What is the influence of a deductible on healthcare use?

An analysis of the behaviour of individuals concerning health insurance deductibles in The Netherlands

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This thesis analysed the behaviour of individuals concerning health insurance deductibles in The Netherlands. Three separate analyses have been performed. Firstly, a cross-section analysis researched the effect of having an increased voluntary deductible on care avoidance. Secondly, the effect of a health shock on the change in an individual's voluntary deductible over time has been researched. Thirdly, the effect of the increments in the mandatory deductible over several years on medical specialist visits has been studied. The used data is derived from the "Gezondheidsenquête" (Health Survey) 2010-2013 collected by the Dutch Central Bureau for Statistics (CBS) and the LISS (Longitudinal Internet Studies for the Social sciences) panel administered by CentERdata (Tilburg University, The Netherlands). The conclusion is that having a voluntary deductible does affect a person's healthcare behaviour. The three effects found are: 1. Having a voluntary deductible is associated with an increase in the probability of care avoidance, however due to limitations of the data causality cannot be proven. 2. A health shock decreases the amount of the voluntary deductible. 3. The increments of the mandatory deductible by the Dutch government is not significantly associated with a change in the probability of care avoidance in 2013 compared to 2010.

1 Introduction

Prior to last years' Dutch general elections there was much discussion about the amount of the deductible for the mandatory health insurance in The Netherlands. It was one of the most discussed issues during the elections. Some parties argued that the presence of a deductible caused avoidance of healthcare by the poor. Jeroen Dijsselbloem, former Minister of Finance, stated in a debate that people forego healthcare because of the presence of a deductible (AD, 2016). He advocates removing a mandatory deductible for health insurance. The former Minister of Health, Edith Schippers, did not agree with the Minister of Finance. She argued that there was no evidence of people foregoing healthcare due to an increasing deductible.

In The Netherlands basic healthcare insurance is mandatory for every adult. This insurance contains a mandatory deductible. The amount of the mandatory deductible is set each year and can be increased. As seen as in figure 1 the amount of the mandatory deductible has increased over the years. It went from €160 in 2010 to €385 in 2016. Although 73% of the Dutch population is not against a mandatory deductible more than half of them is against a further increase of it (TNS-NPO, 2016). Due to the many debates concerning the amount of the deductible the newly formed government promises that it will freeze the amount of the deductible until 2021 (Rijksoverheid, 2017).
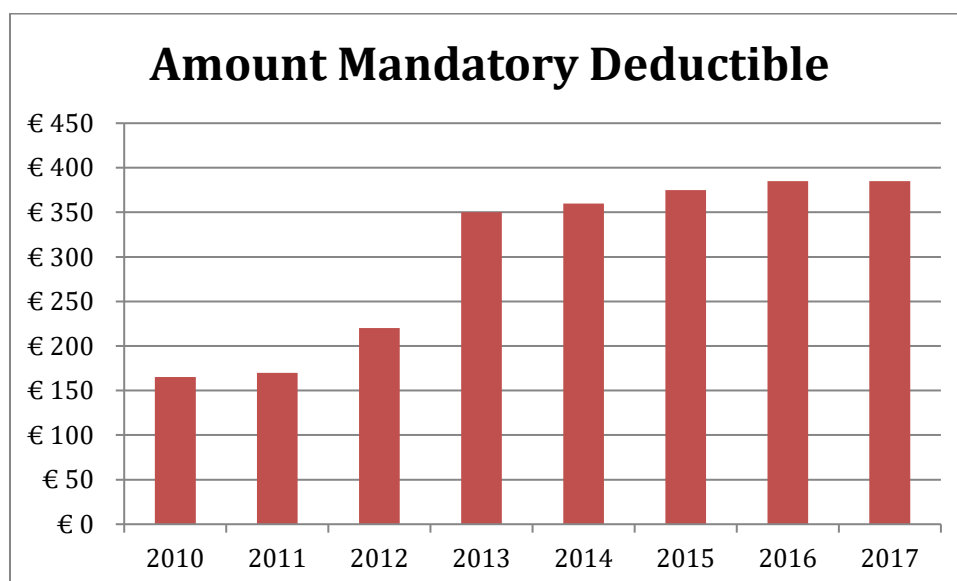

Figure 1: Amount of the mandatory deductible in the Netherlands

The implementation of the deductible in The Netherlands had three desired effects (ESB, 2018). Firstly, it is meant as an instrument to finance the ever-rising healthcare costs. As of 2015 the deductible raises roughly three billion euro a year. Secondly, it is used to steer patients to the best and cheapest hospitals. Thirdly, a deductible has been implemented to decrease unnecessary healthcare usage, thus to counteract moral hazard. A deductible results in price sensitive consumers and it reduces economic inefficiencies that are present in healthcare use. The Dutch Ministry of Health estimated that healthcare costs are €650 million lower due to people foregoing healthcare because of occurring costs. A deductible reduces the risk of moral hazard that could prevail when one does not face the costs healthcare use. One of the downsides of a deductible is that it could lead to individuals avoiding healthcare because of the potential high costs that occur when one visits a medical specialist. This possible foregoing of healthcare lead to the many debates concerning the amount of the deductible and to the discussions if there should be a deductible in the first place.

To counteract moral hazard even more insured individuals in The Netherlands have the possibility to make use of a voluntary deductible. This deductible is on top of the mandatory deductible. With a voluntary deductible people have the option to increase their deductible in levels of €100 up to an increase of €500 per year. In return for this they will get a premium rebate on their insurance premium of roughly 50% of the increased amount. As of 2017 the total deductible (the combination of the mandatory and voluntary deductible) can range from €385 to €885. The percentage of Dutch insured with a voluntary deductible increased from 6% in 2010 to more than 12% in 2017 (DNB, 2017). In 2017 72% of them opted for the maximum level of €500, which means that their total deductible was €885. This type of deductible is getting more and more popular in The Netherlands. But there is also much debate concerning this option. The CEO of Dutch insurer DSW wrote in an open letter to the Ministry of Health that it is unfair that a healthy person can financially benefit by increasing their voluntary deductible (Oomen, 2017). He stated that the people for who it is not beneficial to choose such a deductible finance this benefit. He estimated that by abolishing the voluntary deductible the insurance premium can be decreased by €20 or the mandatory deductible can be decreased by €50. The Dutch Central Planning Bureau (CPB) has found no evidence that voluntary deductibles impact the risk solidarity (CPB, 2016).

While there is much discussion about the benefit and solidarity of mandatory and voluntary deductibles there is little research on how they impact an individual's decision. There are still many questions to discuss left such as; could a voluntary deductible incentivize a person to avoid healthcare? Or what influences one's decision to choose the amount of the voluntary deductible? Or did the rise of the mandatory deductible make people forego treatment?

All these questions lead to the question how a deductible affects one's healthcare behaviour. More precise: What is the influence of the amount of a deductible on healthcare behaviour?

