysis does not control for this possibility, which might have biased the coefficients downwards. The negative effect could be (partly) explained by the fact that financial literates are less prone to make suboptimal choices – thus less inclined to take out a voluntary deductible – if they know it is financially not beneficial. However, only analysing the actual out-of-pocket expenses could verify this argument, which gives input for further research.

In 2012, the mandatory deductible increased substantially compared to the year before. From €170 in 2011 to €220 in 2012.[32] This could have two effects: (1) individuals are more reluctant to take out a voluntary deductible in the succeeding year, since the compulsory deductible has already increased. They are afraid of even higher out-of-pocket expenses. And (2) individuals are more willing to take out a voluntary deductible if they have low health care expenditures. It is less likely that they will "consume" the entire compulsory deductible, and it is therefore beneficial to them to have a higher deductible. If the first effect dominates the second effect, it is therefore possible that financially literates have a lower tendency to opt for a voluntary deductible.

In the analysis we controlled for risk aversion, which has a negative effect on the uptake on the voluntary deductible uptake. However, various other behavioural factors, that are not controlled for, could have influenced the choice as well. Some of these might explain the negative relationship between financial literacy and deductible choice: loss aversion, status quo bias, and inertia. In case of loss aversion individuals prefer avoiding losses to acquiring equivalent gains. In case of the voluntary deductible, people might lose more utility from (the risk of) higher out-of-pocket expenses, than they gain positive utility from the premium rebate.

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[32] In 2010 the compulsory deductible was set at €160, and it has never been smaller than €150. Therefore the increase to €220 increase is considered large.

Additionally, status quo bias could lead to people choosing the default setting. When entering an insurance contract, this is the zero voluntary deductible choice. Related with the status quo bias is inertia, the resistance of the insured to make any changes in its position. This results in people having the same insurance contract for years, without making an active choice for the voluntary deductible. The extent of these biases is likely to be associated with financial literacy (Mitchell & Lusardi, 2011). In case of loss aversion, uncertainty exists about the potential loss of choosing a voluntary deductible. One does not know for sure how much its healthcare costs are going to be. Financial literates might be better in estimating the potential costs and thus losses. In turn, this might result in lower loss aversion as less uncertainty exists about potential losses. Therefore, the effect of financial literacy might be biased due to the omission of loss aversion. The same applies to status quo bias and inertia. Financial literates are expected to better understand the consequences of opting for a voluntary deductible. Agnew and Szykman (2005) showed that individuals with fewer financial knowledge are more likely to succumb to default bias when making investment decisions. This could also hold true for the insurance market.

Lastly, the deductible choice only considers a small stake of risk. By opting for the maximum voluntary deductible the possible out-of-pocket expenses equals €491 on a yearly basis.[33] Comparing this to the compulsory deductible of €220, the actual risk-taking amounts €271 only. Moreover, the amount that can be saved by opting for the maximum voluntary deductible is just €271. It is very likely that people do not care for saving this small amount on a yearly basis, when the other choice is no extra out-of-pocket expenses for certain. Financial literates might even better understand the relative small stakes involved, and therefore not to decide to opt for a voluntary deductible.

7.1.3. Complementary insurance

The last hypothesis stated that financial literacy has a positive effect on the uptake of complementary insurance as well. Individuals with higher financial knowledge might experience insurance as more valuable. This is also found by Dalkilic and Krikbesoglu (2015) who related financial literacy to insurance awareness amongst Turkish university students. A qualitative research was conducted on perceptions of insurance in general. They found that

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[33] The out-of-pocket expenses with the maximum voluntary deductible is €720. However, after accounting for the average premium rebate which was €229 in 2012, this amounts to only €491.

individuals with higher financial literacy find insurance more useful, more necessary, and a less waste of money. This is related to the findings of Gousia (2014), who suggests that individuals underestimate the value of insurance in the absence of financial knowledge in the private long-term care insurance market. The positive coefficient of basic financial literacy suggests that in the Dutch health insurance market, higher financial literacy is associated with higher coverage rates, indicating that financially knowledgeable people perceive insurance as more valuable.

Another explanation for the positive effect is the presence of adverse selection in the health insurance market (DNB, 2017). Individuals might take out complementary insurance because they know they are going to use the healthcare covered in the succeeding year. As explained earlier, it is financially profitable to take out complementary insurance for 9 physiotherapy treatments, than to pay for them separately. I believe that financial literates are better in detecting these financial benefits, and are more prone to this moral hazardous behaviour. From here I come to the first limitation of the model. The LISS panel does not elaborate on the types of complementary insurance individuals take out. In 2012, over 1300 different complementary insurance policies existed (NZa, 2012). To really investigate the effect of financial literacy on the proposed adverse selection problem, more information is required about the type of complementary insurance, and moreover, the use of healthcare and the associated costs. Furthermore, panel data is preferred since if it is adverse selection that plays a role here, individuals would also opt out again of the complementary insurance once the needed healthcare has been consumed. Analysing the choices individuals make over a longer time span could detect the individuals involved in this moral hazardous behaviour. Financial literacy is expected to play a positive role here, but that is not in the scope of this paper and should be covered in future research.

