DETERMINANTS OF THE DEMAND FOR HEALTH INSURANCE COVERAGE

K.P.M. van Winssen

Determinants of the demand for health insurance coverage

Determinanten van de vraag naar zorgverzekeringsdekking

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Chapter 4

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Chapter 1

Introduction

1.1 BACKGROUND

In the Netherlands, insurance premiums are as large as 11 per cent of the Gross Domestic Product, which makes the Netherlands the number one country in Europe when it comes to insurance penetration in 2014 (SwissRe, 2015). On average, each Dutch individual spends 5,689 US Dollars on insurance of which over 75 per cent is spent on non-life insurance. The Netherlands is the country with the highest per capita spending on non-life insurance in the world in 2014 (SwissRe, 2015). This high demand for insurance not only holds for insurance in general, but also for health insurance specifically. After all, Dutch insured are obliged to purchase basic health insurance but, nevertheless, also voluntarily demand high health insurance coverage. This is for instance shown by the fact that only 12 per cent of the Dutch individuals opted for a reduction of health insurance coverage in the form of a voluntary deductible and at the same time 84 per cent of the Dutch individuals chose an extension of health insurance coverage in the form of supplementary health insurance in 2016 (Vektis, 2016). In the classical economic theory, an individual behaves in a rational way and aims to maximise utility. From this theory, a potential explanation for the demand for high health insurance coverage might be risk aversion (Cutler and Zeckhauser, 2000; Nyman, 1999). Individuals might know something about their need for healthcare services in the upcoming period, but the exact amount they will need to spend on healthcare will to a large degree be uncertain. Risk averse individuals will want to protect themselves from the possibility of having to need a substantial amount of money to purchase the necessary treatments and consequently purchase health insurance. So, from a traditional economic point of view, the main reason to purchase health insurance is the reduction of uncertainty regarding financial losses (Nyman, 1999). This implies that the value of health insurance increases with the unpredictability of healthcare spending and with risk aversion (Cutler and Zeckhauser, 2000). This dissertation questions whether risk aversion alone can explain the demand for high health insurance coverage as expressed by the low uptake of voluntary deductibles and the high uptake of supplementary health insurance. After all, the value in terms of reduction of uncertainty regarding financial losses is limited in those cases. For instance, Dutch individuals can opt for the highest voluntary deductible of €500 and get a premium rebate of €300 in return, which implies that little financial risk (i.e., €200) is left. This implies that Dutch insured are willing to pay €300 in order to commute a deductible of €500. Additionally, the Dutch supplementary health insurance mostly provides access to already affordable healthcare services such as dental check-ups and regular consultations with the physiotherapist, meaning that the risk reduc-

tion from purchasing supplementary insurance is limited. Dutch insured are for instance willing to purchase supplementary health insurance covering dental expenses up to a maximum of €250 per individual per year for an annual premium of €180 per individual. These examples illustrate that other aspects than risk aversion are likely to affect the demand for health insurance coverage as well. Against this background, this dissertation studies the following central research question:

What are potential explanations for the low demand for voluntary deductibles in basic health insurance and the high demand for supplementary health insurance?

To answer this central research question, the traditional economic literature and the behavioural economic literature will be studied. Furthermore, several empirical analyses and empirical simulations will be performed using real world data from a large Dutch health insurer containing individual-level information on healthcare expenses and risk characteristics for six years. This dissertation could provide important insights into which aspects drive the demand for health insurance coverage. With these insights the design of health insurance – and more specifically the design of voluntary deductibles and the supplementary health insurance – could be optimised and the individual's decision-making process concerning health insurance coverage could be better facilitated. The next section of the introduction will discuss the voluntary deductible and the corresponding three research questions. The third section will elaborate on the supplementary health insurance and provides the corresponding fourth and fifth research questions. Finally, the fifth section will provide the structure of this dissertation.

1.2 THE VOLUNTARY DEDUCTIBLE

By opting for a voluntary deductible, individuals voluntarily choose to lower their health insurance coverage in return for a premium rebate. In the Netherlands, but also Germany, Switzerland and the USA individuals are being offered the possibility to opt for such a voluntary deductible. Voluntary deductibles are introduced in order to counteract moral hazard. Moral hazard refers to the change in health behaviour and health consumption resulting from the fact that the insurer reimburses (part of) the costs. In case of a deductible, individuals pay healthcare expenses up to the deductible amount out-of-pocket. In the Netherlands, individuals can opt for five predetermined deductible levels,

i.e., €100, €200, €300, €400, €500. The voluntary deductible is preceded by a mandatory deductible (i.e., €385 in 2016), from which expenses for the GP, maternity care and for children are excluded. Each health insurer is free to determine the community-rated premium rebate individuals receive in return for their chosen deductible amount.

1.2.1 Financial profitability

In the Dutch mandatory basic health insurance, 12 per cent of the insured opted for a voluntary deductible in 2016 (Vektis, 2016), which is relatively low compared to the 56 per cent of Swiss insured opting for a voluntary deductible in 2014 (Bundesamt für Gesundheit, 2014). Given this low percentage, it might be questioned whether the low uptake of the voluntary deductible in the Dutch basic health insurance might be explained by the fact that it is financially unattractive for the Dutch consumer to opt for a voluntary deductible. The first research question of this dissertation focuses on the financial profitability of opting for a voluntary deductible as a potential explanation for the low demand for voluntary deductibles in health insurance. It is stated as follows:

Q1. How profitable is a voluntary deductible in health insurance for the consumer?

In order to answer this question, a large Dutch database with individual-level information on insurance claims and background characteristics for six years is used. With this data, we study the financial profitability in retrospect, both at the individual level and for different groups of insured based upon their background characteristics. Additionally, we relate the financial profitability to background characteristics in a multivariate binary logistic regression analysis.

1.2.2 Ex-ante and ex-post premium differentiation

As mentioned already, only 12 per cent of the Dutch individuals opted for a voluntary deductible in 2016 (Vektis, 2016). Therefore, the moral hazard reduction resulting from this deductible is quite limited. Economic theory predicts that rational consumer behaviour causes individuals to opt for a voluntary deductible only if their expected expenses under the deductible fall (far) below the premium rebate. This phenomenon is referred to as adverse selection and implies that low-risk individuals are more inclined to opt for a voluntary deductible than high-risk individuals (within the same premium risk group) (Akerlof, 1970; Cummins et al., 1982; Cutler and Zeckhauser, 1998; Neudeck and Podczeck, 1996; Pauly, 1986). This kind of behaviour would also imply that insured do not opt for a voluntary deductible in a (incidental) year they expect

(high) healthcare expenses. In free markets, insurers can reduce adverse selection by risk-rating the premium or by denying insured to reduce the deductible level in later years. Additionally, insurers in either free or regulated markets – such as in the Netherlands – can reduce adverse selection by an ex-ante or ex-post differentiation of the premium according to, respectively, the duration of the contract for which the voluntary deductible holds or the number of previous years insured have opted for a voluntary deductible. It is hypothesised that the longer the period for which the voluntary deductible holds or the more previous years insured have opted for a voluntary deductible, the lower the premium can be. Such a differentiated premium rebate could incentivise insured to opt for a voluntary deductible for a longer period or more consecutive years. Consequently, this could imply a larger reduction in moral hazard since insured then also opt for a voluntary deductible in (incidental) years they expect (high) healthcare expenses. The second research question of this dissertation explores the premium patterns in case of either an ex-ante or ex-post differentiation of the premium and reads:

Q2. What would the premium look like when differentiated to either the duration of the contract for which the voluntary deductible holds or the number of previous consecutive years insured have opted for a voluntary deductible?

In order to answer this research question, we will simulate the distribution of insured across the deductible options and subsequently determine the corresponding premium patterns. To achieve this, data from a large Dutch health insurer with individual-level information on healthcare expenses and risk characteristics of 762,982 insured for six years are used.

1.2.3 Behavioural economic determinants of deductible uptake

The previous research questions studied the financial profitability – of which the premium makes up a substantial part – of opting for a voluntary deductible as a potential explanation for the low demand for voluntary deductibles in health insurance. The results thereof show that opting for a voluntary deductible would have been financially profitable for about one in two insured in retrospect (see chapter 2). Nevertheless, only 12 per cent of the Dutch insured opted for a voluntary deductible in 2016 (Vektis, 2016). This discrepancy suggests that reasons other than the financial profitability might influence the decision to opt for a voluntary deductible. Subsequently, the third research question of this dissertation reads:

Q3. Which determinants could affect deductible uptake in health insurance and which strategies could increase deductible uptake?

In other words, this research question does not only identify potential determinants of deductible uptake, but also aims to provide insights into what these determinants imply for the design of voluntary deductibles. After all, if more insured would opt for a voluntary deductible, moral hazard will, ceteris paribus, be further reduced. To answer this research question, an extensive literature study in the behavioural economic field is performed.

1.3 THE SUPPLEMENTARY HEALTH INSURANCE

The Dutch health insurance system could, roughly, be classified into the Law on Long-term Care (Wet Langdurige Zorg (2015)), the Health Insurance Act (Zorgverzekeringswet (2006)) and the supplementary health insurance. The first covers healthcare services for individuals who need round-the-clock intensive healthcare or close supervision. The Health Insurance Act obliges individuals to purchase basic health insurance that covers – among others – expenses for the GP, the hospital and pharmaceuticals. Next to this mandatory basic health insurance, Dutch insured can voluntarily extend their health insurance coverage by purchasing supplementary health insurance. This supplementary insurance provides coverage for healthcare services not (or partially) covered by the mandatory basic health insurance. In the Netherlands, these healthcare services include, among others, dental care for adults, physiotherapy, durable medical equipment, alternative medicines, pharmaceuticals, care consumed in a foreign country, orthodontics and maternity care, as far as these benefits are not covered by basic health insurance. Contrary to basic insurance, supplementary insurance in the Netherlands is offered at a free market, which means that insurers are free to determine the premiums, coverage and cost-sharing arrangements. Additionally, instead of the requirements of community-rating and open enrolment such as at the basic health insurance market, insurers on the supplementary insurance market are free to apply risk-rating and selective underwriting.

1.3.1 Non-optimal supplementary health insurance

Traditional economics states that the advantage of purchasing health insurance can be found in the reduction of uncertainty regarding financial losses, while the disadvantage lies in moral hazard, the loading fee and transaction costs. Ultimately, health insurance design involves a trade-off between the gains from risk pooling and the losses from moral hazard, the loading fee and

transaction costs. In this respect, the literature shows that full insurance is far from optimal and that a mix of coverage and cost-sharing is preferred (e.g., Arrow, 1976; Manning and Marquis, 1996; Zeckhauser, 1970). Optimal designs of health insurance a) protect individuals against unpredictable high financial risks, b) provide access to otherwise unaffordable healthcare services, c) include first-dollar cost-sharing, and d) incorporate individual caps on out-of-pocket expenses (see table 1.1). The Dutch supplementary health insurance deviates from the optimal insurance design as described by the traditional economic literature in several aspects (see table 1.1). Firstly, the Dutch supplementary health insurance covers healthcare services that do not involve large losses and it applies coverage limits. Due to these coverage limits, the risk reduction resulting from the supplementary health insurance seems limited. Secondly, the Dutch supplementary health insurance mostly provides access to already affordable healthcare services such as dental check-ups and regular consultations with the physiotherapist. These two characteristics suggest that the consumers' welfare gain from purchasing supplementary health insurance may be limited. Thirdly, the loading fee (i.e., about 17 per cent of the premium (Vektis, 2015c)), moral hazard and the transaction costs of the supplementary health insurance are substantial. Substantial moral hazard can be expected, because most healthcare services are subject to first-dollar coverage, while substantial transaction costs could arise since many insurers offer many different supplementary insurance policies. Consequently, the consumers' welfare loss from the Dutch supplementary health insurance may be substantial.

Table 1.1 Characteristics of health insurance design: "optimal" versus the Dutch supplementary health insurance.

Characteristic		Optimal insurance design	Dutch supplementary insurance
1.	What does the insurance provide protection against and what does it provide access to?	Unpredictable high financial risks and otherwise unaffordable healthcare services.	Mostly predictable low financial risks (e.g., dental check-ups and consultations at the physiotherapist). Some supplementary insurances provide protection against large expenses, but these are mostly maximised (e.g., dental expenses after an accident (up to about €10,000), care consumed in a foreign country)
2.	Is cost sharing applied and if so, how?	Yes, in the form of first-dollar cost sharing.	In general no; only dental insurances apply coinsurance of 20-25%.
3.	Are caps on out-of-pocket expenses applied and if so, how?	Yes, in the form of an individual cap.	No, after the coverage limits (e.g., nine treatments at a physiotherapist) are reached, insured pay the full expenses for healthcare services out-of-pocket.

In short, given this non-optimal design of the Dutch supplementary health insurance, it is all the more surprising to observe that so many Dutch insured purchase supplementary insurance. The fourth research question of this dissertation reads:

Q4. Why do so many Dutch insured take out non-optimal supplementary health insurance?

To answer this research question, we will systematically study 1) the traditional economic literature on optimal insurance design, 2) the behavioural economic literature to see whether aspects – other than those mentioned in the traditional economic literature – could provide a welfare gain to insured when taking out supplementary health insurance and 3) the behavioural economic literature to see whether certain aspects could indicate why insured make suboptimal choices.

1.3.2 Adverse selection

The Dutch supplementary health insurance is offered at a free market. Nevertheless, many insurers do still apply community-rating and open enrolment as a result of societal pressure. Theory predicts that the combination of a free market with community-rating should lead to adverse selection (Rothschild and Stiglitz, 1976). Adverse selection refers to the tendency that, within each premium risk group, high-risk individuals have a larger incentive to buy supplementary insurance or to extend their coverage compared to low-risk individuals. Historically, almost all Dutch individuals purchased supplementary health insurance. There are, however, four indications that adverse selection has started to occur in the Dutch supplementary health insurance. Firstly, the percentage of individuals with supplementary insurance decreased from 93 per cent in 2006 to 84 per cent in 2016 (Vektis, 2016). Secondly, individuals with supplementary health insurance take out insurance policies with less comprehensive coverage than before (Vektis, 2015c; Gezondheidsnet, 2012). Thirdly, insurers' total technical result on supplementary insurance policies reduced substantially since 2008 (Vektis, 2015a). Fourthly, more and more insurers stop offering supplementary health insurance policies providing coverage for healthcare services mostly used by high-risk individuals, while the premium for policies that do offer this coverage increased considerably (Zorgwijzer, 2015). To counteract adverse selection, insurers are allowed to apply premium differentiation, which means that the premium for each insurance policy is adjusted to the individual's risk. Nevertheless, only very few Dutch insurers

apply premium differentiation due to a fear of loss of reputation. Against this background, the fifth research question reads:

Q5. How could adverse selection affect the premium for supplementary insurance over time and would premium differentiation be able to counteract adverse selection?

To answer this research question, the uptake and premium development of supplementary health insurance over time is simulated using data from a large Dutch health insurer with individual-level information on healthcare expenses and risk characteristics from 110,261 insured for six years.

1.4 STRUCTURE OF THIS DISSERTATION

This dissertation is structured as follows. In part I (The voluntary deductible), chapter 2 studies the financial profitability of opting for a voluntary deductible as a potential explanation for the low demand for voluntary deductibles (i.e., research question 1). Thereafter, chapter 3 examines the premium patterns for health insurance in case they would be differentiated to either the duration of the contract for which a voluntary deductible holds or the number of previous years insured opted for a voluntary deductible (i.e., research question 2). Chapter 4 studies potential behavioural economic determinants that affect the decision to opt for a voluntary deductible to explain the low uptake of voluntary deductibles. This chapter additionally provides insights into the implications of these determinants for the design of the voluntary deductible by mentioning several strategies to increase the number of insured opting for a voluntary deductible (i.e., research question 3).

In part II (The supplementary health insurance), chapter 5 incorporates the traditional economic literature on optimal insurance design and the behavioural economic literature to explain why so many Dutch insured purchase non-optimal supplementary health insurance (i.e., research question 4). Furthermore, chapter 6 studies the effect of adverse selection on the uptake and premium development of supplementary health insurance over time and the potential of premium differentiation to counteract adverse selection (i.e., research question 5). Subsequently, chapter 7 summarises the main findings of the preceding chapters and subsequently answers the central research question of this dissertation. It additionally provides the policy implications of the findings of this dissertation and shows several directions for further research.

Since chapters 2 through 6 are written as separate articles[1], they can be read independently.

[1] This dissertation is based upon five separate articles relating to chapters 2 through 6. The first author of all these articles has performed most of the work during all stage of the research, starting from searching and studying the relevant literature, to performing the empirical analyses, to reporting the findings. The co-authors (i.e., respectively, the co-supervisor and the supervisor) were consulted on a frequent basis to share ideas, discuss the findings, and / or to provide feedback on the manuscript.

Part I The voluntary deductible

Chapter 2

How profitable is a voluntary deductible in health insurance for the consumer?

ABSTRACT

To counteract moral hazard in health insurance, insured can be offered a voluntary deductible in return for a premium rebate. In the Dutch mandatory basic health insurance however, only 11 per cent of the insured opted for a voluntary deductible in 2014. Several determinants could affect the decision to opt for a voluntary deductible. This paper examines one of these determinants: the financial profitability. A voluntary deductible is profitable for the consumer if the out-of-pocket expenses do not exceed the offered premium rebate. The empirical analyses, based upon individual-level data on costs and characteristics of over 800,000 Dutch insured, show that a voluntary deductible of €500 on top of the mandatory deductible of €360 would have been financially profitable for 48 per cent of the Dutch insured given the average premium rebate of €240 in 2014. If the whole population had a voluntary deductible, most insured would obtain either the maximum loss (44 per cent) or the maximum gain (41 per cent). A voluntary deductible is profitable for males, young insured, healthy insured and insured with few healthcare expenses in the past. To further reduce moral hazard, the following strategies can be used to increase the number of insured opting for a voluntary deductible: provide insured with information regarding the voluntary deductible and introduce a shifted deductible.

2.1 INTRODUCTION

A well-known consequence of (comprehensive) health insurance is moral hazard, which refers to the change in health behaviour and consumption caused by the (partial) reimbursement of costs by the health insurer. One strategy for policy makers and health insurers to counteract moral hazard is offering insured a voluntary deductible in return for a premium rebate (Folland et al., 2010; Zweifel and Manning, 2000). Germany, the Netherlands, Switzerland and the USA apply this strategy. In the Dutch mandatory basic health insurance, 11 per cent of the insured opted for a voluntary deductible in 2014 (Vektis, 2014), which is relatively low compared to the 56 per cent of Swiss insured opting for a voluntary deductible in 2013 (Bundesamt für Gesundheit, 2013). Given this low percentage it can be questioned whether the voluntary deductible in the Dutch basic health insurance is attractive for the consumer.