The following needs to be considered to get an answer to the question. As a deductible in The Netherlands consists of a mandatory and voluntary component the effect of both parts on healthcare visits has to be researched. However, given the voluntary component of the deductible it is possible that a person adjusts his deductible according to his expected healthcare use. The possibility exists that both the deductible and the (expected) healthcare use influence each other. There could be a case of simultaneity. To get a good indication of this there will be analysed if a healthy person suffering a health shock will adjust his voluntary deductible in the next period. To get an even clearer picture of the effect of a deductible on healthcare use the effect of the increments in the mandatory deductible will also be analysed. For this component people do not have to option to adjust their deductible according to their expected healthcare needs.

Deductible ⟷ **Healthcare Use**

Simultaneity

This leads to the following sub-questions:

1. What is the influence of having a voluntary deductible on an individual's decision to avoid healthcare?
2. How does a health shock influence a person's voluntary deductible choice?
3. How do increments in the mandatory deductible affect medical specialist visits?

In the next chapter the relevant literature concerning moral hazard, healthcare behaviour and (voluntary) deductibles will be described.

For the first sub-question (chapter 3) data from the Health Survey collected by the CBS will be used. A probit regression will be estimated to estimate the influence of having a voluntary deductible on the probability of an individual not going to a medical specialist given that he is suffering a condition.

For the second sub-question (chapter 4) data from the LISS panel will be used. A fixed-effects estimator will be used to research if and to what extent a person suffering a health shock adjusts his voluntary deductible in the next possible period.

For the third sub-question (chapter 5) data from both the LISS panel and the Health Survey will be used. In the first analysis a fixed-effects logit model, using data from the LISS panel, will be used to analyse if the increments of the mandatory deductible by the Dutch government affected the probability of a person visiting a medical specialist. In the second analysis a probit regression, using the Health Survey, will be used to estimate the effect of the same mandatory deductible on the probability of avoiding care.

As there are three separate sub-questions with two datasets the data, methodology and results will be described separately for each sub-question.

After researching the three sub-questions a overall conclusion will be drawn. Also the limitations of this research will be described.

2 Literature

One of the biggest issues in health insurances is the risk of moral hazard. It is desired that insurances do not affect the incentives of the insured (Arrow, 1963). It is desired that the event against which insurance is taken be out of control of the insured individual. In health the risk of getting ill could be uncontrollable but the probability can be influenced by one's behaviour. If the medical spending of a person is partly or fully paid for by others by making use of insurance then it could result in him consuming more medical care than if he had to pay for the care himself (Cutler & Zeckhauser, 2000). He could overspend. In the case of mandatory and voluntary deductibles moral hazard could arise if a person reaches the threshold of his deductible. After reaching the threshold a person does not have the incentive anymore to keep his medical spending in bounds, thus could utilize more healthcare than he would otherwise have.

There are two fundamental researches for the effect of healthcare prices on the usage of healthcare: the RAND Health Insurance Experiment and the Oregon Health Insurance Experiment.

The RAND Experiment (Newhouse et al., 1987) is one of the fundamental researches of proving that health spending of an individual is affected by the out-of-pocket price of healthcare. In the RAND Experiment families were randomly assigned to one of six plans with different coinsurance rates to see how the plans affected their usage of healthcare. The results showed that (at the time) the price elasticity of demand for medical spending was – 0.2. This showed that health spending of an individual does respond to the out-of-pocket price of healthcare. It was one of the first researches that showed the presence of moral hazard in healthcare.

The Oregon Health Insurance Experiment is one of the other fundamental researches of showing the effect of different levels of co-payments on healthcare usage (Finkelstein et al., 2012). In this experiment uninsured low-income adults in Oregon were randomly selected and were given the chance to apply for Medicaid. This experiment showed that individuals

who were covered by Medicaid, opposed to individuals without coverage, had higher healthcare utilization, lower out-of-pocket healthcare spending and medical debt and better self reported health.

Goldberg et al. (2017) researched the effects of the employees of a large self-insured firm going from a free healthcare plan to a nonlinear high-deductible plan. This caused a spending reduction between 11.8% and 13.8%. They divided the spending reductions into consumer price shopping, quantity reductions and quantity substitutions. The spending reduction was mainly due to a reduction in healthcare consumption by consumers. They found reduced consumer consumption for different types of care such as low-value care and free preventive high-value care. This consumption reduction mostly occurred when consumers were still under the deductible. Their regression found that consumers reduce spending by 42% while under the deductible and that consumers also reduced spending by 10% if they ended the previous year under the deductible. This indicates that consumers adjust their behaviour according to their experience of the previous year.

Van Winssen et al. (2014) found that 48% of the Dutch insured would be financially better off if they opted for the maximum voluntary deductible of €500, while only 11% of the Dutch insured opted for a voluntary deductible in 2014.

Netherlands institute for health services research (NIVEL) researched the nature and magnitude of avoidance of healthcare in The Netherlands (2015). The Dutch Ministry of Health, Welfare and Sport commissioned this research. NIVEL divided avoiding healthcare into two categories. The first category is individuals foregoing visiting a general practitioner (GP). The second category contains individuals who do not follow through on referrals by the GP. NIVEL found that of the 2270 respondents 15% considered going to a GP but did not go. 53% did not go because they expected their symptoms or illness to improve over time. 21% foregone a visit to the GP due to (potential) costs. 27% of the people who have got a referral from a GP did not follow through on it. 52% of them did not do so due to cost concerns. NIVEL found a significant relationship between respondents foregoing healthcare due to cost concerns and their financial status and age group.

Dutch research agency TNS-NIPO did a research, commissioned by Dutch insurer VGZ, about healthcare behaviour of the Dutch concerning the deductible that is present in health insurances. 19% of the 812 respondents said that they postponed or foregone healthcare in the first 7 months of 2016. Half of them reported they postponed or foregone seeing a GP or medical specialist due to the deductible costs. A quarter reported they did not go because they could not afford the deductible costs. 56% of the respondents who said they postponed or foregone healthcare eventually still went to see a GP or medical specialist. This means that roughly 8% of the respondents foregone healthcare.

Most of the existing literature on cost-sharing in Health Economics is focused on American health insurances. Articles such as Baicker & Goldman (2011) focus on the effect of American insurance designs on healthcare utilization by reviewing several articles. The main issues with articles like these are that they are not applicable to the Dutch health insurance system. In the United States most health insurances have higher deductibles than in The Netherlands and, on top of that, they have another cost-sharing component after fulfilling the deductible. Cases such as substitution of service are less relevant in The Netherlands due to the relatively low deductible threshold. In contrast to the American insured the Dutch insured do not face any costs anymore after reaching this threshold. The small amount of articles about health insurance systems, such as in The Netherlands, could be due to the few number of countries that have a system with a mandatory and voluntary component. In the Netherlands most articles are about the effect of the amount mandatory deductible on the likelihood of avoiding health care. Limited research has been conducted on the effects of the voluntary deductible. This research will contribute to the existing literature by clarifying more about the behaviour of individuals with a voluntary deductible and the effect of a person's health on his decision to choose or alter his voluntary deductible.