Van Winssen et al. (2016) argue that the high uptake of complementary insurance might be explained due to the suboptimal choices many Dutch insured make. With suboptimal they mean taking out complementary insurance without making use of it. In 2013, 30% of the Dutch insured with complementary insurance did not file any reimbursement forms to their health insurer (van Winssen et al., 2016). The question that raises is why individuals make suboptimal choices with regards to their insurance. Again, the LISS panel does not provide information to identify which individuals make suboptimal choices regarding their complementary insurance, but it can be debated that financial literacy might be related to the once who did (not).

7.2. Conclusion

In this thesis I study the effect of financial literacy on health insurance choice within the Netherlands. The choices individuals make have a direct effect on the overall healthcare expenditures. With population ageing and increasing technological innovation, the pressure on healthcare expenditures is ever rising. By understanding the determinants in making health insurance choices, policymakers might have an instrument to restrict the overall healthcare expenditures or to make the health insurance market more efficient. Using data from the LISS panel I found evidence that financial literacy has a significant effect on three health insurance choices people make: (1) switching of health insurer, (2) uptake of the voluntary deductible, and (3) the uptake of complementary insurance.

Advanced financial literacy is associated with a higher probability to switch health insurer. After controlling for status quo bias with respect to being collectively insured, this effect is still significant. Possible mechanisms through which financial literacy affects the switching choice are discussed, of which one is the presence of information overload in the Dutch health insurance market. Financial literates might feel less overwhelmed by the information available, and feel more confident in making an informed decision. Thereby, since they are better able to process all relevant information, they tend less often to the status quo. Though, this explanation seems plausible, it is still based on speculation. To actually understand the mechanism through which financial literacy affects switching choice more research is needed and with preference for qualitative research. Behavioural effects not controlled for, are very likely to have an impact on switching behaviour.

Only few consumers make use of the option to switch health insurers. This may indicate a high degree of satisfaction with one's current insurer or it may suggest that consumers are failing to play their role as critical consumers. If the latter is true, the system of managed competition does not work optimal. This is unfortunate, because it can improve the efficiency of the health insurance market. If consumers respond well and adequately to changes in the market, such as price changes or coverage changes, competition is increased in the market. Health insurers then have the incentive to provide good quality care for good prices in order to attract more consumers. My results suggest that advanced financial knowledge plays a significant role here. The positive effect of advanced financial literacy on switching behaviour suggests that financial literates are more active and more critical consumers. Thus by investing in advanced financial literacy, the switching behaviour can be stimulated. This can be used as

an instrument to increase market competition and to enhance efficiency. A more efficient health insurance market will result in lower overall healthcare expenditures.

My results suggest that financial literacy is negatively associated with the voluntary deductible choice, and the effect becomes stronger when controlled for education. Where general knowledge obtained via education positively affects the deductible choice, financial knowledge seems to have an independent negative affect. This contradicted with my hypothesis where I assumed the opposite relationship. I discussed several behavioural biases through which financial literacy might affect the deductible choice: status quo bias, loss aversion, and inertia. The data does not allow to control for these effects and to investigate the actual underlying effect that explains this result. To really understand the mechanisms through which financial literacy affects the deductible choice, qualitative data is needed instead of quantitative analysis. A study where is asked why individuals opt for a voluntary deductible might explain the negative relationship we have found. I leave the study of these underlying effects for further research. The voluntary deductible is used as an instrument to reduce moral hazardous behaviour and to decrease healthcare expenditures. The financial burden is partly shifted from the insurers to the insured when a voluntary deductible is taken out. People will think twice before they decide to purchase health care, and the demand will likely decrease. As Winssen et al. (2015) explained, for 48 percent of the insured without a voluntary deductible, having one would have been financially beneficial to them in 2011. This indicates that many consumers make suboptimal decisions with respect to their deductible choice. Unfortunately, I was not able to investigate which of the subjects made suboptimal choices. If there was data available about the out-of-pocket expenses that the subjects made, I could detangle this effect and relate it to financial literacy. I believe that people with higher financial knowledge make less suboptimal choices. If financial knowledge can predict which individuals make the suboptimal choices, policy makers can use financial literacy as an instrument to enhance efficiency. Suboptimal choices result in a less efficient market, and hence, increase the overall healthcare expenditures.