An insured's decision to opt for a voluntary deductible can be affected by several determinants, like risk aversion, loss aversion, status quo bias, limited knowledge regarding the voluntary deductible and the financial profitability of the voluntary deductible. Risk aversion could affect the decision to opt for a voluntary deductible since uncertainty exists about future healthcare expenses (Gorter and Schilp, 2012; Rice, 2013; Van Kleef et al., 2006). Loss aversion could affect this decision (Johnson et al., 1993) since a voluntary deductible implies a potential loss and losses are overweighted relative to gains (Kahneman and Tversky, 1979). Status quo bias could have an effect since insured tend to prefer their current insurance policy – including the chosen deductible level – when they decide whether or not to renew their current policy (Samuelson and Zeckhauser, 1988). Previous research has shown that insured know little about their health insurance (Hsu et al., 2004; Reed et al., 2009) and that individuals misunderstand complex price schedules including premiums and cost-sharing arrangements (Baicker et al., 2012; Liebman and Zeckhauser, 2004; Marquis, 1981). Limited knowledge regarding a voluntary deductible could therefore also affect the decision. Finally, the profitability of a voluntary deductible could affect the decision to opt for a voluntary deductible (Van Kleef et al., 2006).

This paper focuses on the last determinant: the financial profitability. Considering the low percentage of Dutch insured opting for a voluntary deductible, this paper raises the question whether a voluntary deductible is financially profitable for Dutch insured. The financial profitability of a voluntary deductible depends on the out-of-pocket expenses due to the voluntary deductible and on the offered premium rebate. As long as the out-of-pocket expenses do not exceed the premium rebate, a voluntary deductible is financially profitable. The aim of this paper is to empirically examine the financial profitability of a voluntary

deductible for groups of insured, using a large database with individual-level information on claims and background characteristics for six years. Section two discusses the data and section three describes the methods. Section four presents the results of the empirical analyses. The findings are concluded and discussed in section five and policy recommendations are provided in section six.

2.2 REGULATORY FRAMEWORK

To examine the financial profitability of a voluntary deductible, we use data from a large Dutch health insurer. The insurer operates under the Health Insurance Act, of which the introduction in 2006 was an important further step towards regulated competition. This law obligates insured to take out basic health insurance from a private health insurer. In 2014, insured could choose among 70 basic insurance policies offered by 26 health insurers. Adults are required to pay a mandatory deductible of €360 (2014) per individual per year from which GP-care, obstetric and maternity care are exempted. On top of the mandatory deductible, individual adults can opt for a voluntary deductible of €100, €200, €300, €400 or €500 per individual per year. The law states that the offered premium rebate must be equal for each insured with the same deductible level within the same health insurance product. In 2014, the premium rebate for the highest deductible level varied between insurance policies from €180 to €300 per individual per year and the average premium rebate was €240 per individual per year. Note that the law does not dictate insurers to exclude the same healthcare services (i.e., GP-care, obstetric and maternity care) from the voluntary deductible as from the mandatory deductible, but all insurers do this.

2.3 DATA

For the empirical analyses we use the Achmea Health Database that contains administrative data from a large Dutch health insurer who operates particularly in the western and eastern parts of the Netherlands. It includes individual-level information on insurance claims in the years 2006–2011 aggregated at and categorised into the following eleven types of healthcare services: GP-care, pharmacy, inpatient care, hospital admissions, outpatient care, dental care, maternity care, aids, physiotherapy, mental care and care consumed in a foreign country. Moreover, the database includes an encrypted ID-number and

(per year) information on the year of birth, sex, ethnicity, degree of urbanisation, the number of days of enrolment in the health insurance policy and in which Pharmacy-based Cost Group (PCG) and/or Diagnoses-based Cost Group (DCG) the insured is classified for the risk equalisation scheme. PCGs and DCGs are risk adjusters used as a proxy for health status, based upon prior use of pharmaceuticals and prior hospital inpatient diagnoses, respectively (Van Kleef et al., 2013). Table A1 in Appendix 1 provides the characteristics of the database for 2011 (i.e., the year upon which the analyses are performed). For simplicity reasons, two selection criteria are applied: individuals must be fully insured in all six years and individuals must be 18 years or older on January 1, 2011 since in the Netherlands only adults can opt for a voluntary deductible.

2.4 METHODS

Given the available data, this section describes the operationalisation of the two components of the financial profit: the out-of-pocket expenses and the premium rebate. A voluntary deductible is financially profitable if the out-of-pocket expenses do not exceed the premium rebate. This section furthermore discusses the statistical analyses used to determine the financial profitability of a voluntary deductible.

2.4.1 Operationalisation

Out-of-pocket expenses

Given that we have data regarding individuals who are fully insured in the Dutch basic health insurance in 2011, we performed four steps to achieve the out-of-pocket expenses under the voluntary deductible. First, we deflated the mandatory and voluntary deductible levels and the premium rebates to the level of 2014 in order to estimate the profitability of a voluntary deductible in 2014 (e.g., the average premium rebate of €240 in 2014 is deflated to €209 in 2011). Second, the sum of all aggregated annual healthcare expenses under basic insurance are determined. Third, it is determined which healthcare expenses are subject to the voluntary deductible. This means that expenses excluded from the mandatory and voluntary deductible (i.e., costs for GP-care, obstetric and maternity care) and the mandatory deductible itself are subtracted from the aggregated amount. Given a certain premium rebate, a larger mandatory deductible decreases the out-of-pocket expenses due to the voluntary deductible, because higher healthcare expenses are (ceteris paribus) needed to reach the voluntary deductible. Since the mandatory deductible increased significantly in the Netherlands (i.e., from €170 in 2011 to €360 in 2014), the effect of the

mandatory deductible on the profitability of a voluntary deductible is studied by applying three mandatory deductible levels: no mandatory deductible and the mandatory deductible levels of 2011 and 2014. As a fourth and final step, only the healthcare expenses up to the voluntary deductible amount (i.e., €500) are taken into account to determine the profitability of a voluntary deductible.

In our primary analyses we do not correct the out-of-pocket expenses for a possible moral hazard reduction. Given a certain voluntary deductible amount, the out-of-pocket expenses are smaller as the moral hazard reduction is larger. To indicate the effect of moral hazard on our results, a sensitivity analysis is performed with a reduction of healthcare expenses due to reduced moral hazard. Based upon research by Keeler et al. (1988) (see also (Bakker, 1997; Bakker et al., 2000)), the total moral hazard reduction due to a voluntary deductible of €500 in 2014 is set at 4.7 per cent of the total individual healthcare expenses. The insurer 'benefits' more from the moral hazard reduction (i.e., reimburses less claims) compared to the insured (i.e., pays less out-of-pocket). Calculations by Keeler et al. (1988) (see also (Bakker, 1997; Bakker et al., 2000)), show that the distribution of the total moral hazard reduction is almost 70 per cent to the insurer and 30 per cent to the insured. This means that the largest part of the moral hazard reduction will be reflected in the premium rebate for a voluntary deductible and not in lower out-of-pocket expenses for the insured. For our sensitivity analysis, this implies a reduction of the out-of-pocket expenses of 1.36 per cent of the total individual healthcare expenses.

Premium rebate

Besides the out-of-pocket expenses, the premium rebate determines the profitability of a voluntary deductible. Since Dutch data is used, the Dutch average premium rebate for a voluntary deductible of €500 (i.e., €240 in 2014) is applied. This regards the average over all Dutch insurance policies. To check the sensitivity, the profitability of a voluntary deductible is also determined with the lowest and highest offered premium rebates in 2014 for a voluntary deductible of €500 (i.e., €180 and €300).

2.4.2 Statistical analyses

To determine the financial profitability of a voluntary deductible, we calculated per insured in retrospect whether the out-of-pocket expenses exceed the average premium rebate. Fig. 2.1 illustrates four scenarios of the profitability of a voluntary deductible of €500 on top of a mandatory deductible of €360 given an average premium rebate of €240. If the healthcare expenses are lower than the mandatory deductible (no. 1), the financial profit equals the maximum gain (i.e., the premium rebate of €240). If the healthcare expenses are higher than the

mandatory and voluntary deductible together (no. 4), the financial profit equals the maximum loss (i.e., the voluntary deductible minus the premium rebate, €-260). If the healthcare expenses are lower than the sum of the mandatory deductible and the premium rebate but higher than the mandatory deductible (no. 2), the financial profit equals a gain between €0 and €240. If the healthcare expenses are lower than the sum of the mandatory and voluntary deductible but higher than the sum of the mandatory deductible and the premium rebate (no. 3), the financial profit equals a loss between €0 and €260.

Bivariate approach

After calculating the profitability of a voluntary deductible at the individual level, different groups of insured will be distinguished using background characteristics available in the database. Some of these groups are also explicitly included in the Dutch risk equalisation scheme and defined as such (see Van Kleef and Van Vliet, (2010)). The risk classes in our analyses are based on the following risk characteristics: age/gender, classification in a PCG, classification in a DCG, ethnicity, degree of urbanisation in the area of residence and profitability of a voluntary deductible in previous years. The latter differentiates in which of the previous years and in how many previous years a voluntary deductible would have been profitable in retrospect. Chi-square tests are performed to test whether the profitability of a voluntary deductible correlates significantly with the different groups of insured. Since a large database is used, the results not only represent the profitability in retrospect but also provide an indication of the expected profitability for groups of insured.

Multivariate approach

To estimate individual probabilities that a voluntary deductible of €500 would be profitable in 2014 given the average offered premium rebate on top of the mandatory deductible (i.e., the dependent variable), the abovementioned groups are jointly entered as independent variables into a multivariate binary logistic regression analysis. The individual predicted probabilities are then grouped in deciles and the average financial profit per group is determined to indicate the relation between the profitability of a voluntary deductible and the ex-ante individual predicted probability.

2.5 RESULTS

2.5.1 Profitability

Part one of Table 2.1 shows the profitability for different voluntary deductible levels in the Netherlands in 2014. Two important results can be observed. First, a voluntary deductible would have been profitable for 48 per cent of the insured. This figure is substantially higher than the 11 per cent of insured that actually opted for a voluntary deductible in the Netherlands in 2014 (Vektis, 2014). Second, the larger the voluntary deductible, the larger the share of insured for whom a voluntary deductible would have been profitable. This is because the increase in average premium rebate for each €100 increase in deductible is nearly the same for all deductible levels, while on average the marginal out-of-pocket expenses decrease with each additional €100 deductible.

Table 2.1 Profitability of a voluntary deductible on top of a mandatory deductible of €360 in the Dutch basic health insurance in 2014 in retrospect. Part 1 shows the profitability for different voluntary deductible levels. Part 2 shows the profitability for a voluntary deductible of €500 for different premium rebates (PR), both with and without moral hazard reduction. Part 3 shows the profitability for a voluntary deductible of €500 for different mandatory deductibles.

			Percentage of insured for whom a voluntary deductible (of €500) would have been profitable in retrospect in 2014
1	**Voluntary deductible level**	€100	42.3%
		€200	43.7%
		€300	45.1%
		€400	46.4%
		€500	48.4%
2	**No moral hazard reduction**	Minimum PR (€180)	46.6%
		Average PR (€240)	48.4%
		Maximum PR (€300)	50.0%
	Including moral hazard reduction[a]	Minimum PR (€180)	46.9%
		Average PR (€240)	48.6%
		Maximum PR (€300)	50.2%
3	**Mandatory deductible level**[b]	€0	35.8%
		€170	43.7%
		€360	48.4%

[a] The moral hazard reduction equals 1.36 per cent.

[b] Since the average premium rebate corresponding to a situation without a mandatory deductible is unknown, the average premium rebate corresponding to the situation where the mandatory deductible is €360 (i.e., €240) is applied in that case. This is a valid approach since the average premium rebate for a voluntary deductible has only slightly increased with the increases in the mandatory deductible in the Netherlands in recent years (NZa, 2014). In case the mandatory deductible is €170, the average offered premium rebate in that year (i.e., €219) is applied.

Part two of Table 2.1 shows the profitability of a voluntary deductible of €500 for different premium rebates, both with and without moral hazard reduction in 2014. First, the profitability increases with higher premium rebates. Compared to the average premium rebate, a voluntary deductible would have been profitable for an additional 1.6 per cent of insured if their insurer had offered them the highest premium rebate. Second, the effect of moral hazard reduction on the out-of-pocket expenses caused by the voluntary deductible increases the percentage with about 0.2.

Part three of Table 2.1 shows the profitability of a voluntary deductible of €500 for different mandatory deductible levels. The percentage increases as the mandatory deductible level increases. This is expected since, with an increase in the mandatory deductible level, a larger share of the healthcare expenses is subject to the mandatory deductible. This decreases the out-of-pocket expenses under the voluntary deductible and increases its profitability. The results

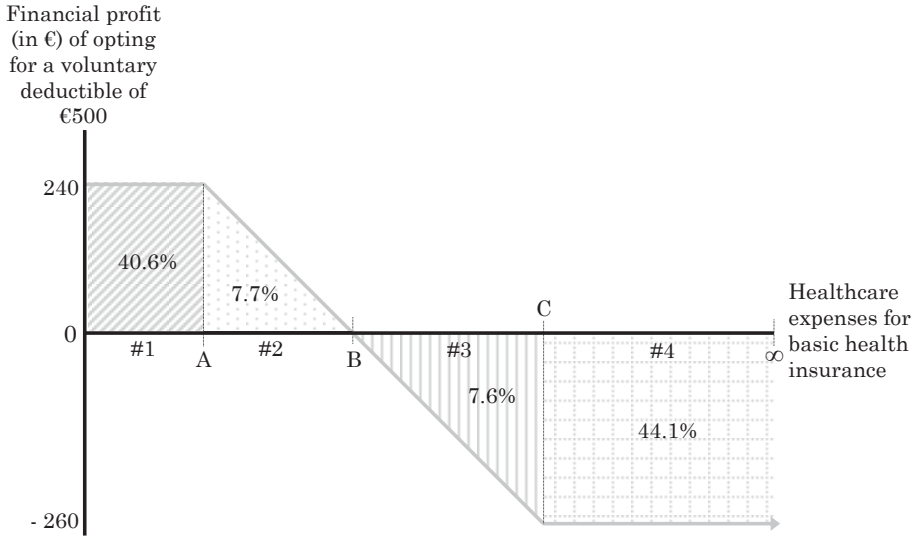

Fig. 2.1 Four scenarios of the profitability of a voluntary deductible of €500 (on top of the mandatory deductible) as a function of healthcare expenses, given the average premium rebate of €240 in 2014. The figures indicate the percentage of insured in each scenario based upon our empirical analyses.
A: Mandatory deductible amount (€360)
B: Mandatory deductible amount + average premium rebate (€600)
C: Mandatory deductible amount + voluntary deductible amount (€860)
#1: Financial profit equals the maximum gain
#2: Financial profit equals a gain between zero and the premium rebate
#3: Financial profit equals a loss between zero and the voluntary deductible amount minus the premium rebate
#4: Financial profit equals the maximum loss

furthermore show (not in the table) that 33.5 per cent of the insured has healthcare expenses below a mandatory deductible of €170 and 40.6 per cent below a mandatory deductible of €360. This is caused by the skewness of healthcare expenses and the exclusion of routine primary care from the deductible. The results imply that, considering a mandatory deductible of €360, any positive premium rebate would make a voluntary deductible of €500 profitable for over 40 per cent of the insured.

Fig. 2.1 shows the percentage of insured in the different scenarios of the profitability of a voluntary deductible based upon our empirical analyses. Over 44 per cent of the insured would have ended up with the maximum loss if they had opted for this voluntary deductible, while about 41 percent would have ended up with the maximum gain. In the sample, the average financial profit of a voluntary deductible of €500 equals €-40. The next section will show however that the average financial profit substantially differs across groups of insured.

2.5.2 Groups of insured

Table 2.2 shows the profitability of a voluntary deductible for groups of insured. First, a voluntary deductible is more profitable for men than for women. Only young females have a positive average profit, while males up to 50 years old have a positive profit. This is probably caused by pregnancy-related healthcare expenses. Second, the profitability strongly decreases with age, both for men and women. This is due to the increase of healthcare expenses with age without the adjustment of the premium rebate to age. Third, a voluntary deductible is more profitable for insured not classified in a PCG than for insured who are classified in a PCG. Fourth, a voluntary deductible is never profitable for insured classified in a DCG and the corresponding average financial profit equals the maximum loss. Finally, the profitability increases as a voluntary deductible would have been profitable in more previous years and as these 'profitable' years are more recent. This could be attributed to the autoregressive character of healthcare costs (French and Jones, 2004). The chi-square tests confirm significant correlation for all groups with the profitability of a voluntary deductible (p-value is 0.000 for all groups).

Since we use a large database, the proportions in Table 2.2 may be interpreted as the expected probability that a voluntary deductible would be profitable for these groups of insured. As such, the results can facilitate the insured's ex-ante decision to opt for a voluntary deductible. For instance, young men have a probability larger than 0.7 that a voluntary deductible would be profitable, just as insured with few healthcare expenses in the past. Meanwhile, for insured classified in a PCG or DCG a voluntary deductible is not likely to be profitable.

Table 2.2 Profitability of a voluntary deductible of €500 on top of a mandatory deductible of €360 given the average offered premium rebate of €240 and the average financial profit (FP) for groups of insured in the Dutch basic health insurance in 2014.

		Group size as % of total (n = 808,189)	Proportion of insured for whom a voluntary deductible results in a positive FP	Average FP (in €) of total subgroup
Male	**18 – 24**	4.2	0.786	119
	25 – 29	3.2	0.759	104
	30 – 34	3.4	0.729	87
	35 - 39	3.8	0.701	71
	40 – 44	4.7	0.659	48
	45 – 49	4.8	0.603	16
	50 – 54	4.2	0.542	-14
	55 – 59	3.6	0.476	-43
	60 – 64	3.6	0.421	-68
	65 – 69	3.1	0.352	-98
	70 – 74	2.7	0.289	-127
	75 – 79	2.2	0.219	-157
	80 – 84	1.5	0.178	-177
	84^{+}	1	0.160	-185
Female	**18 – 24**	3.9	0.651	44
	25 – 29	3.2	0.551	-10
	30 – 34	3.5	0.528	-21
	35 – 39	4.1	0.537	-16
	40 – 44	4.9	0.547	-12
	45 – 49	4.9	0.507	-30
	50 – 54	4.5	0.454	-53
	55 – 59	4.2	0.418	-69
	60 – 64	4.3	0.388	-82
	65 – 69	4.0	0.339	-104
	70 – 74	3.6	0.278	-131
	75 – 79	3.3	0.224	-155
	80 – 84	2.7	0.194	-169
	84^{+}	2.9	0.189	-172
PCG	**Yes**	28.9	0.132	-196
	No	71.1	0.626	29
DCG	**Yes**	4.7	0.000	-260
	No	95.3	0.507	-30
Ethnicity	**Native**	81.4	0.477	-43
	Non-native	18.6	0.510	-29

Table 2.2 (continued)

			Group size as % of total (n = 808,189)	Proportion of insured for whom a voluntary deductible results in a positive FP	Average FP (in €) of total subgroup
Urbanisation		**Very highly urbanised**	38.3	0.476	-44
		Highly urbanised	25.6	0.484	-40
		Moderate urbanised	15.7	0.486	-39
		Poorly urbanised	15.8	0.488	-38
		Very poorly urbanised	4.5	0.512	-27
Profitability in previous years	**Profitable in**	**2006**	48.5	0.683	62
		2007	46.7	0.696	69
		2008	46.1	0.692	67
		2009	45.2	0.707	75
		2010	44.1	0.736	92
	Profitable in x previous years	x **= 0**	30.3	0.045	-236
		x **= 1**	10.2	0.248	-141
		x **= 2**	11.3	0.407	-72
		x **= 3**	13.5	0.565	-4
		x **= 4**	16.6	0.707	75
		x **= 5**	18.2	0.838	149
Total			100	0.483	-40

2.5.3 Individual predicted probabilities

The logit model (see Table A2 in Appendix 2) generates the individual predicted probability that a voluntary deductible of €500 would be profitable in 2014 given the average offered premium rebate. The probabilities range from 0.000 to 0.910 and the average predicted probability equals 0.483. Fig. 2.2 shows the frequency distribution of the predicted probabilities and the associated average financial profit per probability decile. About 26 per cent of the insured has an individual predicted probability between 0.0 and 0.1 with an average financial profit of €-239, which is close to the maximum loss. On the contrary, another 26 per cent has an individual predicted probability larger than 0.8 with an average financial profit of €158.