3 Effect of voluntary deductible on care avoidance

3.1 Data

The data for the first of the three sub-questions in this research is taken from the Gezondheidsenquête (Health Survey) collected by the Dutch Central Bureau for Statistics. The Gezondheidsenquête is conducted to give an overview of the developments, medical contacts, lifestyle and preventive behaviour of the Dutch population. The survey is conducted annually since 1981. Every year there is a sample size of roughly 15.000 people with a response rate of about 60-65% that results in a sample size of roughly 9.500 respondents.

In the survey respondents are asked if they make use of a voluntarily increased deductible for their basic health insurance. Respondents were also asked if they suffer or have suffered fourteen different health conditions. If they did they were asked if they went to visit a GP or medical specialist for that condition. Besides this there is relevant information about the age, education and employment of respondents.

This research will use the Gezondheidsenquête waves from 2010 until 2013. These years are chosen because these are the only years where information about the voluntary deductible of respondents is present. As GP visits in The Netherlands are exempted from deductible payments only medical conditions where it was likely that patients would have to visit a medical specialist will be used for this research. After consultation with a medical specialist five conditions for which a medical specialist visit are likely were chosen. These five conditions were: vasoconstriction, psoriasis, indigestion, osteoarthritis and rheumatoid arthritis.

After merging the data from all four years, making a dummy for each year and dropping all respondents without an observation for the question if they have a voluntary deductible and dropping all respondents who did not suffer one of the five conditions 5.489 observations are left. Subsequently a care avoider variable is created. A respondent gets marked as a care

avoider if he or she did not go to a GP or medical specialist given that they were suffering one of these conditions.
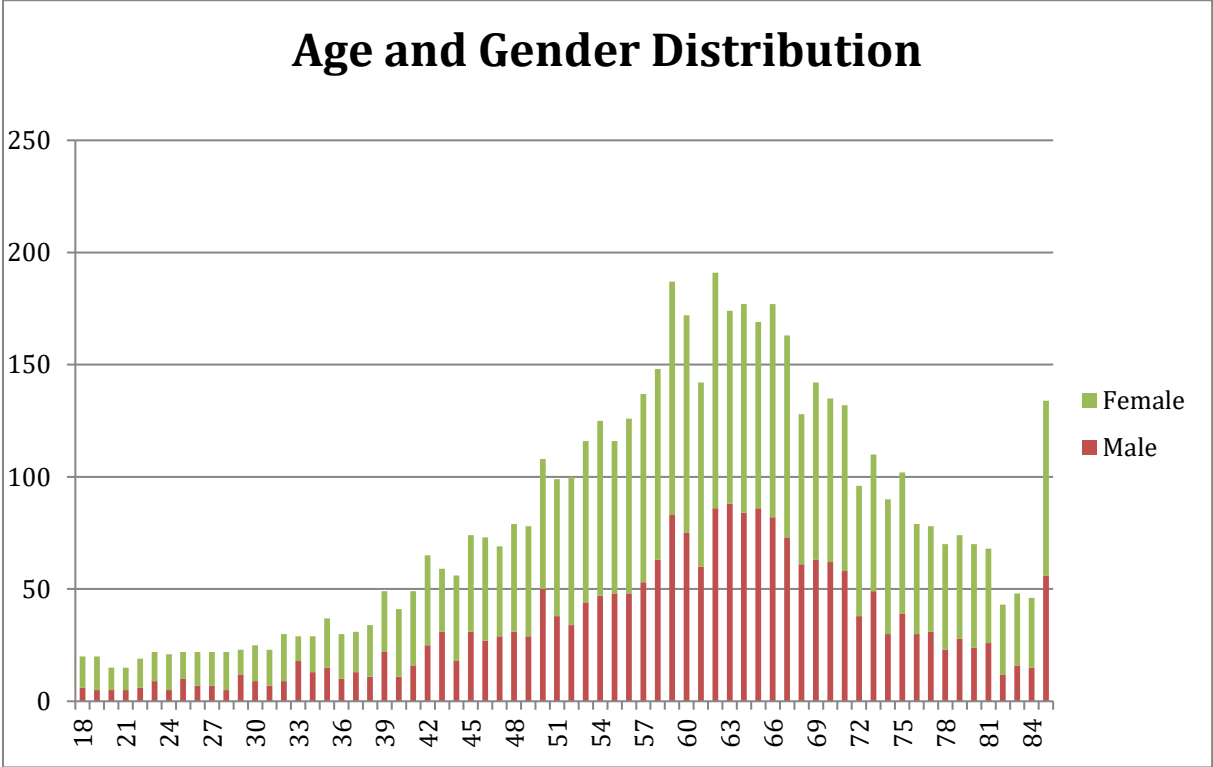
Figure 2: Age and gender distribution of the Health Survey

Of the observations 59% is female. The mean age is 59.48 (note: 85+ older group no specific age). 41.3% of them are male and the remaining 58.7% is female. 36.9% works more than 12 hours a week, 4.3% works 1 to 11 hours a week and 58.8% does not work at all.

The table below shows, per condition, the proportion of the observations that is affected by each condition and if they were affected what percentage of them went to see a GP or medical specialist (note: proportions combined do not have to be 100%, individual can suffer several conditions).

	Vasoconstriction	Psoriasis	Indigestion	Arthritis	Chronic Arthritis
Proportion of total observations	10,0%	12,8%	16,9%	66,3%	23,8%
Visited GP or Medical Specialist	61,5%	42,8%	66,5%	51,7%	68,7%
Did not visit GP or Medical Specialist	38,5%	57,2%	33,5%	48,3%	31,3%

Table 1: proportion of affected per condition

49.1% of the respondents are marked as a care avoider, which means that they did not visit a GP or medical specialist at least one time given that they had one or more of the five conditions.

11% of the respondents have a voluntary deductible on top of the mandatory deductible for their health insurance premium. 85.2% of them did not. 1.9% refused to answer the question and the remaining 1.9% did not know whether they had a voluntary deductible.

3.2 Methodology

3.2.1 First analysis

A probit regression will be used to analyse the influence of having a voluntary deductible on care avoidance. An individual is marked as a care avoider if he did not go to a GP or medical specialist at least once given that he was suffering a condition. There will be controlled for age, gender, employment, education and year of the survey to reduce the effect of confounding variables. Subsequently there will be a probit model estimated per condition to analyse if and how individuals change their behaviour based on the condition they suffer. As the chosen conditions in this data set are mostly chronic conditions there could be a case of reverse causality in this analysis. An individual could adjust his voluntary deductible according to the expected needs caused by the condition. The second and third sub-question makes use of longitudinal data, which reduces the risk of reverse causality.

In the survey there are questions about five conditions for which it is likely that people have to visit a medial specialist, after getting a follow through from a GP. These five conditions were: vasoconstriction, psoriasis, indigestion, osteoarthritis and rheumatoid arthritis. Vasoconstriction is the narrowing (constriction) of blood vessels by small muscles in their walls. When blood vessels constrict, blood flow is slowed or blocked (MedlinePlus, 2017). Psoriasis is a skin condition that causes red, flaky, crusty patches of skin covered with silvery scales (NHS, 2015). Indigestion (dyspepsia) is a general term for pain or discomfort felt in the stomach and under the ribs (NHS, 2016). Osteoarthritis (OA) is the most common chronic condition of the joints. It occurs when the cartilage or cushion between joints breaks down leading to pain, stiffness and swelling (Arthritis Foundation, 2017). Rheumatoid arthritis is an autoimmune disease in which the body's immune system, which normally protects its health by attacking foreign substances like bacteria and viruses, mistakenly attacks the joints (Arthritis Foundation, 2017).