By investing in financial literacy, the uptake of a voluntary deductible will not be encouraged. Note that not for everyone a higher voluntary deductible is financially beneficial. But it is plausible that financial literacy does ensure consumers to make less suboptimal choices regarding their voluntary deductible choice. Whether this is actually the case needs to be

investigated first, but then policymakers have an actual instrument in hand to make the health insurance market more efficient, and thus reduce overall healthcare expenditures.

Basic financial literacy has a strong positive effect on the uptake of complementary insurance. Meaning that higher financial literacy is associated with higher coverage rates in the complementary insurance market. This suggests that individuals with higher financial knowledge attach greater value to having insurance. Another explanation is that in the absence of financial knowledge, people underestimate the value of insurance. Van Winssen et al. (2016) noted that many individuals make suboptimal choices regarding their own welfare. In 2013, 30% of the Dutch insured with complementary insurance did not file any reimbursement forms to their health insurer. Although this is a suboptimal choice with regard to an individual's own welfare, individuals are also able to make suboptimal choices with respect to the entire health insurance market. This is the previously mentioned adverse selection problem, which is becoming a growing threat as stated by the DNB (2017). If individuals only take out complementary insurance for the type of care that they are certain to make use of, and deregister from them once it has been consumed, the complementary insurance pool consists of only high-risk individuals. This will cause premiums to rise, and perhaps to even become unaffordable, resulting in a less efficient health insurance market. Moreover, suboptimal choices, both with respect to the individual or to society, will decrease the market efficiency and negatively affect the health care expenditures. I have provided evidence that basic financial literacy affects the complementary insurance demand positively. This may be because financial literacy people attach greater value to having insurance. Although, making suboptimal choices may have an influence as well, yet further research is needed to determine whether financial knowledge plays a significant role in this. If financial knowledge is related to (not) making suboptimal choices, it can be used as a tool to make the health insurance market more efficient.

To the best of my knowledge, there is no prior empirical research on the effect of financial literacy in the Dutch health insurance market, and moreover, the choices people make. Previous literature already showed that financial literacy is an important factor for making financial decisions in other markets as well. Van Rooij et al. (2011a) showed that financial literacy has a positive effect on stock market participation and Lusardi and Mitchell (2009) find that more financially knowledgeable people are better in retirement planning. This study contributes to the existing literacy by showing that financial literacy also reports significant effects in the Dutch health insurance market. Basic financially literacy results in a lower

probability for opting for a voluntary deductible and a higher probability for taking out complementary insurance. This indicates that basic financial literacy is associated with greater demand for insurance and its coverage. Moreover, advanced financial literacy is also associated with lower voluntary deductible uptake but increases the probability to switch health insurer. Further research is required to determine through which mechanisms financial literacy affects above mentioned decisions, however, we can conclude that once again financial literacy is a prominent factor in making financial decisions. Van Ophem and Berkhout (2009) showed that the Dutch insured do not make a choice as intended by the policy makers: making people more aware of the healthcare costs and reducing overall healthcare expenditures. Financial literacy can be used as an powerful instrument to reach this goal, when the mechanisms are identified. One of these mechanisms is the large-scale of suboptimal choices the Dutch insured make (van Winssen et al., 2015; van Winssen et al., 2016). By investigating whether financial literacy can predict the ones who did (not), the efficiency of the Dutch health insurance can be improved.

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Appendices

A. Health insurance market 2012

Table A1: Supply concerns and health insurers 2012

Concern	Health Insurer	
	AGIS ZORGVERZEKERINGEN N.V.	
	AVERO ACHMEA ZORGVERZEKERINGEN NV	
	DE FRIESLAND ZORGVERZEKERINGEN N.V.	
Achmea	FBTO ZORGVERZEKERINGEN N.V.	
	INTERPOLIS ZORGVERZEKERINGEN NV	
	OZF ACHMEA ZORGVERZEKERINGEN N.V.	
	ZILVEREN KRUIS ACHMEA ZORGVERZEKERINGEN NV	
Achmea		**7**
ASR	ASR BASIS ZIEKTEKOSTENVERZEKERINGEN N.V.	
ASR		**1**
	DELTA LLOYD ZORGVERZEKERING N.V.	
CZ	OHRA ZIEKTEKOSTENVERZEKERINGEN NV	
	OHRA ZORGVERZEKERINGEN N.V.	
	OWM CZ GROEP ZORGVERZEKERAAR UA	
CZ		**4**
DSW-SH	OWM DSW ZORGVERZEKERAAR U.A.	
	OWM STAD HOLLAND ZORGVERZEKERAAR U.A.	
DSW-SH		**2**
Eno	ENO ZORGVERZEKERAAR N.V.	
Eno		**1**
	ANDERZORG N.V.	
Menzis	AZIVO ZORGVERZEKERAAR N.V.	
	MENZIS ZORGVERZEKERAAR N.V.	
Menzis		**3**
ONVZ	ONVZ ZIEKTEKOSTENVERZEKERAAR N.V.	
ONVZ		**1**
	IZA ZORGVERZEKERAAR NV	
	IZZ ZORGVERZEKERAAR N.V.	
	N.V. UNIVÉ ZORG	
VGZ	NV ZORGVERZEKERAAR UMC	
	VGZ ZORGVERZEKERAAR N.V.	
	ZORGVERZEKERAAR CARES GOUDA N.V.	
VGZ		**6**
Zorg&Zekerheid	OWM ZORGVERZEKERAAR ZORG EN ZEKERHEID UA	
Zorg&Zekerheid		**1**
Total: 9		**Total: 26**