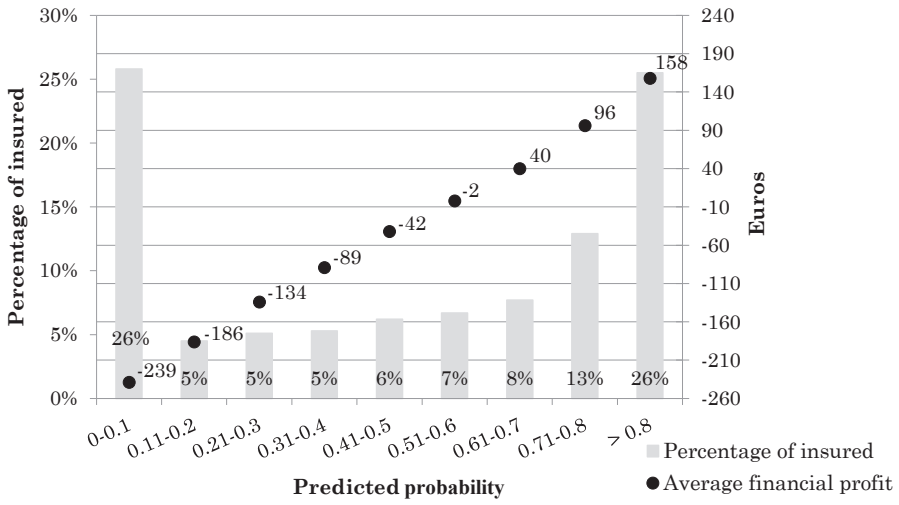

Fig. 2.2 Frequency distribution of the individual predicted probability that a voluntary deductible on top of the mandatory deductible is profitable given the average premium rebate in the Dutch basic health insurance in 2014 and the corresponding average financial profit.

2.6 CONCLUSION AND DISCUSSION

2.6.1 Conclusion

This paper studied the financial profitability of a voluntary deductible in the Dutch basic health insurance. A voluntary deductible is financially profitable when the insured's out-of-pocket expenses do not exceed the premium rebate. We find that given the average premium rebate a voluntary deductible of €500 on top of the mandatory deductible would have been profitable for 48 per cent of the insured in 2014. If the whole population had opted for a voluntary deductible in 2014, 44 per cent would have ended up with the maximum loss and 41 per cent with the maximum gain. The latter implies that any positive premium rebate would make a voluntary deductible profitable for these insured. Bivariate group analyses show that a voluntary deductible is profitable for males, young insured, insured not classified in a PCG or DCG and insured with low past healthcare expenses. Multivariate analyses show that 26 per cent of the insured has a predicted probability that a voluntary deductible would be profitable between 0.0 and 0.1 with an average financial profit of €-239. Meanwhile, another 26 per cent has a predicted probability larger than 0.8 with an average financial profit of €158. In contrast, only 11 per cent of the Dutch population actually opted for a voluntary deductible in 2014 (Vektis, 2014). Apparently, the other determinants (i.e., risk aversion, loss aversion, status quo bias and

limited knowledge regarding the voluntary deductible) play a major role when it comes to the decision to opt for a voluntary deductible.

2.6.2 Discussion

First, our results show a lower bound of the profitability of a voluntary deductible, because there are two reasons indicating that the average health of the insured in our dataset is somewhat worse compared to the Dutch population. Firstly, the comparison of the data (including adults *and children*) with the Dutch population showed that the average health in the dataset is somewhat worse compared to the Dutch population. This is probably caused by the fact that the Achmea Health Database belongs to a former sickness fund. Although only adults are included in our analyses, we expect the difference in average health to partially remain. We have no indication that groups are on average less healthy compared to the Dutch population. Therefore, we expect the group analyses (i.e., Table 2.2) to be representative. Secondly, we restricted our sample to individuals who were fully insured during the six research years, meaning that they have been with the same health insurer for at least six years. Especially elderly and unhealthy insured are less likely to switch insurer (Hendriks et al., 2009; Mosca and Schut-Welkzijn, 2008; Reitsma-van Rooijen et al., 2011), which could explain why the insured in our data might on average be less healthy compared to the Dutch population. Furthermore, due to our inclusion criterion, no decedents are included in our analyses. Consequently, the healthcare expenses in our data would be lower compared to the Dutch population since healthcare expenses are highest during the final year of life (Polder et al., 2006). We expect the first effect to prevail the second effect since 6.5 per cent of the Dutch insured switched health insurer in 2014 (Vektis, 2014) and 1 per cent of our dataset deceased in 2011. Overall, this implies that, within this paper, the average profitability of a voluntary deductible is underestimated and a lower bound of the profitability of a voluntary deductible is provided.

Second, attention should be given to the reduction of the premium rebate as risk equalisation further improves. The Dutch government intends to further improve the risk equalisation formula (House of Representatives, 2014; Van Ginneken et al., 2013; Van Kleef et al., 2013) in the near future. Consequently, differences in expected healthcare expenses between low-risk and high-risk individuals are better compensated and therefore the adverse selection component of the premium rebate will reduce (Van Kleef et al., 2007). Subsequently, the premium rebate will decrease, which could lessen the financial profitability of a voluntary deductible. Overall, a voluntary deductible may become a less effective tool for reducing moral hazard as risk equalisation further improves.

2.7 POLICY RECOMMENDATIONS

2.7.1 Information

Only 11 per cent of the Dutch insured opted for a voluntary deductible in 2014 (Vektis, 2014). Therefore, the voluntary deductible is expected to result in only a modest total moral hazard reduction. If more insured would opt for a voluntary deductible, the moral hazard reduction would increase. Providing insured with understandable information regarding the voluntary deductible is a potential strategy to increase the number of insured opting for a voluntary deductible, since insured have difficulty understanding their health insurance (Baicker et al., 2012; Liebman and Zeckhauser, 2004; Marquis, 1981). The information could emphasise the possibility to opt for a voluntary deductible in return for a premium rebate. Moreover, it could mention the excluded healthcare expenses from the voluntary (and mandatory) deductible, such as GP-care in the Netherlands. Furthermore, it could stress that potentially other cost-sharing arrangements take precedence over the voluntary deductible. Finally, information could be given regarding the probability of a financial profit, like in Table 2.2. These insights are not only relevant for the Netherlands, but also for Germany, Switzerland and the USA since they offer a voluntary deductible in order to reduce moral hazard as well.

2.7.2 Shifted deductible

Our results indicate groups of insured for whom a voluntary deductible is probably not profitable, like insured classified in a PCG or DCG. Nevertheless, a monetary incentive may cause a substantial moral hazard reduction for these insured, because of their high healthcare usage. The introduction of a shifted deductible could make a voluntary deductible also profitable for these insured (Van Kleef et al., 2009). In that case, the deductible range is shifted from [0,d] to [s_i, s_i + d], with d corresponding to the deductible level and s_i corresponding to the deductible's starting point based upon relevant risk characteristics for individual *i*. If such a shifted deductible would be introduced, the probability of exceeding the deductible amount will be reduced and the price sensitivity of the insured in the deductible range will be increased.

Chapter 3

A voluntary deductible in health insurance: the more years you opt for it, the lower your premium?

ABSTRACT

Adverse selection regarding a voluntary deductible in health insurance implies that insured only opt for a voluntary deductible if they expect no (or few) healthcare expenses. This paper investigates two potential strategies to reduce adverse selection: 1) differentiating the premium to the duration of the contract for which the voluntary deductible holds (ex-ante approach), and 2) differentiating the premium to the number of years for which insured have opted for a voluntary deductible (ex-post approach). It can be hypothesised that premiums will decrease with the duration of the contract or the number of years for which insured have opted for a voluntary deductible, providing an incentive to insured to opt for a deductible also in (incidental) years they expect relatively high expenses. To test this hypothesis, we examine which premium patterns would occur under these strategies using data on healthcare expenses and risk characteristics of over 750,000 insured from six years. Our results show that, under the assumptions made, only without risk equalisation the premiums could decrease with the duration of the contract or the number of years for which insured have opted for a voluntary deductible. With (sophisticated) risk equalisation, decreasing premiums seem unfeasible, both under the ex-ante and ex-post approach. Given these findings, we are sceptical about the feasibility of these strategies to counteract adverse selection.

3.1 INTRODUCTION

In several regulated health insurance markets, such as Germany, Switzerland, the Netherlands, and the US, insured are offered the possibility to opt for a voluntary deductible in return for a premium rebate. These deductibles may counteract moral hazard (Folland et al., 2010; Zweifel and Manning, 2000), which is a well-known consequence of (comprehensive) health insurance and refers to the change in health behaviour and healthcare consumption caused by the fact that the insurer reimburses (part of) the costs. Economic theory predicts that rational consumer behaviour causes individuals to opt for a voluntary deductible only if the expected expenses under the deductible fall below the premium rebate. This phenomenon is referred to as adverse selection and implies that low-risk individuals are more inclined to opt for a voluntary deductible than high-risk individuals within the same premium-risk group (Akerlof, 1970; Cummins et al., 1982; Cutler and Zeckhauser, 1998; Neudeck and Podczeck, 1996; Pauly, 1986). Such behaviour would also imply that insured do not opt for a deductible in a (incidental) year they expect (high) expenses. This may limit the moral hazard reduction resulting from the deductible.

In free markets, insurers can reduce adverse selection by risk-rating the premium or by denying insured to reduce the deductible level (or metal tier) in later years. Furthermore, insurers in either free or regulated markets can reduce adverse selection by an ex-ante or ex-post differentiation of the premium according to, respectively, the duration of the contract for which the voluntary deductible holds or the number of previous years for which insured have opted for a voluntary deductible[2]. It is hypothesised that the longer the period for which the voluntary deductible holds or the more previous years insured have opted for a voluntary deductible, the lower the premium can be. This could incentivise insured to opt for a voluntary deductible for a longer period or more consecutive years, implying a larger moral hazard reduction since insured then also opt for a voluntary deductible in (incidental) years they expect high expenses. Related to the ex-ante differentiation, the German law states that the deductible holds for at least three years. Related to the ex-post differentia-

[2] Zweifel (1987) has studied the effect of bonuses (instead of deductibles used as a sanction method) in West Germany comparing three insurers. He shows that a no-claim bonus and an experience rated bonus even more, dampens the demand for ambulatory care. The experience-rated bonus implies that insured received a bonus of two monthly premiums in the first year with no claims, three monthly premiums in the second year, and four monthly premiums in the third consecutive year with no claims. Note, however, that with an ex-post differentiation, the premium is only differentiated to the number of previous consecutive years insured have opted for a voluntary deductible. The amount of claims is of no importance to the premium in the next year the insured opts for a voluntary deductible.

tion, the Dutch law offers insurers the possibility to differentiate the premium rebate to the number of years insured have opted for a voluntary deductible.

This paper explores the premium patterns in case of either an ex-ante or ex-post differentiation of the premium. Our central research question reads: What would the premiums look like when differentiated to either the duration of the contract for which the voluntary deductible holds (i.e., the ex-ante approach) or the number of previous consecutive years insured have opted for a voluntary deductible (i.e., the ex-post approach)? These premiums depend upon the predicted expenses of insured choosing the different deductible options. However, for which deductible option insured choose depends on their predicted expenses and the premium. Our variable of interest, the premium, therefore is an endogenous variable. Consequently, we have to simulate the distribution of insured across the deductible options and subsequently determine the corresponding premiums. To achieve this, we use data on healthcare expenses and risk characteristics of 762,982 insured from six years.

The theoretical background (section 3.2) discusses the moral hazard reduction resulting from deductibles, how to counteract adverse selection in regulated markets, the composition of the premium and the effect of risk equalisation on the premium. The data and methods are explained in sections 3.3 and 3.4. Sections 3.5, 3.6 and 3.7, respectively, present the results, the conclusions and the discussion.

3.2 THEORETICAL BACKGROUND

3.2.1 Moral hazard and deductibles

Moral hazard is a well-known consequence of comprehensive health insurance, such as in Germany, Switzerland, the Netherlands, and the US. It refers to the change in health behaviour and healthcare consumption resulting from the reimbursement of the costs for healthcare services by the insurer. It could be counteracted by cost-sharing arrangements. Many have studied the effect of different cost-sharing arrangements on the moral hazard reduction (Cummins et al., 1982; Folland et al., 2010; Gerfin and Schellhorn, 2006; Gerfin et al., 2015; Trottmann et al., 2012; Zweifel et al., 2009). This paper focuses on the voluntary deductible as an instrument to reduce moral hazard. Gerfin et al. (2015) show that due to high voluntary deductibles, healthcare demand in Switzerland dropped by 27 per cent. Additionally, Trottmann et al. (2012) correct for the selection effect that results from the voluntary deductible and show that high voluntary deductibles in Switzerland reduced healthcare expenses

by 23 per cent. These studies thus show that deductibles could indeed be an effective instrument to counteract moral hazard.

3.2.2 Counteracting adverse selection in regulated health insurance markets

Rational economic behaviour predicts that individuals will only opt for a voluntary deductible if their expected out-of-pocket expenses under the deductible are smaller than the offered premium rebate. This could lead to adverse selection, meaning that low-risk individuals are more inclined to opt for a voluntary deductible than high-risk individuals within the same premium-risk group (Akerlof, 1970; Neudeck and Podczeck, 1996; Pauly, 1986). Eventually, this could result in an adverse selection (or death) spiral. Several studies indicate that the key conditions for adverse selection – the ability to forecast risk and the fact that this forecast affects insurance takeout (Cave, 1985; Rothschild and Stiglitz, 1976; Wilson, 1977) – exist (Manning and Marquis, 1989; Marquis and Holmer, 1986; Marquis and Phelps, 1987). Insurers in free markets can reduce adverse selection by risk-rating the premium or by denying insured to reduce their deductible level in later years. However, insurers in regulated health insurance markets, such as in Germany, Switzerland, the Netherlands, and the US, do not have these options. In these markets, both the premium and the premium rebate for voluntary deductibles must be community-rated, meaning that insurers must offer the same premium (rebate) to each insured with the same insurance policy and the same deductible level[3]. Additionally, the abovementioned countries have open enrolment, which means that applicants cannot be rejected. Therefore, insured can determine each year whether to opt for a voluntary deductible[4]. The requirements of both community-rating and open enrolment cause adverse selection to be larger in regulated markets than in free markets, which limits the moral hazard reduction resulting from voluntary deductibles. Insurers in regulated markets may have two options to reduce adverse selection[5]. The first option regards an ex-ante differentiation of the premium to the duration of the contract for which the voluntary deductible holds (e.g., 1, 5, 10 years, etc.). The second option regards an ex-post differentiation of the premium to the number of previous consecutive years insured

[3] Only in the Health Insurance Marketplaces in the US (formerly known as the Health Insurance Exchanges) premiums may be conditioned on age (1:3), smoking (1:1.5), family size and geography, but not on other risk characteristics.

[4] Note that the voluntary deductible in Germany holds for three years and insured can only adjust their voluntary deductible after these three years.

[5] Note that due to the requirements of community-rating and open enrolment, insurers in regulated markets are, compared to insurers in free markets, unable to risk-rate the premium (rebate) or to deny insured to reduce the deductible level to counteract adverse selection.

have opted for a voluntary deductible. Note that with this option, compared to the ex-ante option, insured have the possibility to adjust (or even opt out of) the deductible level each year. Assuming that insured who opt for a voluntary deductible for a longer contract period or in multiple consecutive years are healthier than insured who only opt for a voluntary deductible in one year, it can be hypothesised that the premium would, ceteris paribus, decrease with the contract period for which the deductible holds or the number of previous consecutive years insured have opted for a voluntary deductible. In Germany, the law states that voluntary deductibles hold for three years, which is related to the ex-ante differentiation as discussed within this paper, except that German insured have no choice regarding the contract period (i.e., insured either choose no deductible or a deductible that holds for three years). The Dutch law provides insurers the possibility to apply an ex-post differentiation of the premium as discussed within this paper, stating that "the premium rebate may depend on the number of calendar years for which the insured has opted for a voluntary deductible"[6]. It was mentioned that insured had to weigh the increase in premium rebate against the possibility to decrease the voluntary deductible (House of Representatives, 2004) and that this would provide insured with an incentive to opt for a deductible also in a year they incidentally expect (high) healthcare expenses. After a decade, however, none of the Dutch insurers utilises the option.

3.2.3 Composition of the premium

To determine the ex-ante and ex-post differentiated premiums, this section discusses the composition of the premium. Generally speaking, the premium paid by insured equals the expected insurance claims[7] (see Fig. 3.1). Insured with a voluntary deductible receive a premium rebate that can be decomposed into three components (Van Kleef et al., 2006). The first component is the effect of self-selection that arises because, given a certain premium rebate, healthy insured have a greater incentive to opt for a voluntary deductible than unhealthy insured (i.e., the adverse selection component). Consequently, market segmentation is created where insured with a voluntary deductible are on average healthier and have lower insurance claims than insured without a voluntary deductible. The second component is the moral hazard reduction resulting from

[6] In the corresponding amendment, this was originally formulated as: "the premium rebate may depend on the duration of the health insurance policy" [House of Representatives, 2004], which is actually an ex-ante differentiation of the premium rebate.

[7] In this paper, we solely focus on the insurance claims and disregard the insurers' loading fee (e.g., overhead costs and administration costs), since in our data (section 3.3) we have no information on the loading fee and since the loading fee only constitutes a small part of the premium.