An important remark to make is that if associations between having a voluntary deductible and care avoidance are found it does not necessarily mean that this is a causal relationship. It is important to make a distinction between the need of healthcare and the different individual characteristics of an individual. For example someone who chooses a voluntary

deductible could be more risk loving and can be less inclined to visit a GP or medical specialist if he is suffering a condition. Or he could expect that his healthcare use will not exceed the mandatory deductible of €385.

3.2.2 Second analysis

A second analysis will be done to examine how individuals with a voluntary deductible behave if they suffer a condition for which they only have to visit a GP. This is exempted from the mandatory and voluntary deductible. This additional analysis will be done because one would expect that there should be no significant effect. If a significant effect is found it could imply that other factors, such as in the previous paragraph described, also affect the decision of a person with a voluntary deductible. Such a result could indicate that one cannot directly compare individuals with and without a voluntary deductible. Same as for the main analysis a probit model will be estimated to analyse this.

For the additional analysis medical conditions were chosen for which an individual could see a GP. In the survey respondents were asked if they suffered a "short term" condition in the past two months and, if they did, if they went to see a GP for that condition. For this analysis only conditions were selected for which it is likely to visit a GP. These conditions were: common cold, flu, laryngitis and sinusitis, acute bronchitis and pneumonia, infection or inflammation of kidney, bladder or urinary tract, otitis and ulcer. Similar to the main analysis an individual will get marked as a care avoider if he does not go to see a GP given that he has a condition at least once.

3.3 Results

3.3.1 First analysis

A first simple probit estimation (table 2) shows that having a voluntary deductible, compared to not having a voluntary deductible, is associated with an increase in the probability of care avoidance. This is significant at a 1% level.

A second model (table 2) with the categorical variables age (categories 18-44, 45-64, 65-74 and 75+), gender, education and employment added also shows that having a voluntary deductible is associated with an increase in the probability of care avoidance. It also estimates that being higher educated (note: higher educated is HBO+), compared to only having basic education is associated with an increase in the probability of care avoidance. This is significant at a 1% level. Additionally working only 1-11 hours per week, compared to working 12+ hours per week, is associated with a decrease in the probability of care avoidance. This is significant at a 5% level. Belonging to the age category of 65-74, compared to being a young adult (18-39), is associated with an increase in the probability of care avoidance. This is significant at a 5% level. There is also a year effect for the year 2013, compared to the base year 2010, that increases the probability of care avoidance. This is significant at a 5% level. The effect of this year could be due to the sudden increase in the mandatory deductible. It increased from €165 in 2010 to €350 in 2013.

The Wald test is significant at a 1% level. The newly added variables are jointly significant. The coefficients are jointly significant different from zero. Including education, gender, employment and age categories to the model results in an improvement of the fit of the model.

The margins estimation (table 3) shows that, on average, having a voluntary deductible, compared to not having one, is associated with an 8.6 percentage point increase in the probability of avoiding care. Being higher educated, compared to having done only basic education, is, on average, associated with a 7.5 percentage point increase in the probability of avoiding care. Working 1-11 hours per week, compared to working 12+ hours per week, is, on average, associated with an 8.7 percentage point decrease in the probability of avoiding care.

	First Analysis				Second Analysis			
	Simple Model		Complete Model		Simple Model		Complete Model	
	Coefficients	T-value	Coefficients	T-value	Coefficients	T-value	Coefficients	T-value
Voluntary Deductible	0.224***	(4.10)	0.216***	(3.92)	0.192***	(4.61)	0.115**	(2.70)
No Voluntary Deductible	0	(.)	0	(.)	0	(.)	0	(.)
2010	0	(.)	0	(.)	0	(.)	0	(.)
2011	0.0559	(1.15)	0.0540	(1.10)	0.0111	(0.28)	-0.000853	(-0.02)
2012	0.0704	(1.46)	0.0693	(1.43)	0.0537	(1.40)	0.0442	(1.12)
2013	0.0892	(1.84)	0.0952	(1.93)	0.0589	(1.54)	0.0403	(1.02)
Primary School			0	(.)			0	(.)
VMBO or MBO 1			0.0118	(0.22)			0.0613	(1.18)
Havo, VWO or MBO 2+			0.00232	(0.04)			0.148**	(2.91)
HBO or WO			0.192**	(3.21)			0.379***	(7.21)
Unknown			0.452***	(3.71)			0.166	(1.63)
Male			0	(.)			0	(.)
Female			-0.0410	(-1.14)			-0.200***	(-6.88)
Works 12+ hours			0	(.)			0	(.)
Works 1-11 hours			-0.180	(-1.85)			0.150*	(2.23)
Unemployed			-0.0794	(-1.63)			-0.126**	(-3.17)
Retired			-0.0452	(-0.35)			0.0119	(0.10)
18-39 years old			0	(.)			0	(.)
40-64 years old			0.109	(1.75)			-0.247***	(-7.12)
65-74 years old			0.167	(1.23)			-0.552***	(-4.77)
75+ years old			0.154	(1.06)			-0.774***	(-5.99)
Constant	-0.0994**	(-2.92)	-0.209*	(-2.51)	0.643***	(23.71)	0.863***	(14.22)
Number of observations	5278		5240		9907		9706	

Table 2: Probit estimations of first and second analysis.   *Note: T-statistics in parentheses   * p<0.05, ** p<0.01, *** p<0.001*

For the conditions psoriasis and osteoarthritis there was a significant association between having a voluntary deductible and avoiding care. Having a voluntary deductible is associated with a decrease on the probability of seeing a GP or medical specialist for psoriasis and arthritis. The average marginal effect decrease for psoriasis is -11.38 (P<0.05) percentage points. For arthritis it is -7.63 (P<0.01) percentage points. While this analysis shows that there is an observed significant association between having a voluntary deductible and care avoidance it is not possible to conclude that this is a causal effect due to possible reverse causality implications. However it shows that there is evidence that something is happening. The second and third analysis will further analyse the workings and behaviour concerning individuals, health and voluntary deductibles.

3.3.2   Second analysis

Here will be analysed if there is an association between a person having a voluntary deductible and not going to a GP, opposed to not going to a medical specialist in the main analysis, given that the person has a condition. A first simple model (table 2) shows a significant positive association between having a voluntary deductible and care avoidance (P<0.01). To get a more comprehensive model there is controlled for the same factors as in the main analysis (table 2). For this model the conclusion remains the same. It is estimated that having a voluntary deductible is associated with an increase of the probability of avoiding a GP, given that the individual has one of the conditions, by 3.35 percentage points (P<0.01)

The Wald test is significant at a 1% level. The newly added variables are jointly significant different from zero.