Source: Marktscan Zorgverzekeringsmarkt (NZa, 2012)

B. Sample Selection and Descriptive Statistics

Table B1: Sample selection

LISS panel - Study Units[a]		Matched	Loss	N in study
2	Health - wave 6 (2012)	5,780	-	5,780
2	Health - wave 5 (2011)	4,386	-1,394	5,072
68	Financial Literacy	3,938	-448	4,860
38	Measuring Higher Order Risk Attitudes of the General Population[b]	2,082	-1,856	3,457
1	Background variables (November 2011)	2,082	0	11,422
-	Missing observations on dependent/explanatory variables	2,062	-20	-
	Number of observations in final dataset	**2,062**		

Note: each subject of the LISS panel has a unique ID number which has been used for merging the datasets [a] overview of all study units at: https://www.dataarchive.lissdata.nl/study_units/view/1. The number in column 1 corresponds to the study unit number as listed by LISS. [b] the study used for measuring risk aversion. The number in second column lists how many observations are lost due to merging. The reference are the matched cases.

Table B2: Voluntary deductible uptake in 2012

	Before		After	
	Freq.	Percent	Freq.	Percent
No voluntary deductible	1,445	70.08	1,524	73.91
€ 100	47	2.28	52	2.52
€ 200	155	7.52	176	8.54
€ 300	76	3.69	77	3.73
€ 400	13	0.63	14	0.68
€ 500	62	3.01	63	3.06
Don't know	264	12.8	156	7.57
N	2,062		2,062	

Note: the first two columns is the voluntary deductible uptake as reported by the subjects in the Health study of 2012. The two latter columns depicts the voluntary deductible uptake after the "don't know" answers have been compared to the Health study of 2011. This led to a reduction of 108 observations for the "don't know" category.

Table B3: descriptive statistics of the dependent variables

Dependent variable	Mean	Std. Dev	Min	Max	N
Switch of health insurer	0.0917	0.2886	0	1	2,062
Voluntary deductible uptake	0.2004	0.4004	0	1	1,906
Complementary insurance uptake	0.7973	0.4021	0	1	2,062

Note: switch of health insurer is equal to 1 if a subject switched health insurers between 2011 and 2012. The voluntary deductible uptake is equal to 1 if a subject reported a positive voluntary deductible in 2012. The number of observations is smaller for the voluntary deductible because the "don't know" answers are excluded in this table. The complementary insurance uptake is equal to 1 if a subject had a complementary insurance in 2012.

Table B4: descriptive statistics of the explanatory variables in equation (4), used for estimating the switch of health insurer.

Variable	Switch = 0	Switch = 1	t test	All	Min	Max
basic financial literacy	0.88	0.88		0.88	0	1
	(.18)	(.18)		(.18)		
advanced financial literacy	0.36	0.41	**	0.37	0	1
	(.26)	(.26)		(.27)		
risk aversion	3.39	3.50		3.40	0	5
	(1.71)	(1.56)		(1.69)		
inconsistent risk aversion	0.15	0.15		0.15	0	1
	(.36)	(.36)		(.36)		
self-assessed health	3.07	3.23	***	3.08	1	5
	(.71)	(.85)		(.73)		
chronically ill	0.33	0.29		0.33	0	1
	(.47)	(0.46)		(0.47)		
collective insurance	0.61	0.46	***	0.60	0	1
	(.49)	(.50)		(.49)		
Health insurer						
Achmea	0.26	0.21		0.31	0	1
	(.44)	(.41)		(.46)		
CZ	0.19	0.19		0.18	0	1
	(.39)	(.39)		(.39)		
Menzis	0.15	0.15		0.15	0	1
	(.36)	(.36)		(.36)		
VGZ	0.29	0.33		0.28	0	1
	(.45)	(.47)		(.45)		
other	0.11	0.11		0.08	0	1
	(.31)	(.32)		(.27)		
gender (1 = female)	0.51	(.47)		(.51)	0	1
	(.50)	(.50)		(.50)		
age	54.13	(44.38)	***	(53.24)	18	89
	(15.79)	(16.03)		(16.05)		
education	(3.49)	(4.01)	***	(3.54)	0	6
	(1.53)	(1.46)		(1.53)		
partner (1 = yes)	0.75	0.74		0.75	0	1
	(.43)	(.44)		(.43)		
net monthly income	2780.96	2920.99		2793.79	0	13500
	(1371.65)	(1377.02)		(1372.40)		
Number of observations	*1,873*	*189*		*2,062*		