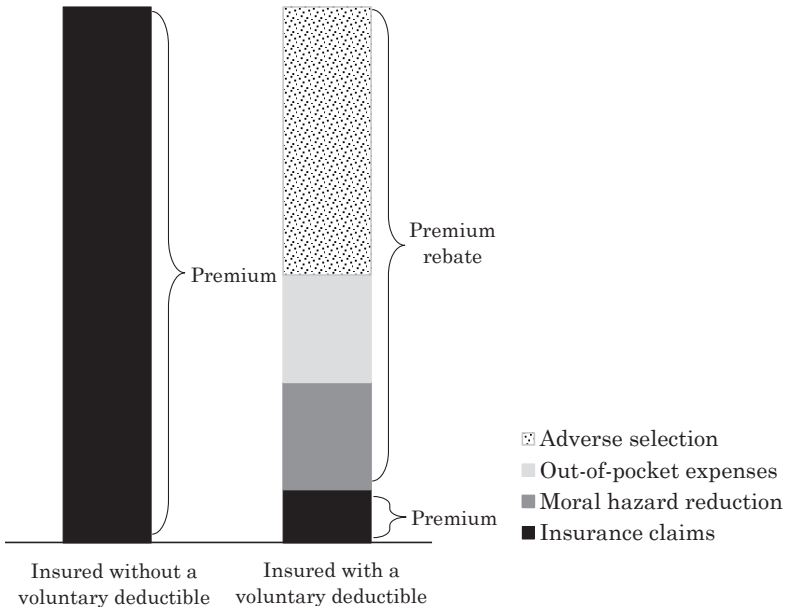

Fig. 3.1 Composition of the premium and premium rebate in health insurance markets without risk equalisation.

the voluntary deductible, which (ceteris paribus) lowers the total healthcare expenses. The third component regards the expected out-of-pocket expenses paid by insured with a voluntary deductible. Consequently, the insurer has to reimburse less than for insured without a voluntary deductible (ceteris paribus).

Many studies show that mostly young and healthy insured opt for a voluntary deductible (e.g., Cutler and Zeckhauser (2000), Gabel et al. (2002), Marquis (1992), Van de Ven and Van Praag (1981), Wolfe and Goddeeris (1991)). Given these findings, it is expected that insured who opt for a voluntary deductible with a long contract period or in more consecutive years are healthier than insured with short contract periods and few years. Subsequently, the expected insurance claims, moral hazard reduction, and out-of-pocket expenses of insured with a voluntary deductible for a long contract period or in more consecutive years could be smaller than for insured with short contract periods or few years. So, if the premium is either ex-ante or ex-post differentiated, one possible outcome could be that the premium decreases with respectively the contract period or the number of years insured have opted for a voluntary deductible. However, insured with long contract periods could incur (unexpected) high healthcare expenses during the contract. As a result, the differentiation could

also result in an increasing premium with the contract period. Furthermore, if the ex-post differentiation indeed results in a behavioural effect (i.e., insured keep the deductible also in years they expect high healthcare expenses), the premium could also increase with the number of years insured have opted for a deductible.

3.2.4 Effect of risk equalisation on the premium

In addition to the requirements of community-rating (i.e., insurers must offer the same premium to each insured with the same policy and the same deductible level) and open enrolment (i.e., applicants cannot be rejected), Germany, Switzerland, the Netherlands, and the US have a risk equalisation scheme that compensates insurers for differences in predicted expenses between low-risk and high-risk individuals. The current German risk equalisation scheme includes demographic risk adjusters and a set of morbidity-based risk adjusters (Buchner et al., 2013). The Swiss risk equalisation scheme includes age, gender, and prior hospitalisation as risk adjusters (Shmueli et al., 2015). The Dutch scheme includes an age and gender interaction, Pharmacy-based Cost Groups (PCGs), Diagnoses-based Cost Groups (DCGs), durable medical equipment cost groups, source of income, region, social economic status, multiple-year high costs and generic somatic morbidity (iBMG, 2015). In 2014, the Health Insurance Marketplaces in all states in America (except Massachusetts) use the risk equalisation model developed by the US Department of Health and Human Services based upon the Hierarchical Condition Categories (Kautter et al., 2014). These risk equalisation systems affect the premium paid by insured. Let us assume that risk equalisation perfectly adjusts for the differences in predicted expenses between low-risk and high-risk individuals. In that case, the premium consists of the expected insurance claims and a risk equalisation payment. Firstly, for insured without a voluntary deductible, this risk equalisation payment is equal to the difference between the average healthcare expenses in the population and the individuals' average predicted insurance claims. This implies that risk equalisation has a negative effect on the premium if the individual expenses are larger than the average expenses, and a positive effect on the premium if the individual expenses are smaller than the average expenses. Secondly, the risk equalisation payment for insured with a voluntary deductible equals the difference between the average healthcare expenses in the population and the sum of the predicted expenses, the moral hazard reduction, and the out-of-pocket expenses resulting from the voluntary deductible. After all, risk equalisation aims to equalise the adverse selection component. In case of perfect risk equalisation, this adverse selection component is fully equalised and incorporated into the premium. Therefore, the

premium rebate only consists of the moral hazard reduction and out-of-pocket expenses. However, if risk equalisation does not perfectly adjust for differences in predicted expenses between low-risk and high-risk individuals, a share of the adverse selection component is not equalised and therefore reflected into the premium rebate. The difference in quality between the Swiss and the Dutch risk equalisation schemes might also (partially) explain why in Switzerland 56 per cent of the insured opted for a voluntary deductible in 2013 (Bundesamt für Gesundheit, 2013), while in the Netherlands only 12 per cent opted for a voluntary deductible in 2015 (Vektis, 2015c). After all, Swiss insurers might be able to reflect a larger share of the adverse selection component into the premium rebate.

3.2.5 Conclusion

In sum, voluntary deductibles are offered in the regulated health insurance markets of Germany, Switzerland, the Netherlands, and the US in order to counteract moral hazard. However, the moral hazard reduction is limited due to adverse selection, where insured only opt for a voluntary deductible if their expected expenses are smaller than the premium rebate. In these regulated markets, adverse selection could potentially be reduced by an ex-ante or ex-post differentiation of the premium to respectively the contract period for which the voluntary deductible holds or the number of previous consecutive years an insured has opted for a voluntary deductible. To determine the differentiated premiums that could then be offered, we perform several empirical simulations in which we also include the effect of risk equalisation on the premium.

3.3 DATA

For the empirical analyses, we use the Achmea Health Database that contains administrative data from a large Dutch health insurer who operates mainly in the western and eastern parts of the Netherlands. It includes individual level information on insurance claims in the years 2006–2011 aggregated at and categorised into the following 11 types of healthcare services: GP-care, pharmacy, inpatient care, hospital admissions, outpatient care, dental care, maternity care, durable medical equipment, physiotherapy, mental healthcare, and care consumed in a foreign country. Moreover, the database includes an encrypted ID number and (per year) information on the year of birth, sex, ethnicity, degree of urbanisation, the number of days of enrolment, and in which PCG and/or DCG the insured is classified for the risk equalisation scheme. Remember that PCGs and DCGs are risk adjusters used as a proxy for health

status, based upon prior use of pharmaceuticals and prior hospital inpatient diagnoses, respectively (Van Kleef et al., 2013). For simplicity reasons, two selection criteria are applied to our simulation sample: individuals must be fully insured in all six years[8] and individuals must be 18 years or older on January 1, 2007, since in the Netherlands only adults can opt for a voluntary deductible. These selection criteria provide us with a sample of 762,982 insured. In order to be able to compare the premium of both the ex-ante and ex-post differentiation and since the deductible amount remains the same for all years (see section 3.2.3), all healthcare expenses are corrected for inflation to the level of 2007. When comparing our sample with the Dutch population, it shows that the average health in the dataset is somewhat worse compared to the Dutch population: e.g., more insured are classified into a PCG or DCG and the average healthcare expenses are higher. This is probably caused by the fact that the Achmea Health Database belongs to a former sickness fund. Since we select insured opting for a voluntary deductible relative to the entire sample, the difference between our sample and the Dutch population could affect the absolute level of the premium but would not affect the premium patterns over the deductible options.

[8] In our dataset, few insured (0.9 per cent) opted for a voluntary deductible in 2011. Note that it is impossible to perform the empirical analyses with the insured who actually opted for a voluntary deductible since we only have data from one Dutch insurer. This means that we cannot follow insured who switch insurers. Research shows that especially young and healthy insured switch insurers (Hendriks et al., 2009; Mosca and Schut-Welkzijn, 2008; Reitsma-van Rooijen et al., 2011). These are also the insured who are most likely to opt for a voluntary deductible (e.g., Cutler and Zeckhauser (2000), Gabel et al. (2002), Marquis (1992), Van de Ven and Van Praag (1981), Wolfe and Goddeeris (1991)). Consequently, our results could become biased if we would perform the analyses with the insured who actually opted for a voluntary deductible in the dataset. To overcome this problem, we perform a simulation study. Prior to the simulation, we have corrected the healthcare expenses of the insured in the dataset who opted for a voluntary deductible in any year. For each of these insured in each of the years for the five different Dutch voluntary deductible levels (i.e., €100, €200, €300, €400 or €500), we increased their healthcare expenses with a percentage based upon extensive research by Keeler et al. (1988) (see also Bakker (1997), Bakker et al. (2000)), to correct for the moral hazard reduction that results from the voluntary deductible. Note that in this case we apply the results of the study by Keeler et al. (1988) since this enables us to apply different percentages for different deductible levels in different years. For the moral hazard reduction in the rest of the paper, we apply the results by Trottmann et al. (2012) since these results are more recent.

3.4 METHODS

3.4.1 Opting for a voluntary deductible

In order to determine the premiums in year *t*, we need to know which insured opt for which deductible option. In other words, for the ex-ante differentiation, we need to know for year *t* which group of insured did not opt for a voluntary deductible and which groups of insured opted for a voluntary deductible with either a 1-, 2-, 3-, 4-, or 5-year contract period. For the ex-post differentiation, we need to know for year *t* which group of insured did not opt for a voluntary deductible, which group opted for a voluntary deductible in year *t*, but not in year *t*-1, which group opted for a voluntary deductible in year *t* and *t*-1, but not in year *t*-2, etc.

Following the theory of rational consumer behaviour, the distributions of insured over the deductible options would ideally be determined by comparing the insured's expected benefits with his/her expected costs of opting for a voluntary deductible, implying that only insured for whom their expected healthcare expenses under the deductible are smaller than the premium rebate would opt for a voluntary deductible. However, whether insured opt for a voluntary deductible in a certain year depends on the premium, but at the same time the premium depends on the distribution of insured over the deductible options. This makes the premium, which is also our variable of interest, an endogenous variable. This means that we cannot use the premium as the input variable to determine who opts for a deductible. Therefore, to get an estimate of these premiums, we make assumptions about the distribution of insured over the deductible options for both the ex-ante and ex-post differentiation. We assume that insured with the lowest predicted healthcare expenses would opt for a deductible. Several models, which can be found in appendix 3, to determine the rank of insured based upon their predicted healthcare expenses in year *t* have been tested. The most accurate model, based upon the Spearman's correlation coefficient, is an OLS model with a log transformation of healthcare expenses and we use this model for our empirical simulations. The dependent variable regards the total healthcare expenses under basic insurance in year *t*. The independent variables indicate several background characteristics that are in the dataset: an age and gender interaction, classification into a PCG and/or DCG in year *t* (based upon information from year *t*-1), degree of urbanisation in the residential area, ethnicity and past total healthcare expenses in year *t*-1 classified into vigintiles. A detailed description of the independent variables can be found in appendix 4. After the healthcare expenses are predicted, insured are ranked accordingly. Furthermore, we determine the rank of insured in years *t*-1, *t*-2, *t*-3, and *t*-4 based upon their predicted healthcare expenses in those

years. In order to do so, we use the same model specification as for year t, but the variables are based upon data from earlier years[9]. Note that for the ex-ante differentiation, insured have to decide on the duration of their contract period in year t (i.e., 2007) and that we use information from the years t+1, t+2, t+3 and t+4 (i.e., 2008, 2009, 2010, 2011) to determine the rank of insured in these years. However, one might question whether insured in year t have (all) information concerning the upcoming years. An alternative approach would be to use only the information from year t and t-1 to determine the rank of insured in future years. With the first approach, we would overestimate adverse selection, while with the second approach we would underestimate adverse selection into multiple-year contracts. After all, research shows that substantial consumer information surplus exists also for multiple-year contracts (Van de Ven and Van Vliet, 1995), meaning that insured do have some information regarding their future healthcare expenses that may not be picked up by administrative information from year t-1. Therefore, and for reasons of simplicity, we determine the rank of insured for all years using the first mentioned approach for both the ex-ante and ex-post differentiation. In appendix 5 we will show that the possible overestimation of adverse selection under this approach has no impact on the main conclusions of this paper.

3.4.2 The ex-ante differentiation

For the ex-ante differentiation, we simulate a distribution of insured over the different contract periods. We assume that an insurer wants to determine the premiums in year t (i.e., 2007 for the ex-ante differentiation) in case he would offer six different insurance policies: a policy without a voluntary deductible and five policies with different contract periods for the voluntary deductible, i.e., 1, 2, 3, 4 or 5 years. Remember that for all years we have ranked insured according to their predicted expenses in that year. We assume that the half of the sample with the lowest predicted expenses in year t opts for an insurance policy with a deductible. To then determine who will opt for which multiyear contract, we sum the rank of the insured over the different contract periods. In other words, for a 2-year contract, we sum the rank of insured in year t and t+1, and for a 3-year contract, we sum the rank of insured in year t, t+1 and t+2, etc. From the half of the sample that is assumed to opt for a policy with a deductible, the quintile with the lowest sum-rank for a 5-year contract is assumed to opt for that policy. From the remaining 40 per cent of insured opting

[9] E.g., for the rank of insured in year t-1 this implies that the dependent variable regards the total healthcare expenses under basic insurance in year t-1 and the independent variables regard an age and gender interaction, classification into a PCG and / or DCG in year t-1 (based upon information from year t-2), degree of urbanisation in the residential area, ethnicity and past total healthcare expenses in year t-2 classified into vigintiles.

for a deductible, the quarter with the lowest sum-rank for a 4-year contract is assumed to opt for that policy. From the remaining 30 per cent of insured opting for a deductible, the third with the lowest sum-rank for a 3-year contract is assumed to opt for that policy. From the remaining 20 per cent of insured opting for a deductible, the half of insured with the lowest sum-rank for a 2-year contract is assumed to opt for that policy and the other half is assumed to opt for a 1-year contract with a deductible. Note that this process does not include the simulation of a behavioural effect where insured would also opt for a long contract period even if they incidentally expect high healthcare expenses in one year during the contract period. In the end, this process provides us with a distribution of insured in year t where a group of 50 per cent of the insured does not opt for a deductible and five groups of 10 per cent do opt for a deductible with respectively a 1-, 2-, 3-, 4- or 5-year contract period. For this distribution of insured, we subsequently determine the premiums per insurance policy.

3.4.3 The ex-post differentiation

For the ex-post differentiation, we simulate a distribution of insured in year t (i.e., 2011 for the ex-post differentiation) based upon the number of previous consecutive years insured have opted for a voluntary deductible. For this differentiation, we assume that an insurer decreases the premium with each additional consecutive year an insured has opted for a voluntary deductible since year t-4 (i.e., 2007 for this differentiation). Two scenarios are simulated depending on the potential behavioural effect of this differentiation.

In scenario I, we assume that the differentiation of the premium has no effect on the decision to opt for a voluntary deductible, which is contrary to what would be expected (and was expected by the Dutch government). Insured only opt for a deductible if they belong to the half of the sample with the lowest predicted expenses. Looking back from year t, we determine for insured who are assumed to opt for a deductible in year t the number of previous consecutive years they are assumed to opt for a voluntary deductible as well.

In scenario II, we assume a moderate behavioural effect of the differentiation of the premium. We assume that insured are willing to keep the voluntary deductible for one year they expect (high) healthcare expenses (i.e., belong to the half of the sample with the highest predicted healthcare expenses). This means for instance that if an insured is assumed to opt for a voluntary deductible in year t-4, he will also opt for a deductible in year t-3, irrespective of his rank in that year. The insured is thereafter assumed to opt out of the voluntary deductible in year t-2 only if he belongs to the half of the sample with the highest predicted healthcare expenses in both year t-3 and t-2, etc. In the end, this process provides us with a scenario where some retention of the voluntary de-

ductible results from the differentiation of the premium, but where insured also opt out of the voluntary deductible if they for instance incur a chronic disease. The simulation process for these scenarios results in a distribution of insured in year *t* over six groups: insured without a voluntary deductible, insured with a voluntary deductible with different numbers of previous consecutive years they have opted for deductible (i.e., 0, 1, 2, 3 or 4 previous consecutive years).

3.4.4 Composition of the premium

After the distribution of insured over the deductible options for both the ex-ante and ex-post differentiation in year *t* are simulated, we calculate the premium for each of the six aforementioned groups per distribution. For the analyses we assume a voluntary deductible of €1,000. The average healthcare expenses per individual ($\overline{\text{HCE}}$) in the dataset are €1,894[10] in all years. The premium is determined using equations (1a) and (1b) for respectively insured without and with a voluntary deductible:

$$P_{NVD} = \overline{\text{IC}}_{NVD} + \overline{\text{REP}}_{NVD} \quad (1a)$$

$$P_{VD} = \overline{\text{IC}}_{VD} + \overline{\text{REP}}_{VD} \quad (1b)$$

where P is the premium, NVD indicates insured without a voluntary deductible, VD indicates insured with a voluntary deductible (with either different contract periods or different numbers of previous years they have opted for a deductible), $\overline{\text{IC}}$ are the average insurance claims and $\overline{\text{REP}}$ represents the average risk equalisation payment. Without any risk equalisation, the equations show that the premium equals the average insurance claims in the group. With risk equalisation, however, the premium is affected by the risk equalisation payment, which is determined for insured *without* a voluntary deductible using equation (2a):

$$\overline{\text{REP}}_{NVD} = \frac{x}{100}\,[\overline{\text{HCE}} - \overline{\text{IC}}_{\text{NVD}}] \quad (2a)^{11}$$

[10] The average healthcare expenses of €1,894 in the data regard the expenses without any cost sharing arrangements (i.e., the insurance claims, out-of-pocket expenses and moral hazard reduction as shown in Fig. 3.1). The average expenses are equal for all years due to the correction for inflation to the year 2007.