When looking more specific at each condition(s) on its own (table 4) there is a significant positive association between having a voluntary deductible and not going to a GP, given suffering the condition, for: common cold, flu, laryngitis (P<0.01) and sinusitis, acute bronchitis and pneumonia (P<0.05) and otitis (P<0.05).

	First Analysis		Second Analysis	
	dy/dx	T-value	dy/dx	T-value
Voluntary Deductible	0.0853***	(3.95)	0.0335**	(2.78)
No Voluntary Deductible	0	(.)	0	(.)
Primary School	0	(.)	0	(.)
VMBO or MBO 1	0.00466	(0.22)	0.0204	(1.17)
Havo, VWO or MBO 2+	0.000919	(0.04)	0.0479**	(2.84)
HBO or WO	0.0759**	(3.22)	0.114***	(6.79)
Unknown	0.176***	(3.86)	0.0536	(1.68)
Male	0	(.)	0	(.)
Female	-0.0162	(-1.14)	-0.0595***	(-6.94)
Works 12+ hours	0	(.)	0	(.)
Works 1-11 hours	-0.0708	(-1.86)	0.0421*	(2.32)
Unemployed	-0.0314	(-1.63)	-0.0389**	(-3.10)
Retired	-0.0179	(-0.35)	0.00352	(0.10)
18-39 years old	0	(.)	0	(.)
40-64 years old	0.0431	(1.75)	-0.0684***	(-7.21)
65-74 years old	0.0658	(1.24)	-0.170***	(-4.40)
75+ years old	0.0609	(1.06)	-0.253***	(-5.46)
2010	0	(.)	0	(.)
2011	0.0213	(1.10)	-0.000259	(-0.02)
2012	0.0274	(1.43)	0.0132	(1.12)
2013	0.0376	(1.94)	0.0121	(1.02)
Number of observations	5240		9706	

*T-statistics in parentheses * p<0.05, ** p<0.01, *** p<0.001*

Table 3: Margins estimations of first and second analysis

	Vasoconstriction	Psoriasis	Indigestion	Osteoarthritis	Rheumatoid Arthritis
Voluntary Deductible	-0.150	0.294*	0.162	0.194**	0.0752
	(-0.82)	(2.07)	(1.06)	(2.81)	(0.65)
No Voluntary Deductible	0	0	0	0	0
Primary School	0	0	0	0	0
VMBO or MBO 1	-0.0295	0.381*	-0.235	0.0460	-0.0245
	(-0.19)	(2.00)	(-1.61)	(0.71)	(-0.23)
Havo, VWO or MBO 2+	0.00320	0.257	-0.164	0.0424	0.00647
	(0.02)	(1.43)	(-1.15)	(0.63)	(0.06)
HBO or WO	0.122	0.433*	0.0233	0.257***	0.147
	(0.63)	(2.28)	(0.15)	(3.50)	(1.11)
Unknown	0.868**	1.050*	-0.168	0.468***	0.586*
	(2.63)	(2.18)	(-0.53)	(3.29)	(2.30)
Male	0	0	0	0	0
Female	0.0701	0.0621	0.213*	-0.0806	-0.110
	(0.58)	(0.60)	(2.17)	(-1.81)	(-1.41)
Works 12+ hours	0	0	0	0	0
Works 1-11 hours	-0.358	-0.405	-0.465	-0.0566	-0.213
	(-1.13)	(-1.50)	(-1.81)	(-0.46)	(-0.94)
Unemployed	-0.217	-0.324*	-0.139	-0.115	0.189
	(-1.19)	(-2.31)	(-1.18)	(-1.89)	(1.86)
Retired	-0.176	0.295	-0.493	-0.135	-0.0814
	(-0.40)	(0.88)	(-1.01)	(-0.87)	(-0.25)
18-39 years old	0	0	0	0	0
40-64 years old	-0.301	-0.0804	0.0470	0.194	0.120
	(-0.88)	(-0.59)	(0.41)	(1.65)	(0.76)
65-74 years old	-0.371	-0.426	0.381	0.295	0.385
	(-0.70)	(-1.27)	(0.79)	(1.59)	(1.10)
75+ years old	-0.317	-0.741	0.294	0.327	0.258
	(-0.58)	(-1.85)	(0.57)	(1.68)	(0.71)
2010	0	0	0	0	0
2011	0.176	0.302*	-0.0935	0.0312	-0.0235
	(1.10)	(2.09)	(-0.73)	(0.53)	(-0.23)
2012	-0.0596	0.275*	-0.0543	0.113	-0.0241
	(-0.38)	(1.96)	(-0.44)	(1.87)	(-0.23)
2013	-0.183	0.308*	0.0116	0.0964	-0.0342
	(-1.09)	(2.25)	(0.09)	(1.59)	(-0.32)
Constant	0.110	-0.229	-0.396*	-0.315*	-0.651***
	(0.28)	(-1.01)	(-2.05)	(-2.34)	(-3.33)
Number of observations	529	661	875	3492	1249

Table 4: probit estimations per condition   *T-statistics in parentheses*   * p<0.05, ** p<0.01, *** p<0.001*

3.4 Sub-conclusion

This chapter analysed the effect of having a voluntary deductible on the probability of avoiding visiting a medical specialist. It is estimated that having a voluntary deductible, compared to not having a voluntary deductible, is associated with an 8.6 percentage point increase in the probability of avoiding visiting a medial specialist. While this significant effect is found there is still the possibility, as described in the introduction, that there is a case of simultaneity. An individual could alter his voluntary deductible according to his expected healthcare use. The results found could be skewed due to this. To get a clearer picture the next chapter will analyse if suffering a health shock has effect on the voluntary deductible of an individual in the following period.

Furthermore the additional analysis showed there is a negative significant association between a person having a voluntary deductible and the probability of visiting a GP, given that he has a condition. As these GP visits are exempted from the deductible this result could indicate that there are differences in personal characteristics between people who have and who do not have a voluntary deductible. Goldberg et al. (2017) found that consumers reduce consumption of free preventive (high-value) care when they face a deductible. They argue that this could be due to limited knowledge of consumers knowing which treatments are free. While the visitation of a GP and consumption of free preventive care are not exactly the same this argument could also hold for the case of a decrease of visitations for GPs.

4 Effect of health shock on deductible amount

4.1 Data

For the second and third analysis data from the LISS (Longitudinal Internet Studies for the Social sciences) panel administered by CentERdata (Tilburg University, The Netherlands) will be used. The LISS panel is a representative sample of Dutch individuals who participate in monthly Internet surveys. The panel is based on a true probability sample of households drawn from the population register. A longitudinal survey is fielded in the panel every year, covering a large variety of domains including health, work, education, income, housing, time use, political views, values and personality. The panel consists of 4500 households and 7000 individuals. Respondents are chosen by CBS and CentERdata and get financial compensation for completing online questionnaires. Surveys are conducted monthly since 2007.

For this research only the health module from 2009 until 2017 will be used. Usually the surveys for the health module are conducted in the month November. In this case there are two exemptions as there is no data available for 2013 and the survey for 2014 was conducted in July. For every year there are roughly 5.500 respondents.