Note: this table reports the descriptive statistics of the explanatory variables denoted in equation (4). The first column depicts the mean of the explanatory variable if the subject did not change health insurer (Switch = 0). The second column presents the mean of the variable if the subject has switched health insurers. Column three denotes the significance of the t test between those means. Column four gives the total sample mean. Standard deviations are in parentheses. ***p<0.01 **p<0.05 *p<0.1 (two-sided test).

Table B5: descriptive statistics of the explanatory variables of equation (5), used for estimating the voluntary deductible choice.

Variable	VD = €0	VD > €0	t test	All	Min	Max
basic financial literacy	0.89	0.87	**	0.88	0	1
	(.17)	(.18)		(.18)		
advanced financial literacy	0.37	0.37		0.37	0	1
	(.27)	(.27)		(.27)		
risk aversion	3.45	3.15	***	3.40	0	5
	(1.68)	(1.75)		(1.69)		
inconsistent risk aversion	0.14	0.17		0.15	0	1
	(.35)	(.38)		(.36)		
self-assessed health	3.03	3.25	***	3.08	1	5
	(.72)	(.76)		(.73)		
chronically ill	0.38	0.24	***	0.34	0	1
	(.48)	(.43)		(.47)		
prescription drugs	0.59	0.39	***	0.53	0	1
	(.49)	(.49)		(.50)		
medical specialists	1.40	0.86	***	1.27	0	45
	(3.17)	(1.92)		(2.98)		
gender	0.51	0.47		0.51	0	1
	(.50)	(.50)		(.50)		
age	55.39	50.29	***	53.24	18	89
	(15.34)	(15.56)		(16.05)		
education	3.45	3.86	***	3.54	1	6
	(1.52)	(1.53)		(1.53)		
partner	0.75	0.70	*	0.75	0	1
	(.43)	(.46)		(.43)		
net monthly income	2717.57	2971.64	***	2793.79	0	13500
	(1245.83)	(1561.64)		(1372.40)		
Number of observations	*1,524*	*382*		*2,062*		

Note: this table reports the descriptive statistics of the explanatory variables denoted in equation (5). The first column depicts the mean of the explanatory variable if the subject has no voluntary deductible (VD). The second column presents the mean of the variable if the subject has a positive voluntary deductible. Column three denotes the significance of the t test between those means. Column four gives the total sample mean, including observations with unknown voluntary deductible. Standard deviations are in parentheses. ***p<0.01 **p<0.05 *p<0.1 (two-sided test).

Table B6: descriptive statistics of the explanatory variables of equation (6), used to estimate the complementary insurance uptake

Variable	CI = 0	CI = 1	t test	All	Min	Max
basic financial literacy	0.85	0.89	***	0.88	0	1
	(.21)	(.17)		(.18)		
advanced financial literacy	0.37	0.37		0.37	0	1
	(.27)	(.26)		(.27)		
risk aversion	3.31	3.43		3.40	0	5
	(1.73)	(1.68)		(1.69)		
inconsistent risk aversion	0.17	0.15		0.15	0	1
	(.38)	(.36)		(.36)		
self-assessed health	3.23	3.05	***	3.08	1	5
	(.78)	(.71)		(.73)		
chronically ill	0.24	0.35	***	0.33	0	1
	(.43)	(.48)		(.47)		
collective insurance	0.59	0.63	***	0.60	0	1
	(.50)	(.48)		(.49)		
dentist visits (2011)	1.00	1.54	***	1.43	0	20
	(1.11)	(1.50)		(1.45)		
gender	0.44	0.53	***	0.51	0	1
	(.50)	(.50)		(.50)		
age	50.81	53.86	***	53.24	18	89
	(18.17)	(15.41)		(16.05)		
education	3.58	3.53		3.54	1	6
	(1.61)	(1.51)		(1.53)		
partner	0.72	0.76		0.75	0	1
	(.45)	(.43)		(.43)		
net monthly income	2820.20	2787.08		2793.79	0	13500
	(1437.10)	(1355.83)		(1372.40)		
Number of observations	*418*	*1,644*		*2,062*		

Note: this table reports the descriptive statistics of the explanatory variables denoted in equation (6). The first column depicts the mean of the explanatory variable if the subject has no complementary insurance (CI). The second column presents the mean of the variable if the subject has taken out complementary insurance. Column three denotes the significance of the t test between those means. Column four gives the total sample mean. Standard deviations are in parentheses. ***p<0.01 **p<0.05 *p<0.1 (two-sided test).