[11] Note that, compared to equation (2b), the moral hazard reduction and out-of-pocket expenses in equation (2a) are omitted because insured without a voluntary deductible do not have any moral hazard reduction and out-of-pocket expenses resulting from a deductible.

where x indicates the quality of the risk equalisation model[12] and $\overline{\text{HCE}}$ indicates the average healthcare expenses in the data without any cost-sharing arrangements. Due to the voluntary deductible, the risk equalisation payment for insured *with* a voluntary deductible is different to that of insured without a voluntary deductible and determined using equation (2b):

$$\overline{\text{REP}}_{\text{VD}} = \frac{x}{100} \left[\overline{\text{HCE}} - (\overline{\text{IC}}_{VD} + \overline{\text{MHR}}_{VD} + \overline{\text{OOP}}_{VD})\right] \quad (2b)$$

where $\overline{\text{MHR}}$ and $\overline{\text{OOP}}$ respectively indicate the average moral hazard reduction and the average out-of-pocket expenses for the group of insured with a voluntary deductible (for different contract periods or in multiple consecutive years) resulting from the deductible[13]. After the risk equalisation payment for the different groups of insured is determined, the premiums can be calculated using equation (1a) or (1b) depending on whether the insured has a deductible or not.

In order to determine the differentiated premiums that can be offered by insurers, we need to know 1) the average healthcare expenses in the data, 2) the average insurance claims, the average moral hazard reduction and the average out-of-pocket expenses for the different groups of insured, and 3) the quality of the risk equalisation model. Firstly, the average healthcare expenses in the data are already mentioned and equal €1,894. Secondly, for the average insurance claims for insured who are not assumed to opt for a deductible we use the healthcare expenses in the data. Since no cost-sharing arrangements are in place in our data, the healthcare expenses in the data for insured who are assumed to opt for a deductible include a moral hazard reduction and out-of-pocket expenses they would have in case of a voluntary deductible. Many researchers studied the reduction of healthcare expenses resulting from voluntary deductibles (e.g., Bakker (1997), Bakker et al. (2000), Gerfin et al. (2015), Keeler et al. (1988), Trottmann et al. (2012)). For our simulations, we use the reduction as determined in the study by Trottmann et al. (2012) since the researchers of this recent study corrected for the selection effect that arises when taking out voluntary deductibles. Consequently, the healthcare expenses in the data of insured with a voluntary deductible are reduced by 22.6 per cent due to the voluntary deductible. The size of the out-of-pocket expenses is

[12] x indicates the percentage in which risk equalisation is able to equalise the expected differences in healthcare expenses between low-risk and high-risk individuals caused by differences in health.

[13] Note that in our simulations the moral hazard reduction and out-of-pocket expenses are fully reflected into the premium rebate, while in practise different countries make different choices.

determined as the healthcare expenses after the moral hazard reduction in the interval [0:1,000]. The insurance claims for insured with a voluntary deductible are then determined as the healthcare expenses in the data minus the moral hazard reduction and minus the out-of-pocket expenses. For instance, an insured with healthcare expenses of "€1,250 in the data" and a voluntary deductible of €1,000 will have a moral hazard reduction of €283 (€1,250 x 0.226), out-of-pocket expenses of €967 (€1,250 – €283) and no insurance claims (€1,250 – €283 – €967). However, if an insured who opts for a voluntary deductible of €1,000 has healthcare expenses of "€2,500 in the data", the moral hazard reduction will be €566 (€2,500 x 0.226), the out-of-pocket expenses will be €1,000 (€2,500 – €566 = €1,934) and the insurance claims equal €934 (€2,500 – €566 – €1,000). Thirdly, to determine the effect of risk equalisation on the premium, Van Kleef et al. (2008b) show that equalisation based upon region, age and gender and equalisation based upon demographic factors, PCGs and DCGs reduce the adverse selection component of the premium rebate for the highest Swiss voluntary deductibles with respectively 47 and 74 per cent in 2006. For our simulations, we therefore study the effect of no risk equalisation, perfect risk equalisation and the two models used in the research by Van Kleef et al. (2008b). Note that due to extensive research, risk equalisation schemes have become more sophisticated and that the Dutch scheme of 2015 is already more sophisticated than the 74 per cent model studied by Van Kleef et al. (2008b).

3.5 RESULTS

3.5.1 Situation without differentiation

Since different percentages of insured who are assumed to opt for a voluntary deductible can be studied, Table 3.1 shows the results under the assumption that 5, 25, or 50 per cent of the sample with the lowest predicted expenses would opt for a voluntary deductible of €1,000 without any differentiation of the premium without any risk equalisation. Three insights are drawn from this table. Firstly, the table shows that both the premiums and premium rebates increase with the percentage of insured opting for a deductible. The latter is partially due to the increase of the moral hazard reduction and out-of-pocket expenses, but largely due to the increase in adverse selection. Secondly, in all three cases, the premium rebate is larger than the voluntary deductible itself[14].

[14] Note that the Swiss government has capped the offered premium rebate at 70 per cent of the voluntary deductible level and that all Swiss insurers offer this premium rebate. Due to a relatively poor risk equalisation scheme (and therefore a substantial adverse selection component), it may be that if the Swiss government did not oblige this cap, premium rebates would be much higher.

Thirdly, the premium rebate in general exists for the largest part of an adverse selection component (i.e., 88 per cent of the premium rebate if 50 per cent of the insured would opt for a voluntary deductible).

Table 3.1 Composition of the premium (P) in 2007 for an insurance policy with a voluntary deductible of €1,000 for different percentages of insured with the lowest predicted healthcare expenses who are assumed to opt for a voluntary deductible, without any differentiation of the premium, without any risk equalisation.

%		$\overline{\text{HCE}}$	$\overline{\text{IC}}^a$	$\overline{\text{MHR}}$	$\overline{\text{OOP}}$	**P**^{a}
5 per cent opts for a voluntary deductible						
95	**NVD**	€1,894	€1,981			€1,981
5	**VD**		€46	€51	€129	€46
25 per cent opts for a voluntary deductible						
75	**NVD**	€1,894	€2,417			€2,417
25	**VD**		€75	€74	€176	€75
50 per cent opts for a voluntary deductible						
50	**NVD**	€1,894	€3,289			€3,289
50	**VD**		€128	€113	€257	€128

[a] Note that since a situation without risk equalisation is shown, no risk equalisation payment is in place and the insurance claims equal the premium.

$\overline{\text{HCE}}$ = average healthcare expenses
$\overline{\text{IC}}$ = average insurance claims
$\overline{\text{MHR}}$ = average moral hazard reduction
$\overline{\text{OOP}}$ = average out-of-pocket expenses
P = premium
NVD = insured without a voluntary deductible
VD = insured with a voluntary deductible

Table 3.2 Ex-ante option. Composition of the premium for an insurance policy with a differentiation of the premium to the duration of the contract period for a voluntary deductible of €1,000 in year *t without* any risk equalisation.

%		$\overline{\text{HCE}}$	$\overline{\text{IC}}^a$	$\overline{\text{MHR}}$	$\overline{\text{OOP}}$	**P**^{a}
50	**NVD**		€3,289			€3,289
50	**VD**		€128	€113	€257	€128
10	**VD 1-year contract**		€573	€360	€656	€573
10	**VD 2-year contract**	€1,894	€35	€87	€262	€35
10	**VD 3-year contract**		€19	€56	€173	€19
10	**VD 4-year contract**		€12	€39	€123	€12
10	**VD 5-year contract**		€1	€22	€72	€1

[a] Note that since a situation without risk equalisation is shown, no risk equalisation payment is in place and the insurance claims equal the premium.

$\overline{\text{HCE}}$ = average healthcare expenses
$\overline{\text{IC}}$ = average insurance claims
$\overline{\text{MHR}}$ = average moral hazard reduction
$\overline{\text{OOP}}$ = average out-of-pocket expenses
P = premium
NVD = insured without a voluntary deductible
VD = insured with a voluntary deductible

3.5.2 The ex-ante differentiation

Remember that, for the ex-ante differentiation, we want to determine the premiums in year *t* (i.e., 2007 for this differentiation) in case an insurer would offer six insurance policies: a policy without a voluntary deductible and five policies with different contract periods for the voluntary deductible. Table 3.2 shows the results of this simulation without any risk equalisation and provides three insights. Firstly, the table shows that the premium could decrease with the duration of the contract. Secondly, the premium for insured with a 1-year contract for the deductible is much higher compared to the situation without differentiation. Thirdly, the table shows that the moral hazard reduction for a 1-year contract and the out-of-pocket expenses for both a 1- and 2-year contract are larger compared to the situation without differentiation.

3.5.3 The ex-post differentiation

Remember that for the ex-post differentiation, scenario I simulated a situation without any behavioural effect. The upper part of Table 3.3 shows the results for scenario I without any risk equalisation and provides three insights. Firstly, the table shows that the premium could decrease with the number of previous consecutive years insured have opted for a deductible. Secondly, it shows that compared to the situation without differentiation, the premium is higher for the first three consecutive years. Thirdly, the table shows that the moral hazard reduction and out-of-pocket expenses are larger for the first four consecutive years opting for a voluntary deductible compared to the situation without differentiation.

In scenario II, insured are assumed to keep the voluntary deductible during 1 year they expect (high) healthcare expenses incentivised by the premium differentiation. The bottom part of Table 3.3 shows the results for scenario II without any risk equalisation and provides three insights. Firstly, the results show that the premium would increase sharply for the second consecutive year compared to the first year opting for a deductible and that the premium would thereafter considerably decrease. This would imply that only after the second consecutive year, offering a decreasing premium with the number of years insured have opted for a deductible would be feasible in case of no risk equalisation. The increase in premium for the second consecutive year follows from the retention of the voluntary deductible in that year even if (high) healthcare expenses are expected, meaning that insured who expect (high) healthcare expenses for the second consecutive year opting for a deductible are included in that group. Secondly, compared to a situation without differentiation, the premium is only lower for the fifth consecutive year opting for a voluntary deductible. Thirdly, the moral hazard reduction and out-of-pocket expenses are

Table 3.3 Ex-post option. Composition of the premium for an insurance policy with a differentiation of the premium to the number of previous consecutive years an insured has opted for a voluntary deductible of €1,000 in year *t without* any risk equalisation.

%		$\overline{\text{HCE}}$	$\overline{\text{IC}}^a$	$\overline{\text{MHR}}$	$\overline{\text{OOP}}$	**P**^{a}
SCENARIO I – no behaviour effect						
50	**NVD**		€3,287			€3,287
50	**VD**		€133	€113	€254	€133
9.1	**1VD**		€238	€181	€381	€238
6.0	**2VD**	€1,894	€192	€152	€327	€192
4.7	**3VD**		€141	€126	€291	€141
3.5	**4VD**		€120	€114	€268	€120
26.7	**5VD**		€85	€79	€186	€85
SCENARIO II – moderate behavioural effect						
40.9	**NVD**		€3,584			€3,584
59.0	**VD**		€262	€163	€296	€262
4.6	**1VD**		€287	€208	€423	€287
4.6	**2VD**	€1,894	€502	€281	€457	€502
3.5	**3VD**		€349	€219	€400	€349
6.4	**4VD**		€332	€200	€350	€332
39.9	**5VD**		€213	€134	€245	€213

[a] Note that since a situation without risk equalisation is shown, no risk equalisation payment is in place and the insurance claims equal the premium.

$\overline{\text{HCE}}$ = average healthcare expenses
$\overline{\text{IC}}$ = average insurance claims
$\overline{\text{MHR}}$ = average moral hazard reduction
$\overline{\text{OOP}}$ = average out-of-pocket expenses
P = premium
NVD = insured without a voluntary deductible
VD = insured with a voluntary deductible

larger for the first four consecutive years opting for a deductible compared to the situation without differentiation of the premium. Compared to scenario I, the moral hazard reduction and out-of-pocket expenses are larger for all groups, except for the out-of-pocket expenses for insured with a voluntary deductible for five consecutive years.

3.5.4 Risk equalisation

Table 3.4 provides the estimated ex-ante differentiated premiums in case of perfect risk equalisation. It shows that, as a result of perfect risk equalisation, the premium is expected to increase with the duration of the contract. Furthermore, Table 3.4 shows that only insured with a 1-year contract period for the deductible pay a lower premium compared to the situation without differentiation of the premium. Figure 3.2 additionally shows the premium patterns for an ex-ante differentiation compared to a 1-year contract for the

Table 3.4 Ex-ante option. Composition of the premium for an insurance policy with a differentiation of the premium to the duration of the contract period for a voluntary deductible of €1,000 in year *t* with *perfect* risk equalisation.

%		$\overline{IC}$	$\overline{REP}$	**P**
50	**NVD**	€3,289	€-1,395	€1,894
50	**VD**	€128	€1,396	€1,524
10	**VD 1 year contract**	€573	€305	€878
10	**VD 2 year contract**	€35	€1,510	€1,545
10	**VD 3 year contract**	€19	€1,646	€1,665
10	**VD 4 year contract**	€12	€1,720	€1,732
10	**VD 5 year contract**	€1	€1,799	€1,800

$\overline{IC}$ = average insurance claims
$\overline{REP}$ = risk equalisation payment, determined according to equation (2a) or (2b) given the $\overline{MHR}$ and $\overline{OOP}$ shown in table 3.2
P = premium
NVD = insured without a voluntary deductible
VD = insured with a voluntary deductible

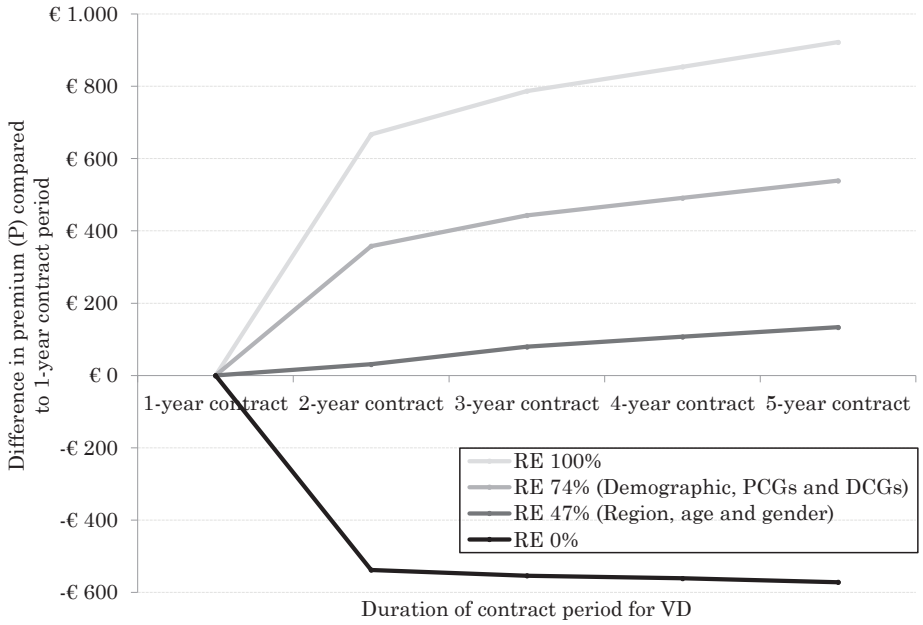

Fig. 3.2 Difference in premium (P) compared to a one-year contract for the voluntary deductible (VD) for risk equalisation models that equalise either 0, 47, 74 or 100 per cent of the difference in predicted expenses between low-risk and high-risk individuals where the distribution of insured in year *t* (i.e., 2007) is determined according to the ex-ante differentiation of the premium.

voluntary deductible for risk equalisation models that equalise 0 per cent, 47 per cent (i.e., based upon region, age, and gender), 74 per cent (i.e., based upon demographic factors, PCGs and DCGs) or 100 per cent of the differences in predicted expenses between low-risk and high-risk individuals. It shows that a decreasing premium with the duration of the contract for which the deductible holds is only feasible without any risk equalisation.

Table 3.5 provides the estimated ex-post differentiated premiums in case of perfect risk equalisation. For scenario I (i.e., without any behavioural effect), the table shows that the premium is expected to increase with the number of years insured have opted for a deductible. For scenario II (i.e., with a moderate behavioural effect), the table shows that the premium could decrease between the first and second consecutive year insured have opted for a deductible, but that it would thereafter increase with the number of consecutive years insured have opted for a voluntary deductible. In both scenarios, only insured who opt

Table 3.5 Ex-post option. Composition of the premium for an insurance policy with a differentiation of the premium to the number of previous consecutive years an insured has opted for a voluntary deductible of €1,000 in year *t* with *perfect* risk equalisation.

%		$\overline{IC}$	$\overline{REP}$	**P**
SCENARIO I no behavioural effect				
50	**NVD**	€3,287	€-1,393	€1,894
50	**VD**	€133	€1,394	€1,507
9.1	**1VD**	€238	€1,094	€1,299
6	**2VD**	€192	€1,223	€1,389
4.7	**3VD**	€141	€1,336	€1,456
3.5	**4VD**	€120	€1,392	€1,495
26.7	**5VD**	€85	€1,544	€1,617
SCENARIO II moderate behavioural effect				
40.9	**NVD**	€3,584	€-1,690	€1,894
59	**VD**	€262	€1,173	€1,435
4.6	**1VD**	€287	€976	€1,263
4.6	**2VD**	€502	€654	€1,156
3.5	**3VD**	€349	€926	€1,275
6.4	**4VD**	€332	€1,012	€1,344
39.9	**5VD**	€213	€1,302	€1,515

$\overline{IC}$ = average insurance claims

$\overline{REP}$ = risk equalisation payment, determined according to equation (2a) or (2b) given the $\overline{MHR}$ and $\overline{OOP}$ shown in table 3.3

P = premium

NVD = insured without a voluntary deductible

VD = insured with a voluntary deductible (the number corresponds to the number of consecutive years)

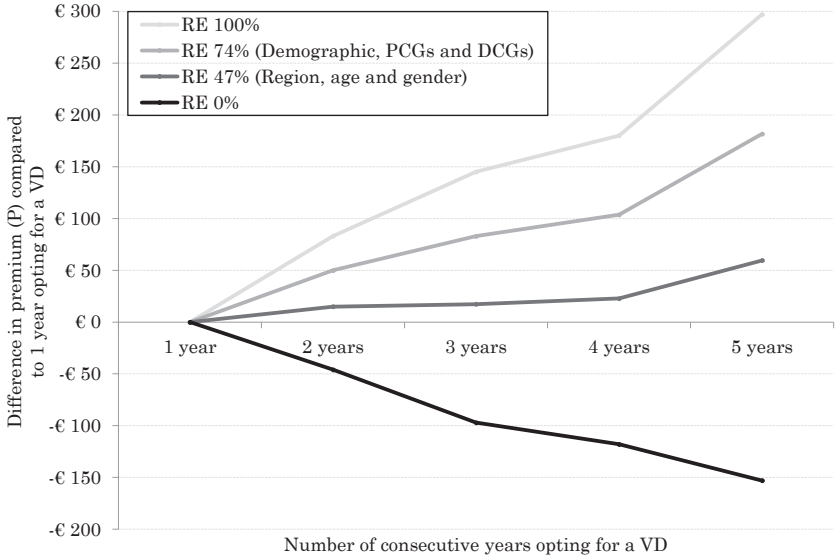

Fig. 3.3 Difference in premium (P) compared to one year opting for a voluntary deductible (VD) for risk equalisation models that equalise either 0, 47, 74 or 100 per cent of the difference in predicted expenses between low-risk and high-risk individuals where the distribution of insured in year *t* (i.e., 2011) is determined according to the ex-post differentiation of the premium for scenario I (no behavioural effect).