In the health module there are three main questions that will be used for the two analyses. In the first question of main interest respondents are asked if in the last 12 months a physician has informed them that they suffer a disease or problem. In the second question respondents are asked if they had contact with a medical specialist in the last 12 months. In the third question respondents are asked what the amount of their voluntary health insurance deductible is. In addition to this background variables will be merged with the health module. These variables are income, age, education, occupation and marital status. Controlling for these variables could result in a more accurate estimation of the effect.
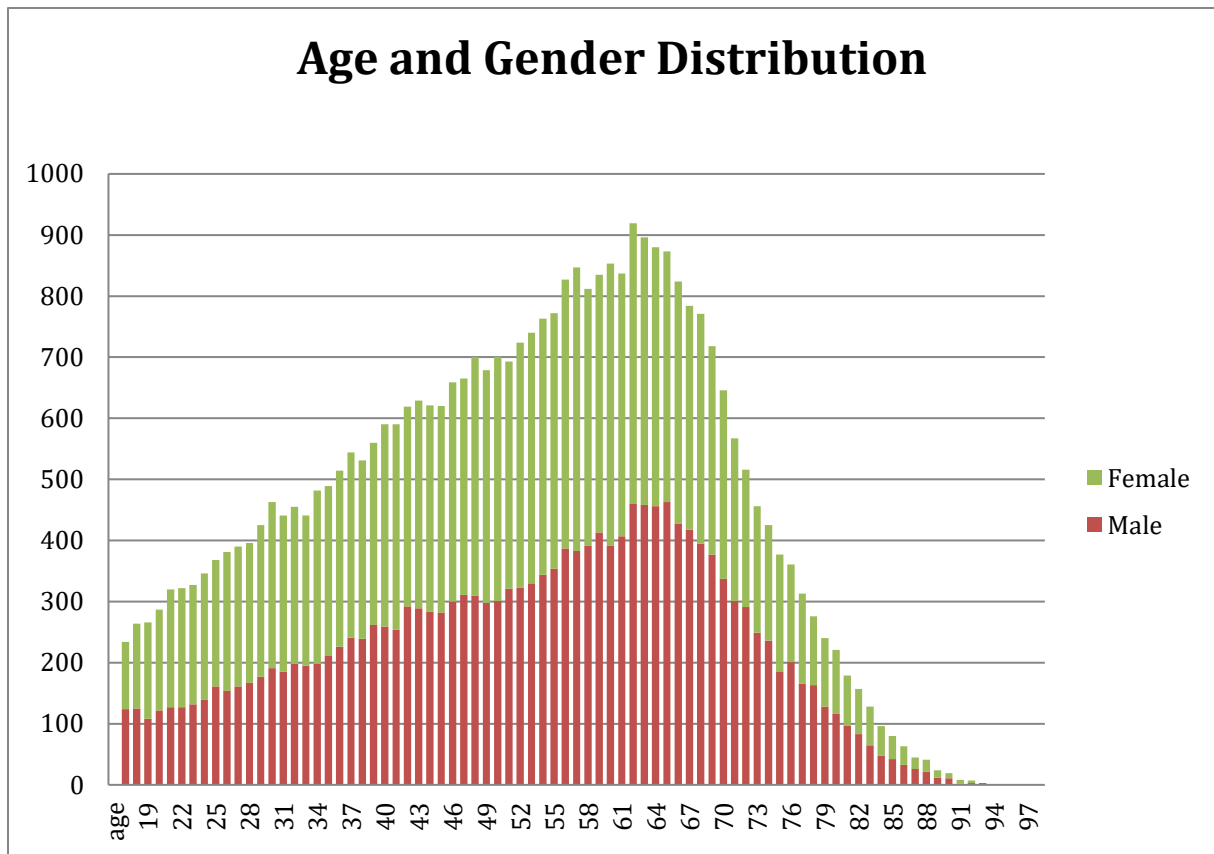
Figure 3: age and gender distribution of the LISS panel

There are a total of 9779 respondents with in total 36940 observations, which means that on average every respondent participated in 3.8 waves of the survey.

In 80% of all the observations the respondents opted for no voluntary deductible on top of the mandatory deductible. Of the people who chose a voluntary deductible most of them opted for the highest possible deductible. While only 2.33% of the respondents opted for the highest possible voluntary deductible 2009, 10.36% of the respondents chose it in 2017.

Voluntary Deductible	Frequency	Percentage
€0	29,597	80,08%
€ 100	1,216	3,29%
€ 200	2,024	5,48%
€ 300	1,403	3,80%
€ 400	430	1,16%
€ 500	2,288	6,19%

Table 5: proportion of each type of deductible in the LISS panel

4.2 Methodology

4.2.1   First analysis

For the second sub-question a fixed effects estimator controlled for robust standard errors will be used to analyse the effect of a health shock in the previous year on the voluntary deductible. A fixed effect model is chosen as the goal is to observe the within variation of an individual.

A health shock is defined as a person going from having no diseases or problems in one period to having at least one disease or problem in the next period. There will be a dummy made if an individual experienced a health shock in the previous year. This lag is chosen because one does not immediately have the option to change his voluntary deductible. He would have to wait until the next year to adjust it. The regression will be controlled for the natural log of the imputed household income, age in categories, education, occupation, marital status and year of survey. An important remark to make is that one's household income of the current period could be affected by the health shock, while it also could affect the decision to adjust the amount of the total deductible. The assumption can be made that adding current income or income in the year of the health shock to the model could possibly decrease the observed effect of a health shock on the deductible. While using a lag for income could have been a better choice it was decided to use the income of the current period due to loss of roughly 40% of the observations otherwise. Also after analysing the results of using imputed household income with a lag and without a lag the observed effect, while not significant with the lag, is roughly similar. Due to the increased certainty of more observations a lag is not taken into account.

4.2.2   Second analysis

A second analysis will be done to observe if the number of conditions of a person in the previous period influences the decision to adjust the deductible. For this there are five categories made (1=no conditions 2=1 condition 3=2-3 conditions 4=4-5 conditions 5=>5 conditions)

4.3 Results

4.3.1 First analysis

A first simple regression (table 6) indicates that experiencing a health shock, opposed to not experiencing one, is associated with a decrease of the voluntary deductible of €8.84. This is significant at a 1% level.

After adding the other control variables to the model the estimation (table 6) shows that experiencing a health shock is associated with a voluntary deductible decrease of €7.72. This is significant at a 5% level. Using the Wald test for joint significance shows that the newly added variables are jointly significant different from zero. This is significant at a 1% level.

4.3.2 Second analysis

The additional analysis (table 6) finds that having two or three conditions and having four or five conditions, compared to not having any conditions, is associated with a decrease of the total deductible of respectively €16.21 and €18.06. Both are significant at a 1% level.

4.4 Sub-conclusion

The analysis in this chapter showed that the health status of a person influences the voluntary deductible in the next period. This indicates that expected healthcare use influences the voluntary deductible, while the previous chapter showed the opposite effect. These results could be a strong argument for the presence of simultaneity. The next chapter will analyse the effects of the increments in the mandatory deductible to get a clearer picture of the effect of a deductible on healthcare use as individuals do not have the option to alter this component of the deductible.