C. Financial literacy questions

1. Suppose you have 100 euros on a savings account and the interest is 2 percent per year. How much do you think you will have on the savings account after five years, assuming that you leave all your money on this savings account: more than 102 euros, exactly 102 euros, less than 102 euros?
    a) more than 102 euros
    b) exactly 102 euros
    c) less than 102 euros
    d) I don't know
    e) I would rather not say

2. Suppose that the interest on your savings account is 1 percent per year and that inflation amounts to 2 percent per year. After 1 year, would you be able to buy more, exactly the same, or less than you could today with the money on that account?
    a) more than today
    b) exactly the same as today
    c) less than today
    d) I don't know
    e) I would rather not say

3. A share in a company usually offers a more certain return than an investment fund that only invests in shares.
    a) True
    b) Not true
    c) I don't know
    d) I would rather not say

4. If the interest rate goes up, what should happen to bond prices?

   a) They should increase

   b) They should decrease

   c) They should stay the same

   d) None of the above

   e) I don't know

   f) I would rather not say

D. Financial literacy indices

Table D1: The relation between subjective and objective financial literacy.

	Oprobit (1)			Oprobit (2)		
Basic financial literacy	0.6877	***	(0.1463)	0.6352	***	(0.1507)
Advanced financial literacy	0.9309	***	(0.1443)	0.8509	***	(0.0955)
Education				0.0032		(0.0171)
Female				-0.1569	***	(0.0491)
Age (scaled)				0.0136		(0.0155)
ln (net income)				-0.0108		(0.0300)
Estimated cut points						
κ_1	-1.4141		(0.1604)	-1.5758		(0.2922)
κ_2	-0.7109		(0.1443)	-0.8724		(0.2788)
κ_3	-0.2250		(0.1397)	-0.3855		(0.2770)
κ_4	0.4844		(0.1385)	0.3263		(0.2771)
κ_5	1.3924		(0.1408)	1.2381		(0.2780)
κ_6	2.5834		(0.1488)	2.4321		(0.2826)
Summary statistics						
Log pseudolikelihood	-3202.99			-3197.05		
Pseudo R^2	0.0216			0.0234		
χ^2	127.51	***		143.59	***	
N	2,062			2,062		

Note: the dependent variable is self-assessed financial literacy, which ranges from 1 (very poor) to 7 (very good). Robust standard errors are reported in the parentheses; ***$p<0.01$ **$p<0.05$ *$p<0.1$. Scaling on age: age=age/10 and age^2 = (age/10)^2

Table D2: Socio-demographics and financial literacy

	Basic financial literacy		Advanced financial literacy	
Education	0.0215	***	0.0439	***
	(0.0028)		(0.0037)	
Gender	-0.0267	***	-0.1237	***
	(0.0078)		(0.0112)	
Age	0.0128	***	0.0124	***
	(0.0028)		(0.0035)	
Partner	0.0119		0.0103	
	(0.0105)		(0.0138)	
ln (net income)	0.0069		0.0039	
	(0.0046)		(0.0088)	
constant	0.6886	***	0.1705	**
	(0.0396)		(0.0677)	
Summary statistics				
F-statistic	18.00	***	71.35	***
R squared	0.049		0.1334	
N	2,062		2,062	

Note: this table shows the results of the OLS regression on basic and advanced financial literacy indices. Robust standard errors are in the parentheses ; ***$p<0.01$ **$p<0.05$ *$p<0.1$. Scaling on age: age=age/10 and age^2 = (age/10)^2

E. Estimation results

Table E1: Probit results for switching health insurer (equation 4)