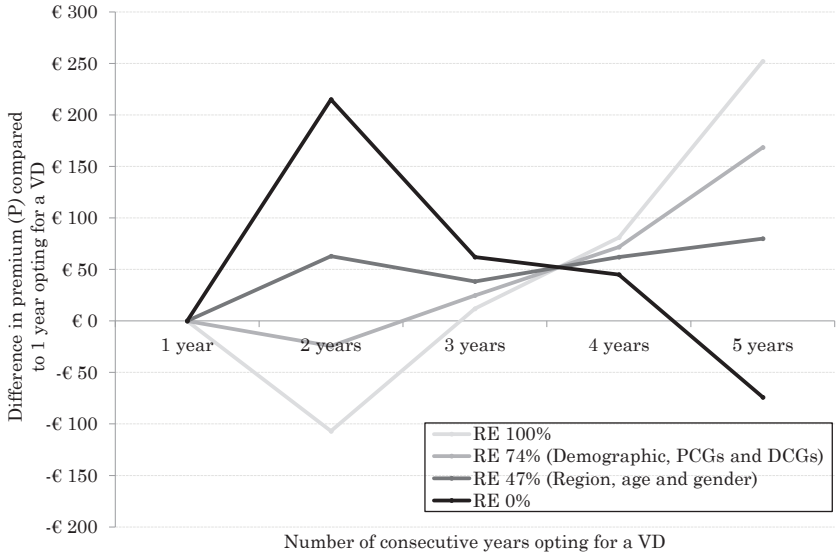

Fig. 3.4 Difference in premium (P) compared to one year opting for a voluntary deductible (VD) for risk equalisation models that equalise either 0, 47, 74 or 100 per cent of the difference in predicted expenses between low-risk and high-risk individuals where the distribution of insured in year *t* (i.e., 2011) is determined according to the ex-post differentiation of the premium scenario II (moderate behavioural effect).

for a voluntary deductible for the fifth consecutive year are offered a higher premium compared to the situation without differentiation of the premium. Figures 3.3 and 3.4 additionally show the premium patterns for an ex-post differentiation for, respectively, scenario I and II compared to one year opting for a voluntary deductible for risk equalisation models that equalise 0, 47, 74, or 100 per cent of the differences in predicted expenses between low-risk and high-risk individuals. Figure 3.3 for scenario I confirms that only without any risk equalisation the premium could decrease with the number of consecutive years insured have opted for a deductible. Figure 3.4 for scenario II shows that the premium could only decrease for the second consecutive year insured have opted for a voluntary deductible in case of perfect or sophisticated (i.e., 74 per cent) risk equalisation. But thereafter, the premium would substantially increase with the number of consecutive years insured have opted for a deductible. Furthermore, the premium could only decrease from the second consecutive year insured have opted for a deductible in a situation without risk equalisation. It might therefore not be that surprising that none of the Dutch insurers utilises the option to ex-post differentiate the premium. Overall, under the assumptions made within this paper, these results imply that, due to risk equalisation, it does not seem likely that insurers in Germany, Switzerland, the Netherlands, or the US could offer a decreasing premium if it is either differentiated to the duration of the contract for which the voluntary deductible holds or the number of previous consecutive years insured have opted for a voluntary deductible.

3.6 CONCLUSIONS

Voluntary deductibles are implemented in regulated insurance markets such as Germany, Switzerland, the Netherlands, and the US to counteract moral hazard. However, the moral hazard reduction resulting from these deductibles could be mitigated by adverse selection, since insured only opt for a deductible if their expected out-of-pocket expenses under the deductible are smaller than the premium rebate. Insurers in regulated markets may reduce this adverse selection by differentiating the premium according to either the duration of the contract for which the voluntary deductible holds (ex-ante approach) or the number of previous years insured have opted for a voluntary deductible (ex-post approach). It can be hypothesised that, the longer the period for which the voluntary deductible holds or the more previous years an insured has opted for a voluntary deductible, the lower the premium will be. This would incentivise insured to opt for a voluntary deductible for a longer period or for another con-

secutive year. To determine the premiums that could be offered in case of such differentiations, we simulated the distribution of insured over the deductible options for both the ex-ante and ex-post differentiation. Thereafter, we calculated the premiums based upon the insurance claims and a risk equalisation payment. The results show that only without risk equalisation insurers would be able to offer a decreasing premium with the duration of the contract or with the number of previous consecutive years insured have opted for a voluntary deductible. With moderate, sophisticated, or perfect risk equalisation, the premiums are expected to increase for both the ex-ante and ex-post differentiation. These results are due to the fact that as either the duration of the contract or the number of years insured have opted for a voluntary deductible increases, the insurance claims decrease but the risk equalisation payments increase, which overall increases the premium. In sum, under the assumptions made in this paper, the results imply that, due to risk equalisation, it seems unlikely that insurers in Germany, Switzerland, the Netherlands, or the US can offer premiums that decrease with either the duration of the contract for which the voluntary deductible holds or the number of previous consecutive years insured have opted for a voluntary deductible. Given these findings, we are sceptical about the feasibility of these strategies to counteract adverse selection.

3.7 DISCUSSION

3.7.1 General discussion points

This section provides four general discussion points regarding the representativeness of our data, the sample sizes of the groups under study, the way risk equalisation is taken into account and the omission of the loading fee in our analyses. Firstly, as mentioned when discussing the data, the average health in the sample is somewhat worse compared to the Dutch population. This implies that the absolute premiums presented in this paper are probably higher than they would be in the Dutch population. The effect of this limitation on relative premiums (i.e., the increase or decrease of the premium with the duration of the contract period or the number of previous consecutive years opting for a voluntary deductible) and our conclusions, however, will be minor since deductible choice is simulated relative to spending and characteristics in our sample and not relative to an absolute benchmark. Furthermore, it seems most likely that if insurers would want to differentiate the premiums for their health insurance policies, they would use their own data to determine these premiums. Nevertheless, we emphasise that our absolute results are not generalisable to

the entire (Dutch) population. In order to achieve more generalisable results, a more representative dataset would be necessary.

Secondly, some of the groups resulting from our simulations are quite small (e.g., 3.5 per cent of the sample) and the results of these groups could be affected by a few insured in the data with very large insurance claims. However, only 176 insured (i.e., 0.02 per cent) and 17 insured (i.e., 0.002 per cent) in the data had healthcare expenses, respectively, larger than €100,000 or €200,000 in 2011. Sensitivity checks where these insured are omitted show that the absolute premiums change only marginally and that the relative premiums remain unchanged.

Thirdly, contrary to our analyses, cost reductions resulting from the voluntary deductible (i.e., moral hazard reduction and out-of-pocket expenses) are in Switzerland, Germany, and the Netherlands partially captured by risk equalisation and can consequently not be fully reflected into the premium rebate (Van Kleef et al., 2008a). This implies that the premium for insured with a deductible would be higher compared to our paper, but it does not affect the relative premiums found in this paper.

Fourthly, this paper only studied insurance claims and disregarded the insurer's loading fee. Although the loading fee does not constitute a large part of the premium, it could affect the premium, the premium rebate and risk equalisation if the average loading fee differs between insured with and without a voluntary deductible. For instance, administration costs differ between these groups since insured with a deductible do not send their bills to the insurer before the total amount exceeds the deductible. Consequently, the insurer does not have to handle the bills of these insured (Van Kleef et al., 2007). Even in a system where most bills are settled between the insurer and the provider, such as in the Netherlands, a difference in administration costs between insured who do and do not opt for a deductible can exist. One can hypothesise that, since upcoding is a serious problem (Steinbusch et al., 2007), insurers spend a lot of time verifying the received bills. Since insured with a voluntary deductible on average use less healthcare services and therefore file less bills compared to insured without a deductible, it could be assumed that verifying the bills of the latter group is more expensive. In a market without any (or with poor) risk equalisation, this could imply that the premiums could potentially decrease for insured with a voluntary deductible compared to the simulations showed within this paper due to smaller administrative costs. However, further research regarding the effect of the loading fee on the premium - also in case of an ex-ante or ex-post differentiation - is necessary.

3.7.2 Empirical assumptions

This section provides five discussion points regarding the assumptions in our empirical simulations. Firstly, we based the assumption of which insured opt for a voluntary deductible solely on the predicted healthcare expenses. However, research shows that other determinants than the predicted expenses affect the decision to opt for a deductible as well, such as loss aversion, risk attitude, ambiguity aversion, debt aversion and omission bias (Van Winssen et al., 2015b). As a result of these factors, it could be expected that fewer insured (i.e., less than 50 per cent) opt for a voluntary deductible. As shown in Table 3.1, fewer insured opting for a deductible affects the absolute premium, but sensitivity analyses showed that the relative premiums for both the ex-ante and ex-post differentiation would not be affected.

Secondly, since we simulate who opts for a deductible based upon predicted expenses, we are unable to incorporate planned medical decisions not identified by the explanatory variables used in our estimation models, such as pregnancy. In our simulations, insured with unidentified planned medical decisions might opt for a deductible, while in practice they would not due to (high) expected healthcare expenses. We therefore may underestimate adverse selection into the different deductible options.

Thirdly, we do not study expenses for different types of healthcare services, but only use total healthcare expenses. Gerfin et al. (2015) show that deductibles affect different types of healthcare differently, where the decrease in healthcare expenses due to the deductible is most pronounced for inpatient care and prescription drugs. This could impact the insured's decision to opt for a voluntary deductible, which is not taken into account in our analyses.

Fourthly, we assume very strong adverse selection into the different deductible options: the entire half of the sample with the lowest predicted expenses opts for a voluntary deductible. A sensitivity check for scenario I of the ex-post differentiation shows that if this assumption is relaxed (i.e., one in two insured belonging to the half of the sample with the lowest predicted expenses randomly opts for a deductible in year *t*), the premiums still increase with the number of consecutive years insured have opted for a voluntary deductible in case of perfect risk equalisation.

Fifthly, for the ex-ante differentiation, we determine the rank of insured in the upcoming years using information from these years. It might, however, be questionable how much information insured actually have on future expenses. Therefore, we performed a sensitivity check for the ex-ante differentiation using only the information known at the start of year *t* to rank insured (see the results in appendix 5). This approach implies an underestimation of adverse selection, since research shows that insured do have some information on

future healthcare expenses (Van de Ven and Van Vliet, 1995). The sensitivity check shows that, although the absolute premiums are somewhat different, the relative premiums show the same pattern as with the approach used within this paper: without risk equalisation, the premiums decrease with the duration of the contract period and with risk equalisation, the premiums increase with the duration of the contract period.

3.7.3 Market dynamics

Our results show the first-order effects (i.e., the premiums when starting to offer insurance policies with ex-ante or ex-post differentiated premiums) and disregard any market dynamics. This section elaborates on these market dynamics for markets without risk equalisation since the results already showed that ex-ante or ex-post differentiated decreasing premiums are impossible with sophisticated or perfect risk equalisation.

Regarding the ex-ante differentiation, if insurer 'A', for instance, would offer these six health insurance policies, insured would have a large incentive to opt for a policy with a contract period longer than 1 year due to the decreasing premium. However, if a competitor would not offer differentiated premiums, his premium for a policy with a voluntary deductible would be much lower (i.e., €128 compared to €573; see Table 3.2). If insurer 'A' would be able, due to optimal marketing, to attract the healthiest insured away from his competitor into the long contract policies, it might indeed be attractive to offer ex-ante differentiated premiums. The reason is that in that case, his competitor has set the premium for a policy with a voluntary deductible too low and must increase it. Additionally, since the results only show the first-order effects, the estimated premiums could change over time when the contract expires and insured once again get to choose between the different deductible options. As with the ex-post approach, it could be that insured are willing to accept (high) healthcare expenses during one year of their contract period. Further research into this dynamic behavioural effect for insurance markets without risk equalisation would be necessary to provide insights into the resulting premium patterns.

Regarding the ex-post differentiation, scenario I (Table 3.3) especially shows the first-order effects. In that case, insurer 'B', for instance, could offer these six health insurance policies, but he could also decide to combine two or three insurance policies. Note that, as with the ex-ante differentiation, a competitor of insurer 'B' who might not offer differentiated premiums, might be less expensive than insurer 'B'. Again, in that case, insurer 'B' should try to attract the healthiest insured away from his competitors into the policies for insured who opted for a deductible in more consecutive years. From scenario I, scenario II could be interpreted as the situation after 5 years (i.e., year t+5) with some

market dynamics simulated as a moderate behavioural effect of the decreasing premium on the insured's decision to opt for a deductible. It already shows that decreasing premiums could only be offered upward of two consecutive years, but further research into market dynamics and behavioural effects in insurance markets without risk equalisation would be necessary to provide further insight into the resulting premium patterns.

Chapter 4

Potential determinants of deductible uptake in health insurance: how to increase uptake in The Netherlands?

ABSTRACT

In health insurance, voluntary deductibles are offered to the insured in return for a premium rebate. Previous research has shown that 11 per cent of the Dutch insured opted for a voluntary deductible in health insurance in 2014, while the highest voluntary deductible level was financially profitable for almost 50 per cent of the population in retrospect. To explain this discrepancy, this paper identifies and discusses six potential determinants of the decision to opt for a voluntary deductible from the behavioural economic literature: loss aversion, risk attitude, ambiguity aversion, debt aversion, omission bias, and liquidity constraints. Based on these determinants, five potential strategies are proposed to increase the number of insured opting for a voluntary deductible. Presenting the voluntary deductible as the default option and providing transparent information regarding the voluntary deductible are the two most promising strategies. If, as a result of these strategies, more insured would opt for a voluntary deductible, moral hazard would be reduced.

4.1 INTRODUCTION

Although fiercely debated (e.g., Hurley (2013), Smith (2013)), cost-sharing is an effective way to counteract moral hazard[15] in health insurance (Newhouse, 1993; Pauly, 1968; Zweifel and Breuer, 2006). One type of cost-sharing is to provide insured with the possibility to opt for a voluntary deductible in return for a premium rebate. Previous research has shown that a voluntary deductible was expected to be financially profitable for almost 50 per cent of the Dutch population in 2014 (Van Winssen et al., 2015a), while at the same time only 11 per cent of the Dutch insured opted for a voluntary deductible (Vektis, 2014). This discrepancy suggests that reasons other than the profitability influence the decision to opt for a voluntary deductible. The aim of this paper is twofold: 1) to identify determinants of the decision to opt for a voluntary deductible to shed light on the observed discrepancy, and 2) to provide strategies that can potentially increase the number of insured opting for a voluntary deductible. After all, if more insured would opt for a voluntary deductible, moral hazard will, ceteris paribus, be reduced.

In the next section, we elaborate on the Dutch example in which the discrepancy is observed (section two). In section three, six potential determinants of the decision to opt for a voluntary deductible are identified from the behavioural economic literature, and these determinants are discussed in order to shed light on the observed discrepancy. Subsequently, section four provides five potential strategies to increase the number of insured opting for a voluntary deductible. Finally, the implications for moral hazard are discussed in section five and the conclusion is provided in section six.

4.2 THE DUTCH SITUATION

The Health Insurance Act, enacted in 2006[16], obligates all Dutch residents to buy basic health insurance from a private insurer for community-rated premiums, which are mostly automatically deducted from the insured's bank account (Schut and Van de Ven, 2011). By this law, a mandatory deductible requires each adult to pay the first €360 (i.e., deductible level of 2014) of healthcare

[15] Moral hazard refers to the change in health behavior and consumption caused by the fact that the health insurer reimburses the costs (Folland et al., 2010; Zweifel and Manning, 2000).

[16] Since the possibility to opt for a voluntary deductible has already existed for a decade, we do not expect that unfamiliarity with the deductible would be a large contributor to the explanation of why insured forego deductibles. However, the percentage of insured with a voluntary deductible has increased considerably in these years (i.e., from 5 per cent in 2006 (Vektis, 2006) to 11 per cent in 2014 (Vektis, 2014)).

expenses out-of-pocket per year. On top of the mandatory deductible, adults can opt for a voluntary deductible of one of five levels (€100, €200, €300, €400 or €500) for which they receive a premium rebate in return that is deducted from their monthly premium. Lawfully, the rebate must be equal for each insured opting for the same deductible level within the same health insurance product[17]. In 2014, the average premium rebate for the highest deductible level was €240 and varied among insurers from €180 to €300 per individual per year. In financial terms, opting for a voluntary deductible in a specific year has been profitable for an individual if the out-of-pocket expenses under the voluntary deductible (on top of the mandatory deductible) in that year were smaller than the offered premium rebate of that year (Van Kleef et al., 2006; Van Winssen et al., 2015a). Based on Dutch claims data of more than 800,000 individuals, Van Winssen et al. (2015a) showed that opting for the highest voluntary deductible level against the average premium rebate would retrospectively have been profitable for 48 per cent of the Dutch insured in 2014. Their research showed that, on average, a voluntary deductible was profitable for males up to the age of 50, for healthy insured, and for insured for whom opting for a voluntary deductible would have been profitable in previous years. They additionally show that for almost 20 per cent of the insured, a voluntary deductible would have been profitable in all 5 years prior to their research year, implying that for a substantial group of insured the profitability is fairly stable over the years. In real life, however, only 11 per cent of the Dutch insured indeed opted for a voluntary deductible in 2014 (Vektis, 2014). The discrepancy between the latter group and the group of insured for whom a voluntary deductible would have been profitable (e.g., 48 per cent) implies that determinants other than the potential financial benefit might influence the decision to opt for a voluntary deductible. Six potential determinants are identified and discussed in the next section.

4.3 POTENTIAL DETERMINANTS OF THE DECISION TO OPT FOR A VOLUNTARY DEDUCTIBLE

4.3.1 Loss aversion

A first potential explanation for the observed discrepancy between the percentage of insured (i.e., about 48 per cent in the Netherlands in 2014) for whom a voluntary deductible is expected to be profitable and the percentage of insured (i.e., 11 per cent in the Netherlands in 2014) who actually opted for a voluntary

[17] Additionally, insurers may offer insured who have opted for a voluntary deductible in previous years a different premium rebate. However, in practice, this does not happen.

deductible, is loss aversion. Kahneman and Tversky (1979) explain loss aversion by stating that 'losses loom larger than gains' and that 'the aggravation that one experiences in losing a sum of money appears to be greater than the pleasure associated with gaining the same amount'. Loss aversion is denoted by λ, where λ> 1 implies loss aversion with avoidance of losses and little attention to gains and λ< 1 implies gain seeking with little attention to losses (Wakker, 2010). Tversky and Kahneman (1992) estimated λ to be 2.25, meaning that the pain of losses is felt 2.25 times as much as the joy of gains. Attema et al. (2013) on the other hand estimated λ in the health domain to be 1.18.