	First Analysis				Second Analysis	
	Simple		Complete		Additional	
	Coefficients	T-value	Coefficients	T-value	Coefficients	T-value
No Health Shock	0	(.)	0	(.)		
Health Shock	-8.838**	(-2.62)	-7.724*	(-2.23)		
2009	0	(.)	0	(.)		
2010	4.177**	(2.89)	3.210*	(2.16)	0	(.)
2011	12.88***	(7.50)	12.79***	(6.91)	9.518***	(5.53)
2012	19.29***	(10.05)	18.44***	(8.67)	15.87***	(7.99)
2013	28.96***	(12.31)	27.04***	(10.28)	24.87***	(9.83)
2015	42.48***	(15.71)	40.62***	(13.13)	38.21***	(12.44)
2016	33.57***	(12.26)	30.30***	(9.38)	28.31***	(8.91)
2017	31.69***	(11.31)	27.68***	(8.16)	26.24***	(7.78)
Imputed HH Inc			1.011	(0.58)	0.484	(0.25)
18-24 years old			0	(.)	0	(.)
25-34 years old			14.49	(1.26)	10.07	(0.79)
35-44 years old			39.24**	(2.78)	31.31*	(2.01)
45-54 years old			56.22***	(3.64)	46.06**	(2.72)
55-64 years old			55.94***	(3.44)	41.61*	(2.33)
65 years and older			42.90*	(2.52)	27.45	(1.47)
Primary School			0	(.)	0	(.)
VMBO			8.848	(0.54)	11.06	(0.53)
Havo or VWO			26.35	(1.50)	20.50	(1.01)
MBO			11.64	(0.83)	14.24	(0.80)
HBO			25.42	(1.49)	30.52	(1.53)
WO			42.53	(1.74)	47.22	(1.70)
Married			0	(.)	0	(.)
Separated			5.080	(0.28)	0.335	(0.02)
Divorced			0.895	(0.08)	-1.670	(-0.12)
Widow(er)			-19.55**	(-2.83)	-18.37*	(-2.25)
Never married			-23.66*	(-2.45)	-23.13*	(-2.08)
No conditions					0	(.)
1 condition					-3.967	(-1.32)
2-3 conditions					-16.21***	(-4.73)
4-5 conditions					-18.06***	(-3.74)
5+ conditions					-6.468	(-1.88)
Constant	39.88***	(26.96)	-18.99	(-0.80)	1.632	(0.06)
Number of observations	35974		33297		29628	

*T-statistics in parentheses * p<0.05, ** p<0.01, *** p<0.001*
Table 6: Estimations of the regression models from the first and second analysis

5 Effect of increasing mandatory deductible on medical specialist visits

5.1 Data

The analyses for the third sub-question will make use of the Health Survey from the CBS and the LISS panel administered by CentERdata from the first and second sub-questions.

Figure 4 shows the percentage of respondents visiting a medical specialist for the Health Survey and LISS panel. For the Health Survey it is given that they are suffering one of the five conditions mentioned in sub-question one because only for these conditions it is expected a person has to visit a medical specialist.
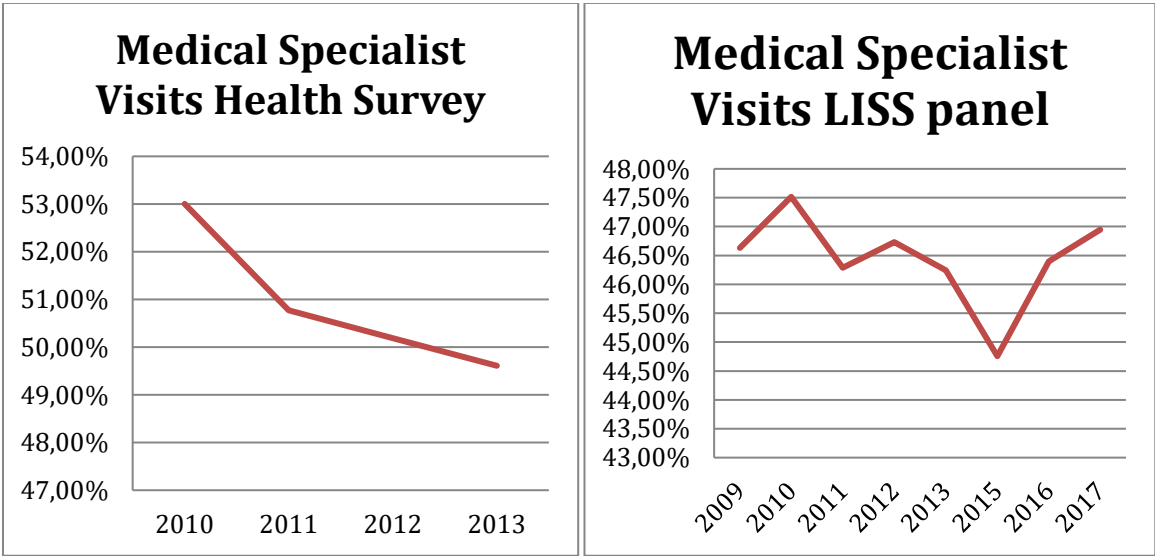

Figure 4: percentage of respondents visiting a medical specialist for both data sets

For the second analysis a dummy variable is constructed for when it is expected that an individual reached the threshold of the mandatory deductible. People who do not have a single condition or only suffer angina, pain in the chest, high blood pressure, hypertension or asthma are not marked for fulfilling the mandatory deductible. This is done in consultation with a medical specialist

5.2 Methodology

5.2.1 First analysis

For the third sub-question a fixed effects logit model will be used to estimate the effect of the increments of the mandatory deductible by the Dutch government on the probability of contacting a medical specialist. Margins will be estimated to get a clear answer. There will be controlled for the same variables as in the second analysis. Additionally to control for the potential effects of moral hazard there will also be controlled for an individual reaching the threshold of the mandatory deductible due to a chronic disease. Moral hazard could be present for someone who expects to reach the threshold due to him not having to spend any more money after reaching the threshold.

5.2.2 Second analysis

As the Health Survey dataset contains more accurate information on medical specialists visits the same analysis will be performed with this dataset. A categorical variable for the amount of the mandatory deductible in each year will be created to estimate with a probit regression if this affected the probability of a person visiting a medical specialist. Similar as in the first analysis the same probit regression will be estimated per condition.

5.3 Results

5.3.1 First analysis

A first simple model shows that an increasing level of the mandatory deductible is associated with an increase of the probability of an in individual going to a medical specialist. This is significant at a 5% level. After adding the control variables to the model it still shows a significant and even stronger positive association between the amount of the mandatory deductible and the probability of medical specialist visits. This is significant at a 5% level.

Estimating the average marginal effect shows that, on average, increasing the mandatory deductible by €1 by the Dutch government increases the probability of an individual visiting a medical specialist with 0.02476 percentage points. This is significant at a 1% level. This suggests that the adjustment of the mandatory deductible from €220 in 2011 to €350 in 2013 increased the probability of a person going to a medical specialist with 3.22 percentage points.