	Probit (1)		Probit (2)	
Financial Literacy				
Basic financial literacy	-0.0939	(0.2196)	-0.0600	(0.2197)
Advanced financial literacy	0.2800 *	(0.1668)	0.3027 *	(0.1694)
Risk aversion				
Risk aversion	0.0174	(0.0253)	0.0164	(0.0254)
Inconsistent risk aversion	0.1209	(0.1256)	0.0988	(0.1251)
Health				
Self-assessed health (1-5)	0.0915	(0.0609)	0.0992	(0.0603)
Chronically ill	0.1073	(0.0946)	0.1241	(0.0960)
Collective insurance (1 = yes)			-0.2730 ***	(0.0901)
Health Insurer (base level is Achmea)				
CZ			0.0993	(0.1398)
Menzis			0.0905	(0.1493)
VGZ			0.1655	(0.1202)
Other			0.0759	(0.1570)
Personal characteristics				
Female	-0.0756	(0.0826)	-0.0717	(0.0836)
Age	-0.0876	(0.1326)	-0.0197	(0.1361)
Age^2	-0.0091	(0.0137)	-0.0149	(0.0140)
Partner	-0.0745	(0.1032)	-0.0757	(0.1039)
Education (base level is primary)				
secondary education	-0.1541	(0.1729)	-0.1437	(0.1756)
higher secondary education	0.2750	(0.1962)	0.2905	(0.1987)
vocational education	0.0304	(0.1729)	0.0276	(0.1750)
higher vocational education	0.1176	(0.1769)	0.1346	(0.1787)
university	0.2334	(0.2077)	0.2426	(0.2088)
ln (net income)	-0.0080	(0.0486)	-0.0034	(0.0491)
constant	-0.9716 *	(0.5757)	-1.1976 **	(0.5888)
Summary statistics				
Log pseudolikelihood	-589.27		-582.71	
Pseudo R²	0.0672		0.0776	
χ²	79.44 ***		93.47 ***	
Percentage correctly predicted	90.83%		90.83%	
N	2,062		2,062	

Note: In this table the estimated probit coefficients for switching health insurer are reported. Robust standard errors are in the parentheses: ***p<0.01 **p<0.05 *p<0.1 (two -sided test).

Table E2: Probit results for voluntary deductible choice (equation 5)

	Probit (1)			Probit (2)		
Financial Literacy						
Basic financial literacy	-0.4345	**	(0.1865)	-0.4279	**	(0.1857)
Advanced financial literacy	-0.2438	*	(0.1349)	-0.2298	*	(0.1344)
Risk aversion						
Risk aversion	-0.0514	**	(0.0203)	-0.0534	***	(0.0203)
Inconsistent risk aversion	0.1163		(0.0939)	0.1119		(0.0932)
Health						
Self-assessed health (1-5)	0.0979	*	(0.0528)	0.1372	***	(0.0517)
Chronically ill	-0.1100		(0.0862)	-0.1930	**	(0.0815)
Medical specialist visits 2011	-0.0171		(0.0146)			
Prescription drugs (1 = yes)	-0.2249	***	(0.0807)			
Personal characteristics						
Female	-0.0552		(0.0695)	-0.0679		(0.0694)
Age	0.0483		(0.1294)	0.0658		(0.1292)
Age^2	-0.0101		(0.0129)	-0.0144		(0.0128)
Partner	-0.1485	*	(0.0837)	-0.1556	*	(0.0832)
Education (base level is primary)						
secondary education	0.0116		(0.1395)	0.0164		(0.1390)
higher secondary education	0.0196		(0.1752)	0.0276		(0.1745)
vocational education	0.1673		(0.1438)	0.1631		(0.1433)
higher vocational education	0.2468	*	(0.1430)	0.2551	*	(0.1425)
university	0.4778	***	(0.1699)	0.4789	***	(0.1701)
ln (net income)	-0.0104		(0.0511)	-0.0054		(0.0510)
constant	-0.2371		(0.5412)	-0.4628		(0.5372)
Summary statistics						
Log pseudolikelihood	-903.61			-908.28		
Pseudo R²	0.0537			0.0488		
χ²	86.83	***		76.31	***	
N	1,906			1,906		

Note: In this table the estimated probit coefficients for taking out a positive voluntary deductible are reported. Robust standard errors are in the parentheses: ***p<0.01 **p<0.05 *p<0.1 (two -sided test).

Table E3: Probit results for complementary insurance uptake (equation 6)