According to Kahneman and Tversky's cumulative prospect theory (CPT) (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992), the overall value (*V*) of a decision (or prospect) is expressed in terms of a subjective value (υ), which assigns to each possible outcome (*x*) a number that reflects the subjective value of that outcome, and a decision weight (ω), which associates with each probability (*p*) a decision weight that reflects the impact of this probability on the overall value of the prospect. Opposed to previous studies (e.g., Friedman and Savage (1948), Markowitz (1952)), CPT applies the principle of diminishing marginal sensitivity to both the value function and the weighting function. For decision weights, this implies an inverted S-shaped weighting function that differs for gains and losses. The outcomes are defined relative to a reference point, which implies that the value function measures the value of deviations from this reference point: either gains or losses (respectively ω^+ and ω^-)[18] (Kahneman and Tversky, 1979). In case of a binary prospect (*p, x; y*), where the outcome is *x* with probability *p* and the outcome is *y* with probability 1 - *p* (such as is the case with opting for a voluntary deductible), the evaluation of prospects becomes (Wakker, 2010):

$V(p, x\,;\, y) = w^+(p) \times (u(x) - u(y)) + u(y)$ for pure gain prospects;
$V(p, x\,;\, y) = w^-(p) \times (u(x) - u(y)) + u(y)$ for pure loss prospects, and;
$V(p, x\,;\, y) = w^+(p) \times u(x) + w^-(1 - p) \times u(y)$ for mixed prospects, where $x > y$.

Often it is assumed that the reference point in any decision is the current state of wealth, although the expected state might be the relevant reference point in some situations (Wilkinson, 2008). In case of the decision to opt for a voluntary deductible, several views and associated reference points can be considered. Table 4.1 shows four potential scenarios and the way they are evaluated ac-

[18] The overall value of a prospect in CPT differs from that in expected utility theory (EUT) where choices under uncertainty are evaluated by their expected utility (Von Neumann and Morgenstern, 1944). The main deviations from CPT with respect to EUT are the dependence upon a reference point, probability weighting and loss aversion (Attema et al., 2013). We prefer to use CPT since it proves to have more descriptive validity than EUT.

cording to CPT based upon two dimensions of the decision to opt for a voluntary deductible. The first dimension regards whether the premium for health insurance is excluded or included in the insured's perception. The second dimension regards whether the decision is perceived as a one-stage or two-stage process. If the decision is perceived as a one-stage process, the premium rebate is integrated into the deductible amount, while if a two-stage process is perceived, the received premium rebate is separated from the deductible amount. Hershey and Schoemaker (1985) and Bleichrodt et al. (2001) found that one of the offered alternatives is often taken as the reference point. Schmidt (2012) adds that the reference point when opting for a voluntary deductible is most likely full insurance. This would imply that not opting for a voluntary deductible seems to be the relevant reference point in each of the four scenarios in Table 4.1. This means that, from this reference point, the insured decides whether to opt for a voluntary deductible or to retain the reference point.

The presence of loss aversion largely depends on the perception of the reference point. Prospects coded as losses from the reference point are affected by loss aversion. Wakker (2010) emphasises that loss aversion only concerns mixed prospects (i.e., where the outcome is either a gain or a loss) and does not affect preferences between pure gain and pure loss prospects. In that case, loss aversion is only present in scenario 1, since only this scenario regards a mixed prospect. For scenario 2, loss aversion is expected to be absent because the separate stages respectively regard a gain prospect and a loss prospect[19] but not a mixed prospect. Scenario 3 regards a loss prospect and the two stages in scenario 4 both regard a loss prospect and therefore loss aversion is expected to be absent in these scenarios. Regarding the latter scenarios, the issue of whether the health insurance premium is perceived as an intended expenditure (i.e., in some countries, including the Netherlands, individuals are obliged to buy health insurance) and therefore not subject to loss aversion or perceived as a loss and therefore potentially subject to loss aversion, is unresolved in the scientific literature to date (e.g., Bateman et al. (1997), Bateman et al. (2005), Heath and Soll (1996), Novemsky and Kahneman (2005a), Novemsky and Kahneman (2005b), Thaler (1985)). So from the viewpoint of scenario 1, the insured may forego the voluntary deductible since they are loss averse and prefer the reference point (i.e., no voluntary deductible).

[19] We define a mixed prospect as a prospect that involves a gain and a loss and do not regard zero to be a gain. Therefore, we do not regard the second stage of scenarios 2 and 4 as mixed prospects but respectively as a gain and loss prospect.

Table 4.1 Four scenarios, and the way they are evaluated according to CPT, regarding the insured's perception of the decision (or prospect) to opt for a voluntary deductible of €500, assuming that 'not opting for a voluntary deductible' is the reference point.

		Premium	
		Excluded	**Included**
Process	**One stage process**	**Scenario 1** **Mixed prospect**	**Scenario 3** **Loss prospect**
		Probability p to gain €240 (x) Probability $1 - p$[a] to lose €260 (y)[b,c] V (p, x; y) = $\omega^{+}(p) \times \upsilon(240) + \omega^{-}(1-p) \times \upsilon(-260)$	Probability p to lose €917 (x) Probability $1 - p$ to lose €1,417 (y) V (p, x; y) = $\omega^{-}(p) \times (\upsilon(-1{,}417) - \upsilon(-917)) + \upsilon(-917)$
		Scenario 2 **Gain and loss prospect**	**Scenario 4** **Loss and loss prospect**
	Two stage process	Certainty of gaining €240 (x) AND Probability p to lose nothing (y) Probability $1 - p$ to lose €500 (z) V (1, x) = $\upsilon(240)$ AND V (p, y; z) = $\omega^{+}(p) \times \upsilon(0) + \omega^{-}(1-p) \times \upsilon(-500)$	Certainty of losing €917 (x) AND Probability p to lose nothing (y) Probability $1 - p$ to lose €500 (z) V (1, x) = $\upsilon(-917)$ AND V (p, y; z) = $\omega^{+}(p) \times \upsilon(0) + \omega^{-}(1-p) \times \upsilon(-500)$

[a] p is in all scenarios defined as the probability of staying healthy, while 1 - p is defined as the probability of getting sick

[b] The proposed prospects (in all scenarios) concern a simplified version (i.e., either no healthcare expenses under the voluntary deductible are incurred or healthcare expenses that exceed the voluntary deductible are incurred), while, in practice, the insured has to deal with a more continuous distribution of healthcare expenses

[c] The outcomes and premiums in all scenarios are based upon the average offered premium rebate (i.e., €240) for a voluntary deductible of €500 and the average premium (i.e., €1,157) in the Dutch basic health insurance in 2014

4.3.2 Risk attitude

Risk attitude is a second potential determinant of the decision to opt for a voluntary deductible. Kahneman and Tversky (1979) propose that diminishing marginal sensitivity with respect to outcomes for both gains and losses enhances risk aversion[20] for gains and risk seeking for losses. Illustratively, individuals generally prefer a certain gain of 100 over a gain of 200 with a probability of .5, but if the prospects are reversed (i.e., a certain loss of 100 or a loss of 200 with a probability of .5), individuals prefer the latter option. However, the combination of diminishing marginal sensitivity for both the value function and the decision weighting function implies a fourfold pattern of risk attitudes: individuals are risk-averse for gains and risk seeking for losses of moderate to high probabilities (larger than approximately .35) and risk-seeking for gains

[20] For the definition of risk aversion see (Pratt, 1964).

and risk-averse for losses of small probabilities (smaller than approximately .35) (Tversky and Kahneman, 1992).

The insured's objective probability of the outcomes of opting for a voluntary deductible is unknown[21]. The probability that opting for a voluntary deductible results in a loss would be small for healthy insured. Van Winssen et al. (2015a) have shown that especially young males and insured for whom a voluntary deductible would have been profitable in the past have a high probability (i.e., larger than .65) of a positive financial result. Furthermore, their results show, based upon a combination of background characteristics of insured, that more than 40 per cent of the insured have a predicted probability larger than .65 that opting for a voluntary deductible is profitable. Note that insured might not be aware of their own probability that opting for a voluntary deductible is financially profitable. Furthermore, prospect theory shows that individuals are bad at estimating probabilities and often overestimate probabilities of rare events (Wilkinson, 2008). Additionally, determining this probability might be very complicated and may impose a high cognitive burden. Assuming scenario 1 in Table 4.1 and based upon the fourfold pattern of risk attitudes, it is expected that insured within the observed discrepancy (i.e., the difference between the 11 per cent of insured who actually opted for a voluntary deductible and the 48 per cent of insured for whom a voluntary deductible would have been profitable) will be risk-averse since the probability of loss is considered to be small. However, assuming scenarios 2 and 4, where the choice is considered a two-stage process, the effect of the risk attitude is unclear. Since the first stage of the decision does not involve any uncertainty, risk attitude is not expected to have any effect on the decision in that stage. In the second stage, risk aversion is expected such as in scenario 1 because the risk of a loss remains small. However, the combined effect of both stages is unknown. Assuming scenario 3, where the decision always results in a loss, risk-seeking behaviour is expected. Gorter and Schilp (2012) support the notion that risk aversion potentially plays a role in the decision to opt for a voluntary deductible by showing that risk preferences (e.g., financial risk tolerance, smoking and drinking behaviour) have a significant positive effect on the choice for a voluntary deductible. Rice (2013) emphasises that the degree of risk aversion alone cannot explain individuals' preference for low deductibles and that loss

[21] Obviously, chronically ill insured are aware of their probability since they know for certain that opting for a voluntary deductible is not profitable for them under the current design. However, the aim of this paper is to shed light on the discrepancy between the low percentage of insured who do opt for a voluntary deductible and the high percentage of insured for whom opting for a voluntary deductible is expected to be profitable. Opting for a voluntary deductible is not expected to be profitable for chronically ill and therefore we do not aim to provide determinants of their decision to opt for a voluntary deductible.

aversion remains an important determinant. Additionally, several studies have shown that presenting individuals with prospects within an insurance context may enhance risk aversion. Schoemaker and Kunreuther (1979) report that, although mathematically equivalent, 45 per cent of the respondents preferred a zero deductible option presented in an insurance context, while only 13 per cent preferred this option outside the insurance context. Hershey et al. (1982) demonstrate a similar result and state that individuals are more risk averse under the insurance formulation than under the gamble formulation of the same prospect. Since the decision to opt for a voluntary deductible is considered within an insurance context, these studies indicate that risk aversion may be more pronounced than mentioned before. In sum, the effect of risk attitude on the decision to opt for a voluntary deductible is largely unclear and depends strongly on the scenario. For scenario 1, risk aversion is expected, which might explain why insured forego deductibles, while for scenario 3, risk-seeking behaviour is expected, which would predict that insured do opt for a deductible.

4.3.3 Ambiguity aversion

Ambiguity aversion[22] is a third potential determinant of the decision to opt for a voluntary deductible and has been incorporated into CPT. According to Ellsberg (1961) ambiguity regards 'the nature of one's information concerning the relative likelihood of events', which depends on 'the amount, type, reliability and 'unanimity' of information'. This gives rise to 'one's degree of confidence in an estimate of relative likelihoods'. Frisch and Baron (1988) add that this uncertainty about probabilities is created by missing information that is relevant and could be known. Ambiguity aversion captures individuals' preferences for prospects with known probabilities over prospects with unknown probabilities and was first presented by Ellsberg (1961). In a hypothetical experiment, individuals were confronted with two urns. The first urn contained 100 red and black balls in an unknown ratio and the second urn contained exactly 50 red and 50 black balls. The majority of respondents preferred to bet on either red or black in urn two rather than in urn one, indicating ambiguity aversion. Ritov and Baron (1990) show the presence of ambiguity aversion in healthcare in a study on children's vaccination, where the vaccination reduces the risk of dying from a specific disease, but simultaneously might have adverse health effects. When ambiguity about the risk of adverse health effects was caused by missing information (i.e., a child had a high risk or no risk of adverse effects, but it was impossible to find out which) individuals were more reluctant to vaccinate, indicating ambiguity aversion. In most experiments on ambiguity aversion, respondents had to choose between two situations: one with known

[22] Ambiguity aversion is sometimes also referred to as uncertainty aversion.

probabilities and another with unknown probabilities. In case of opting for a voluntary deductible, a comparison with known probabilities is absent. Chow and Sarin (2001) conducted several experiments concerning ambiguity aversion under comparative and non-comparative conditions and conclude that the ambiguity effect exists under both conditions, but that it is significantly reduced in the non-comparative condition. This indicates that ambiguity aversion may actually influence the decision to opt for a voluntary deductible, even though a comparison with known probabilities lacks. Ellsberg (1961) adds that individuals often perceive the status quo as the situation with low variation and that ambiguities of the new situation are more salient than those of the current situation. Therefore, when deciding to opt for a voluntary deductible, ambiguity aversion might create a preference for the current situation. This causes insured without a voluntary deductible not to opt for a voluntary deductible in the next year even if this would result in the same (or a better) expected value. Note that from ambiguity aversion it follows that individuals will value provision of any information that reduces their ambiguity, even if it will not change their decision, while standard economic theory predicts that information is only demanded if it affects the decision (Camerer and Weber, 1992).

Several studies argue that a (psychological) driver of ambiguity aversion is found in the competence hypothesis that states that individuals prefer to bet on their beliefs in situations where they feel knowledgeable, and prefer to bet on chance when they feel ignorant (Heath and Tversky, 1991; Keppe and Weber, 1995; Tversky and Fox, 1995). Several researchers show that insured have limited knowledge about their health insurance (Hsu et al., 2004; Reed et al., 2009) and others add that individuals misunderstand complex price schedules including premiums and cost-sharing arrangements (Baicker et al., 2012; Liebman and Zeckhauser, 2004; Marquis, 1981). Additionally, estimating the probability that a voluntary deductible would be financially profitable might be complex and might impose a high cognitive burden. This could especially be the case for individuals with low levels of numeracy and/or health literacy. Based upon these studies, individuals' limited knowledge about health insurance could indicate that (in)competence affects the degree of ambiguity aversion for the decision to opt for a voluntary deductible. In sum, since probabilities regarding the profitability of voluntary deductible are absent, ambiguity aversion (partially through incompetence) might explain why insured forego deductibles.

4.3.4 Debt aversion

A fourth potential determinant of the decision to opt for a voluntary deductible is debt aversion, which stems from mental accounting theory (Thaler, 1985; Thaler, 1999). Thaler defines mental accounting as 'the set of cognitive

operations used by individuals and households to organise, evaluate, and keep track of financial activities' (1999). The theory incorporates CPT and provides a better understanding of the psychological processes that underlie choices and decisions. Prelec and Loewenstein (1998) build upon Thaler's theory and predict strong debt aversion because individuals establish mental accounts that create linkages between consumption and payments. Debt aversion in their work is defined by individuals' preferences to prepay for consumption and to get paid for work after completion. Individuals dislike the feeling of 'having the meter running' and prefer flat-rate pricing schemes even if they pay more for the same usage (Prelec and Loewenstein, 1998; Thaler, 1999). The latter is called the flat rate bias and can be illustrated by a preference for unlimited Internet access at a fixed monthly price over paying per megabyte. Prelec and Loewenstein (1998) provide two motives why individuals are inclined to prepay for a product. Firstly, individuals hope to enjoy the product untroubled from payment concerns and secondly, individuals want to avoid the unpleasant experience of paying for consumption that has already been enjoyed.

Debt aversion firstly predicts that insured dislike paying for healthcare after consumption and secondly that insured prefer flat-rate pricing schemes (e.g., health insurance) to payment decoupling. This makes debt aversion relevant for the decision to opt for a voluntary deductible. Debt aversion could prevent insured from opting for a voluntary deductible since, if the insured opts for a voluntary deductible, healthcare is paid for after consumption, while if the insured does not opt for a voluntary deductible, a flat rate is paid in advance. Overall, due to the debt that results from consuming healthcare when having a voluntary deductible, insured might forego deductibles.

4.3.5 Omission bias

Omission bias is a fifth potential determinant of the decision to opt for a voluntary deductible. Samuelson and Zeckhauser (1988) introduced the status quo bias that describes individuals' tendency of 'doing nothing or maintaining one's current or previous decision'. Ritov and Baron (1992), however, state that two claims are embedded in this bias: firstly, individuals prefer to keep the current state and secondly, individuals are reluctant to take action to change this state. The latter is called omission bias. Ritov and Baron (1992) explain status quo bias by the fact that changing the status quo requires an act, while keeping the status quo requires only an omission. Through three experiments they show that the omission bias was present in choice whether the status quo was changed by action or not. Furthermore, they demonstrate that no consistent status quo bias was found in choice when both choices did (not) involve an action. This result corresponds to norm theory where Kahneman and Miller

(1986) state that omissions are considered the norm, while commissions are compared to what would have happened if nothing had been done. So, regardless of the outcome, omissions are evaluated as neutral, where commissions are evaluated as negative if the outcomes are worse and evaluated as positive if the outcomes are better than the expected outcome of inaction.

A potentially underlying factor of omission bias is decision fatigue, which means that individuals tire from making decisions in general (Wilkinson, 2008). A second potentially related factor to omission bias concerns transaction costs (Strombom et al., 2002). Transaction costs regard the time and effort that it takes to choose a plan with or without a voluntary deductible. Another potentially related factor is regret avoidance, which implies that whenever choice can induce regret, individuals have an incentive to eliminate choice (Thaler, 1980). Regret avoidance helps explain individuals' preference for first dollar coverage, since many individuals find decisions that involve trade-offs between healthcare and money unpleasant (Thaler, 1980). Thaler (1980) considered the following example: for their child, a couple has to decide on taking a diagnostic test that costs x. A small risk exists that the child has a serious disease that can only be treated if detected early. The couple will certainly experience regret if they decide not to test the child and he/she is found to have the disease. If the test is performed and shows the likely negative result, the couple may regret the expenditure, especially if it was expensive relative to their wealth. These psychic costs could be avoided if all healthcare consumption is prepaid and no decision (i.e., act) is required.

Decision fatigue may affect the decision to opt for a voluntary deductible, since insured might just be tired from making all kinds of (financial) decisions and therefore decide to renew their current plan (i.e., the plan with(out) a voluntary deductible). Furthermore, transaction costs may affect the decision to opt for a voluntary deductible since insured would want to avoid these costs and therefore renew their current plan (i.e., the plan with(out) a voluntary deductible). Regret avoidance may affect the decision to opt for a voluntary deductible since insured might not want to take the risk of having to regret the decision (not) to opt for a voluntary deductible if healthcare expenses that exceed (or stay below) the deductible amount are incurred. Additional to these direct effects, these factors might also indirectly effect the decision to opt for a voluntary deductible. After all, if an insured has opted for a voluntary deductible, he needs to make more and more complex decisions regarding the usage of healthcare services (e.g., when and where to seek care and how much these services cost) while little support for making these decisions is available. With this in prospect when opting for a voluntary deductible, omission bias might also indirectly prevent insured from opting for a voluntary deductible.