After adding a dummy for a person reaching the threshold of the mandatory deductible the variable is no longer significant at a 1%, 5% or 10% level. The Wald test shows that adding this categorical variable to the model results in an improved fit of the model. These results indicate that there is no significant association between the increase of the mandatory deductible by the Dutch government and the probability of visiting a medical specialist.

5.3.2 Second analysis

Because of the more accurate medical specialist visits data in the Health Survey the same analysis is done for this data set (table 12). Similar as in the LISS panel data no significant effect of the increased mandatory deductible on probability of visiting a medical specialist was found. Only after looking at each specific condition there is a significant effect found for psoriasis. Estimating the marginal effects for psoriasis shows that the probability of an individual visiting a general practitioner or a medical specialist in 2010, when the mandatory deductible was €165, compared to 2013, when the mandatory deductible was €350, is 11.13 percentage points higher. This is significant at a 5% level. This could partially be caused by the increased mandatory deductible, but it could also be due to other non-observed year effects.

	Second Analysis			
	Care Avoidance		Psoriasis	
	Coefficients	T-value	Coefficients	T-value
€165 deductible	-0.0928	(-1.89)	0.293*	(2.13)
€170 deductible	-0.0419	(-0.82)	-0.0160	(-0.11)
€220 deductible	-0.0252	(-0.51)	-0.0000284	(-0.00)
€350 deductible	0	(.)	0	(.)
Primary School	0	(.)	0	(.)
VMBO or MBO 1	0.0184	(0.34)	-0.405*	(-2.13)
Havo, VWO or MBO 2+	0.00226	(0.04)	-0.268	(-1.48)
HBO or WO	0.192**	(3.22)	-0.470*	(-2.48)
Unknown	0.459***	(3.79)	-1.119*	(-2.36)
Male	0	(.)	0	(.)
Female	-0.0487	(-1.36)	-0.0615	(-0.60)
Works 12+ hours	0	(.)	0	(.)
Works 1-11 hours	-0.151	(-1.61)	0.467	(1.56)
Unemployed	-0.0909	(-1.78)	0.296*	(2.02)
Retired	-0.0540	(-0.77)	-0.203	(-0.92)
18-19 years old	0	(.)	0	(.)
20-29 years old	0.464	(1.56)	0.148	(0.21)
30-39 years old	0.441	(1.51)	0.202	(0.30)
40-49 years old	0.573*	(2.00)	0.268	(0.39)
50-59 years old	0.516	(1.82)	0.231	(0.34)
60-69 years old	0.556*	(1.96)	0.345	(0.51)
79-79 years old	0.594*	(2.05)	0.906	(1.28)
80+ years old	0.653*	(2.22)	0.546	(0.70)
Constant	-0.513	(-1.77)	-0.265	(-0.37)
Number of observations	5240		661	

*T-statistics in parentheses   * p<0.05, ** p<0.01, *** p<0.001*

Table 7: probit estimations the effect of the increments in the mandatory deductible on care avoidance and care avoidance for respondents with psoriasis

5.4 Sub-conclusion

The analyses in this chapter, for both the LISS panel and the Health Survey, did not find a general effect of the increments in the mandatory deductible on care avoidance. Only when looking at each condition specifically a positive significant effect on care avoidance was found for people with psoriasis.

6 Conclusion

This thesis analysed the behaviour of individuals concerning healthcare insurance deductibles in healthcare in The Netherlands. Three separate analyses have been performed.

The analysis for the first sub-question using the Health Survey from the CBS estimated that having a voluntary deductible, compared to not having a voluntary deductible, is associated with an 8.6 percentage point increase in the probability of avoiding visiting a medial specialist. Looking at each of the chosen five conditions separately showed there was a significant association for having a voluntary deductible and avoiding care for the conditions psoriasis and osteoarthritis. An additional analysis showed there is a significant negative association between a person having a voluntary deductible and the probability of visiting a GP, given that he has one of the conditions. As visiting a GP in The Netherlands is exempted from the deductible one would expect that there would be no difference between people with and without a voluntary deductible. This result indicates that the effects found in the first analysis are not necessarily care avoidance and could be due to other factors, as people with a voluntary deductible are less likely to get medical treatment, even when no costs are involved. It could show that other personal characteristics of people with and without a voluntary deductible affect an individual's decision to get treatment for a condition. Or that consumers are badly informed. The main limitation of the first analysis was that given the conditions in the dataset were chronic diseases individuals had to option to alter their voluntary deductible to their expected health care needs. This could mean that there is a reverse causality. While it is not possible to say there is a significant effect this analysis showed that there is a difference and *something* happening when a person has a voluntary deductible.

For the second sub-question data from the LISS panel has been used. As this is longitudinal data the risk of reverse causality has been reduced in this analysis. The fixed effects estimation showed that experiencing a health shock is associated with a decrease in the voluntary deductible in the next year of €7.72. The additional analysis showed that the

number of conditions affected the amount of the deductible. This analysis indicates that the analysis in the first sub-question shows a reverse causality or at best simultaneity.

The third and final sub-question researched if the increments of the mandatory deductible in The Netherlands affected the probability of a person visiting a medical specialist given that he had a condition. This analysis has been done with the Health Survey and LISS panel data. After controlling for a person passing the mandatory deductible threshold no significant effect was found for the LISS panel data. For the Health Survey, which contains more information on medical specialists, also no significant effect of the mandatory deductible on medical specialist visits was found. Only for people with psoriasis it is estimated that the likelihood of visiting a medical specialist in 2010, when the mandatory deductible was €165, compared to 2013, when it was €350, was 11.13 percentage points higher. However it is not entirely possible to conclude that this is all due to the increased mandatory deductible. Other non-observed year effects could have affected this probability.

This thesis showed that there certainly is a difference between people who have and who have not a voluntary deductible for their health insurance. Due to limitations of the datasets it is hard to conclude that all the effects found are causal. It is certain to say that having a health shock affects a person's decision to alter his voluntary deductible. The associations found between having a voluntary deductible and avoiding health care and the effect of the increments in the mandatory deductible on care avoidance are not certainly causal. Further research with better and more precise data on health conditions, medical specialist visits and money spent on medical specialist could add more certainty to the found effects and associations in this thesis. As this research showed that there is a difference between people with and without a voluntary deductible it is important for future research to make a distinction between these two groups.

7 Limitations

In the first analysis there was no information on income of the respondents. As there are costs for going to a medical specialist the income of an individual could influence his behaviour. Another limitation of this analysis was that for the chosen conditions it is likely that a person has to visit a medical specialist, but there is no certainty that they went to a medical specialist. There was only information on if they visited a medical specialist or a GP. Besides this the chosen conditions can be arbitrary. Using another combination of conditions could possibly result in different results. The main limitation was that the health conditions for this analysis were chronic conditions. Individuals have the possibility to adjust their voluntary deductible according to their expected healthcare needs. This could imply that the found association is a reverse causality. Having information on more different non-chronic health conditions, healthcare use and income of the respondent could increase the certainty of the estimation.

For the third analysis more precise information on health conditions would improve the certainty of the results. Also information on healthcare spending would have made it possible to create a more accurate dummy for people who expect to reach the threshold of the deductible.

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