	Probit (1)			Probit (2)		
Financial Literacy						
Basic financial literacy	0.5292	***	(0.1781)	0.5665	***	(0.1793)
Advanced financial literacy	0.0478		(0.1368)	0.0810		(0.1363)
Risk aversion						
Risk aversion	0.0163	**	(0.0198)	0.0175		(0.0196)
Inconsistent risk aversion	-0.0867		(0.0944)	-0.0511		(0.0923)
Health						
Self assesed health (1-5)	-0.1361	***	(0.0515)	-0.1373	***	(0.0499)
Chronically ill	0.1609	**	(0.0820)	0.1626	**	(0.0801)
Collective insurance (1 = yes)	0.2843	***	(0.0701)	0.2975	***	(0.0693)
Dentis visits	0.1851	***	(0.0353)			
Personal characteristics						
Female	0.1651	**	(0.0678)	0.2175	***	(0.0658)
Age	0.3742	***	(0.1157)	0.4282	***	(0.1166)
Age^2	-0.0348	***	(0.0113)	-0.0395	***	(0.0114)
Partner	0.0981		(0.0849)	0.1091		(0.0841)
Education (base level is primary)						
secondary education	0.1746		(0.1252)	0.1947		(0.1262)
higher secondary education	0.0587		(0.1563)	0.1029		(0.1561)
vocational education	0.1506		(0.1308)	0.1825		(0.1322)
higher vocational education	0.1055		(0.1322)	0.1697		(0.1333)
university	-0.1070		(0.1593)	-0.0181		(0.1588)
ln (net income)	-0.0166		(0.0454)	-0.0139		(0.0451)
constant	-0.7374		(0.4980)	-0.7984		(0.4939)
Summary statistics						
Log pseudolikelihood	-962.89			-984.89		
Pseudo R²	0.0737			0.0526		
χ²	121.21	***		99.27	***	
N	2,062			2,062		

Note: In this table the estimated probit coefficients for taking out complementary insurance are reported. Robust standard errors are in the parentheses; ***p<0.01 **p<0.05 *p<0.1 (two -sided test).

F. Robustness checks

Table F1: Probit results for deductible choice with self-assessed financial literacy and the number of total correct answers as an index for financial literacy. Average Marginal Effects are reported

	Probit (1)			Probit (2)		
Financial Literacy: Self-assessed				-0.0177	**	(0.0074)
Financial Literacy: # Correct responses	-0.0302	***	(0.0097)			
Risk aversion	-0.0145	***	(0.0053)	-0.0143	***	(0.0054)
Inconsistent risk aversion	0.0283		(0.0248)	0.0386		(0.0247)
Self-assessed health (1-5)	0.0372	***	(0.0136)	0.0396	***	(0.0137)
Chronically ill	-0.0536	**	(0.0213)	-0.0554	***	(0.0213)
Female	-0.0207		(0.0183)	-0.0136		(0.0179)
Age (scaled)	0.0201		(0.0344)	0.0182		(0.0348)
Age^2 (scaled)	-0.0041		(0.0034)	-0.0040		(0.0034)
Partner	-0.0403	*	(0.0218)	-0.0433	**	(0.0219)
Education (base level is primary)						
secondary education	0.0053		(0.0326)	0.0015		(0.0339)
higher secondary education	0.0124		(0.0417)	-0.0008		(0.0422)
vocational education	0.0454		(0.0350)	0.0359		(0.0358)
higher vocational education	0.0736	*	(0.0351)	0.0535		(0.0357)
university	0.1494	***	(0.0484)	0.1156	**	(0.0474)
ln (net income)	-0.0025		(0.0138)	-0.0040		(0.0136)
Summary statistics						
Log pseudolikelihood	-906.51			-908.41		
Pseudo R²	0.0506			0.0487		
χ²	80.49	***		77.05	***	
N	1,906			1,906		

Note: the dependent variable is voluntary deductible choice. Robust standard errors are reported in the parentheses: ***p<0.01 **p<0.05 *p<0.1. Scaling on age: age=age/10 and age^2 = (age/10)^2

Table F2: Ordered probit estimation results on voluntary deductible choice

	Ordered probit		
Basic financial literacy	-0.3400	**	(0.1687)
Advanced financial literacy	-0.1750		(0.1305)
Risk aversion	-0.0384	**	(0.0191)
Inconsistent risk aversion	0.0890		(0.0861)
Self-assessed health (1-5)	0.1468	***	(0.0462)
Prescription drugs	-0.2591	***	(0.0729)
Female	-0.0748		(0.0657)
Age (scaled)	0.0526		(0.1257)
Age^2 (scaled)	-0.0117		(0.0123)
Partner	-0.1326	*	(0.0783)
Education (base level is primary)			
secondary education	0.0208		(0.1282)
higher secondary education	0.0657		(0.1662)
vocational education	0.1392		(0.1319)
higher vocational education	0.2743	**	(0.1310)
university	0.5149	***	(0.1579)
ln (net income)	0.0063		(0.0469)
Estimated cut points			
κ_1	0.6890		(0.4992)
κ_2	0.7957		(0.4985)
κ_3	1.2790		(0.4975)
κ_4	1.6528		(0.5030)
κ_5	1.7533		(0.5045)
Summary statistics			
Log pseudolikelihood	-1421.32		
Pseudo R^2	0.0384		
χ^2	99.89	***	
N	1,906		

Note: the dependent variable is voluntary deductible choice, which ranges from €0 to €500. Robust standard errors are reported in the parentheses; ***p<0.01 **p<0.05 *p<0.1. Scaling on age: age=age/10 and age^2 = (age/10)^2