In short, omission bias (and related to that, decision fatigue, transaction costs and regret avoidance) may directly and indirectly affect the decision to opt for a voluntary deductible since for most insured (i.e., those insured without a voluntary deductible) it requires an act to change their current plan to a plan with a voluntary deductible, which they are reluctant to do.

4.3.6 Liquidity constraints

A sixth potential determinant of the decision to opt for a voluntary deductible is the fear of encountering liquidity problems. Gorter and Schilp (2012) hypothesise that consumption commitments (e.g., mortgage payments) explain the low percentage of Dutch insured opting for a voluntary deductible. Additionally, several studies researched the impact of liquidity constraints on risk attitude and loss aversion. Firstly, Chetty and Szeidl (2007) conclude that consumption commitments, since they are costly to adjust (e.g., mortgage payments can only be adjusted by moving), increase risk aversion for small and moderate stakes. For example, if an individual is forced to reduce his expenditure by 10 per cent and has precommitted 50 per cent of his income, he must reduce spending on discretionary items by 20 per cent. Since the precommitted expenditure is not freely adjustable, the utility curvature is greater than if it would be adjustable as to amplify risk aversion. Secondly, Novemsky and Kahneman (2005a) state that for consumers who maintain a tight budget, the purchase of a good that was not budgeted for is associated with giving up some other good (i.e., either consumption or savings). This is then evaluated as a loss, which is consistent with the finding of Wicker et al. (1995) that there is more loss aversion when a greater proportion of money is designated for necessities. These studies indicate that liquidity constraints could be closely related to other determinants that are identified within this paper, such as risk attitude and loss aversion. Thirdly, Sydnor (2010) investigated if liquidity constraints explain the preference for low deductibles in home insurance. Though this was not the case, it could be interesting to study whether this holds for the health insurance market.

Due to liquidity constraints, insured might not opt for a voluntary deductible because they may be unable or may fear to be unable to pay the deductible amount if healthcare is consumed[23]. Furthermore, liquidity constraints are expected to increase risk aversion and loss aversion and thereby (negatively) affect the decision to opt for a voluntary deducible.

[23] Liquidity constraints may also encourage insured to opt for a voluntary deductible since the premium rebate reduces the monthly premium and relieves liquidity constraints.

4.3.7 Overview of potential determinants

This section discusses in short the effect of the six potential determinants on the decision to opt for a voluntary deductible. Note that the different determinants are not per definition independent, and could be closely related (e.g., liquidity constraints could be related to risk aversion). Loss aversion is only expected to make insured forego voluntary deductibles in scenario 1 from Table 4.1. For scenario 1, the fourfold pattern of risk attitudes furthermore predicts risk averse behaviour, while the effect for scenarios 2 and 4 (i.e., the two-stage scenarios) is unclear since in the first stage uncertainty plays no role while risk aversion is expected for the second stage. Regarding scenario 3, risk-seeking behaviour is expected that may encourage insured to opt for a voluntary deductible. Furthermore, irrespective of the scenario, ambiguity aversion may arise since the probability distribution of healthcare expenses is largely unknown, which may explain why insured forego deductibles. Since in case of a voluntary deductible healthcare is consumed first and paid after, debt aversion may explain why insured do not opt for a voluntary deductible. Omission bias is seen as a fifth potential determinant since individuals are reluctant to take action to change their current plan, which is necessary for the uptake of deductibles. Finally, liquidity constraints are expected to influence the decision to opt for a voluntary deductible and increase both risk aversion and loss aversion. In general, it is expected that especially in scenario 1 of Table 4.1, insured would not be inclined to opt for a voluntary deductible since the six potential determinants all negatively affect the overall value of opting for a voluntary deductible compared to not opting for a voluntary deductible. In scenarios 2, 3, and 4, some of the determinants are not or less relevant, i.e., loss aversion is expected to be absent in those scenarios and the effect of risk attitude is unclear in scenarios 2 and 4. Therefore, the overall effect of these scenarios on the decision to opt for a voluntary deductible is unclear.

Which of the proposed scenarios is adopted by insured in practice is unknown. For two reasons, however, we believe that scenarios 1 and 2 are most likely to be adopted. The first reason is that we suspect that (Dutch) insured do not include the premium in their decision. For example, taking out health insurance is mandatory in the Netherlands and the decision to opt for a voluntary deductible is a subsequent decision that may not be directly related to the fact that a premium has to be paid for health insurance itself. The second reason is that the premium is mostly paid on a monthly basis, while the voluntary deductible concerns a yearly amount. This might make integrating the health insurance premium into the decision to opt for a voluntary deductible difficult for insured.

4.4 POTENTIAL STRATEGIES

Based upon the six potential determinants of the decision to opt for a voluntary deductible, this section discusses five potential strategies that could increase the number of insured opting for a voluntary deductible. While discussing these strategies, we will incorporate nudge theory as proposed by Thaler and Sunstein (2009). The idea behind nudging is to move individuals in directions that will make their lives better without forcing them. They consider a nudge to be 'any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives' (2009). Nudges are not considered to be mandates and should be easy and cheap to avoid. An illustrative example of a nudge is putting fruit at eye level in a school canteen to make children eat healthier, while entirely banning junk food would not be considered a nudge. Note that not all proposed strategies can be considered a nudge and that within this paper only strategy one and three are considered a nudge. This will be further discussed in the subsequent sections. Table 4.2 shows how the five different strategies affect the determinants of the decision to opt for a voluntary deductible.

4.4.1 Default option

A first promising strategy to increase the number of insured opting for a voluntary deductible is to present the voluntary deductible as the default option. This implies that when buying insurance, the plan includes by default a voluntary deductible for the associated premium. The plan would not be mandatory because insured can commute the voluntary deductible for an increase in premium. Table 4.3 shows the insured's perception of the voluntary deductible as the default option. According to the literature, this strategy is expected to increase the number of insured opting for a voluntary deductible (Johnson et al., 1993; Krieger and Felder, 2013; Moshinsky and Bar-Hillel, 2010; Thaler and Benartzi, 2004; Thaler and Sunstein, 2009) since it potentially affects three determinants from the theoretical framework. Note that this strategy intends to shift the reference point from 'not opting for a voluntary deductible' to 'opting for a voluntary deductible'. Firstly, the effect of loss aversion would diminish since, assuming that 'opting for a voluntary deductible' is the reference point, 'not opting for a voluntary deductible' is a pure loss prospect (i.e., the deductible has to be commuted for an increase in premium). In case of a pure loss prospect, loss aversion is absent (Wakker, 2010) and therefore has no effect on the decision to opt for a voluntary deductible if a voluntary deductible is the default option. Secondly, with 'opting for a voluntary deductible' as the reference point, risk seeking behaviour is expected since commuting the voluntary deductible

Table 4.2 Summary table of the determinants regarding the decision to opt for a voluntary deductible (VD) and the way they are affected by the different strategies

	Strategy 1 **Default option**	**Strategy 2** **Information regarding the voluntary deductible**	**Strategy 3** **Information regarding healthcare expenses**	**Strategy 4** **No-claim rebate**	**Strategy 5** **Saving for healthcare**
Loss aversion	If the reference point is 'opting for a VD': loss aversion is eliminated. If 'not opting for a VD' is the reference point: loss aversion remains the same.	-	-	Loss aversion could be reduced depending on whether loss aversion occurs for the premium.	-
Risk attitude	If the reference point is 'opting for a VD': risk seeking. If 'not opting for a VD' is the reference point: risk aversion.	-	-	-	-
Ambiguity aversion	-	Increased competence and decreased ambiguity aversion.	Reduced effect of ambiguity aversion.	-	-
Debt aversion	-	-	-	Reduced effect of debt aversion.	Reduced effect of debt aversion.
Omission bias	Omission bias remains, but causes the insured to retain the VD.	-	-	-	-
Liquidity constraints	-	-	-	-	Reduced effect of liquidity constraints.

implies a certain loss. Thirdly, with this strategy, the insured is inclined to retain the voluntary deductible due to omission bias (and decision fatigue and transaction costs). If a default option is set, it is expected that more insured would opt for a voluntary deductible than under an opt-in design. Therefore, making the voluntary deductible the default option can be considered a strong nudge. Furthermore, the nudging power of the default option will be reinforced if the option comes with some implicit or explicit suggestion that it represents the norm, which is related to norm-theory, or the recommended course of action (Thaler and Sunstein, 2009). An example of the effect of default options can be found in MediShield (a basic catastrophic illness insurance scheme) in Singapore. In 1990, with the introduction of MediShield, the Singapore government wanted to ensure that as many individuals as possible would be covered by this plan. In order to reach this goal, they implemented an opt-out scheme where everyone would be automatically enrolled. As a result of this, the overall coverage for MediShield raised from 51 per cent in 1990 to 88 per cent in 2012 (Low and Yee, 2012).

Table 4.3 Insured's perception and the associated value function regarding the voluntary deductible for strategy one (i.e., the default option) and strategy four (i.e., a no-claim rebate). Presented are the perceptions for scenario one from table 4.1, but they could be applied to the other scenarios as well.

Opting for a voluntary deductible	Not opting for a voluntary deductible
Strategy 1 – Present the voluntary deductible as the default option	
Probability p to lose nothing (x) Probability 1 - p to lose €500 (y)	Certainty of a premium increase of €240 (x)
$V(p, x; y) =$ $\omega^{+}(p) \times \upsilon(0) + \omega^{-}(1\text{-}p) \times \upsilon(\text{-}500)$	$V(1, x) = \upsilon(\text{-}240)$
Strategy 4 – Offer a voluntary deductible in the form of a no-claim rebate	
Probability p to gain €240 (x) Probability 1 - p to pay €260 (y) too much	Certainty to lose nothing (x)
$V(p, x; y) =$ $\omega^{+}(p) \times \upsilon(240) + \omega^{-}(1\text{-}p) \times \upsilon(\text{-}260)$	$V(1, x) = \upsilon(0)$

4.4.2 Provision of information regarding the voluntary deductible

A second promising strategy to increase the number of insured opting for a voluntary deductible is to provide insured with information regarding the voluntary deductible. According to the literature, this strategy is expected to increase individuals' competence (Marquis, 1981). Through the increase in competence, the effect of ambiguity aversion on the decision to opt for a voluntary deductible could be reduced (Heath and Tversky, 1991; Keppe and Weber, 1995; Tversky and Fox, 1995), which could result in a higher uptake of voluntary deductibles.

The information could for instance concern the functioning of the voluntary deductible[24]. The information could elucidate that a voluntary deductible results in both a premium rebate and a risk that out-of-pocket payments have to be made and that the profit is the balance of these two. The information could furthermore describe the relation between the voluntary deductible and other cost-sharing arrangements such that individuals can better estimate their expected out-of-pocket expenses due to the voluntary deductible (and thus whether opting for a voluntary deductible will be profitable). For example, Van Winssen et al. (2015a) show that over 40 per cent of the Dutch insured had healthcare expenses even below the mandatory deductible of €360. For those insured, opting for a voluntary deductible would be profitable, but they need to know how the voluntary deductible and other cost-sharing arrangements relate in order to consider opting for a voluntary deductible. Finally, Reitsma-van Rooijen et al. (2012) show that Dutch insured avoid the GP because of the mandatory deductible, while GP costs are exempted from the deductible. Apparently, these individuals are not aware of the fact that these healthcare services are exempted from the deductible. Therefore, information could address the exempted healthcare services. Note that all information should be understandable because if individuals are provided with information only an expert would know how to use, incompetence actually increases (2002).

4.4.3 Provision of information regarding healthcare expenses

A third potential strategy to increase the number of insured opting for a voluntary deductible is to provide insured with information regarding their healthcare expenses[25]. For instance, the information could show the number of previous years that opting for a voluntary deductible would have been profitable. Van Winssen et al. (2015a) show that the more (recent) years the voluntary deductible would have been profitable in the past, the larger the probability that opting for a voluntary deductible would be profitable in the upcoming year. Furthermore, insured could be provided with an objective predicted probability that opting for a voluntary deductible would be profitable based upon background characteristics such as age, gender, and chronic illness, such as Van Winssen et al. (2015a) have estimated. Finally, insurers could provide insured with an up-to-date overview regarding their past healthcare expenses.

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[24] It is assumed that individuals are aware of the fact that they can opt for a voluntary deductible at all.

[25] Note that this strategy could also provide insured with information regarding how unattractive it would be for them to opt for a voluntary deductible, making them less inclined to opt for a voluntary deductible.

Based upon the theoretical framework in section three of this chapter, this strategy is expected to directly influence the effect of ambiguity aversion on the decision to opt for a voluntary deductible since information on the outcome probability of the voluntary deductible is provided. Note that Ellsberg (1961) and Fox and Weber (2002) state that the amount, type, reliability, and unanimity of the information should be considered when providing the information to insured to best reduce the effect of ambiguity aversion on the decision to opt for a voluntary deductible. Wakker et al. (2007) studied the effect of statistical information on the choice of insurance that covers a deductible and show that the value of the options that give rise to ambiguity aversion decreased rather than increased when ambiguity reduced. They state that probably the more familiar option is preferred over the option with known probabilities, which could be in accordance with Ellsberg's (1961) notion that ambiguity aversion favours the status quo. Additionally, their results showed that the provision of statistical information enhanced adverse selection, which for health insurance might be undesirable from the societal perspective (Rothschild and Stiglitz, 1976). In a study by Kling et al. (2012), a random sample of participants were sent a personal letter that explained the costs of their current drug plan, the cheapest comparable plan, and the savings they could realise by switching plans. Another random sample received generic brochures regarding the different plans. The results show that the personal letters appear to have nudged more individuals to pick lower-cost plans and the overall switching rate was 10 percentage points higher than among the participants who received the brochures (Thaler and Sunstein, 2009). These results could give an indication that providing insured with information regarding their healthcare expenses and the savings they could realise by opting for a voluntary deductible could potentially increase uptake of voluntary deductibles.

Table 4.4 Example of financing the savings account in case of a voluntary deductible of €500 with an associated premium rebate of €240.

	Premium rebate	Total premium rebate on savings account	Healthcare expenses under the voluntary deductible	Account balance at the end of the calendar year
Year 1	€240	€240	€25	€215
Year 2	€240	€480	€120	€335
Year 3	€240	€720	€500	€75
Year 4	€240	€960	€175	€140
Year 5	€240	€1,200	€0	€380

4.4.4 No-claim rebate

A fourth potential strategy to increase the number of insured opting for a voluntary deductible is to present the voluntary deductible in the form of a 'no-claim rebate'[26]. In case of a no-claim rebate, the insured pays a premium for health insurance and receives a fixed amount of money (i.e., the no-claim rebate) at the end of the year if no healthcare expenses are incurred. If healthcare expenses are incurred, the insured receives no rebate. In other words, compared to a situation with a voluntary deductible, insured pay the full premium (i.e., they do not receive a premium rebate that they would have received if they had opted for a voluntary deductible) and receive a no-claim rebate equal to the amount of the original voluntary deductible (i.e., €500) if no healthcare expenses are incurred. Assuming the Dutch voluntary deductible of €500, the premium increase would equal €260 and the potential rebate would be €500[27]. Compared to the current design of the voluntary deductible, the potential loss (i.e., €260, which is equal to the premium increase) and gain (i.e., €240, which is equal to the no-claim rebate minus the premium increase) are essentially unchanged, but integrated explicitly. Table 4.3 shows the insured's perception of the voluntary deductible in the form of a no-claim rebate. According to the literature, this measure is expected to increase the number of insured opting for a voluntary deductible (Johnson et al., 1993) since it potentially affects two determinants from the theoretical framework. Firstly, the increase in loss aversion due to the increase in premium is expected to be small because of diminishing marginal sensitivity. The effect on loss aversion depends however on whether loss aversion for the premium is experienced. Secondly, this strategy could reduce the effect of debt aversion on the decision to opt for a voluntary deductible since the insured is not in debt with the insurer, but the insurer is potentially in debt with the individual. Furthermore, this strategy could reduce the effect of debt aversion

[26] In 2006 and 2007, a no-claim rebate of €255 was implemented in the Dutch health insurance system but was substituted by a mandatory deductible in 2008 since the five largest health insurers and several politicians argued that the no-claim rebate would be unfair to chronically ill and elderly, that it hardly resulted in any restrain on healthcare expenses and that it resulted in a lot of administrative hassle (Elsevier, 2006). Research by Holland et al. (2009) indicates that the no-claim rebate provided only a weak incentive to reduce healthcare consumption. Furthermore, although seemingly contradictory to the previous statement, their study shows a potential danger of strategic postponement of healthcare utilisation (i.e., in order to receive the no-claim rebate), which may have adverse health effects.

[27] In the Dutch health insurance market, the average offered premium rebate was €240 for a voluntary deductible of €500 in 2014. If the insured would incur healthcare expenses larger than the (mandatory and) voluntary deductible, the loss would be equivalent to €260. In case of a no-claim rebate, this potential loss is added to the premium (i.e., the premium is increased with €260 compared to the current design of the voluntary deductible). In return for this premium increase, the insured will receive up to €500 (i.e., the original voluntary deductible amount) in return if no or little healthcare expenses are incurred.

on the decision to opt for a voluntary deductible, since the insured pays for healthcare expenses ex-ante instead of ex-post.

4.4.5 Saving for healthcare

A fifth potential strategy to increase the number of insured opting for a voluntary deductible is to offer a savings account in combination with a voluntary deductible. Health Savings Accounts (HSAs) are increasingly popular in the USA, Singapore, South Africa, and China, but have different aims and designs (Hurley and Guindon, 2008). In the USA, HSAs are combined with high deductible health plans, which is similar to the strategy proposed here. Note, however, that the deductible amounts in the USA are larger (i.e., a plan must have a minimum deductible of €1,074[28] for individuals and €2,148 for families in 2015 to be HSA-eligible with a maximum limit on out-of-pocket spending of €5,329 for individuals and €10,658 for families) than the amounts in the Netherlands (i.e., the voluntary deductible amounts range from €100 to €500). Similar to the HSAs, we propose to deposit the premium rebate upon a savings account allowing the insured to use the (earmarked) account balance for the voluntary deductible. Literature on savings behaviour shows that individuals have self-control problems (Katona, 1975), meaning that individuals have difficulty with not spending their money on other purposes (Nyhus and Webley, 2006). An earmarked savings account could mitigate this lack of self-control by serving as a precommitment strategy (Thaler, 1980). Table 4.4 provides a potential way to finance the savings account in case the insured opted for a voluntary deductible of €500 and deposited the premium rebate of €240 on the savings account (column 2). A maximum of €1,200 is saved during, for example, 5 years (column 3). Out-of-pocket payments due to the voluntary deductible are paid from the savings account (e.g., €25 in the first year, column 4). Column 5 shows the account balance at the end of each year (i.e., €215 in the first year). In the coming years, the financing of the account continues in the same way.

According to the theoretical framework in section three of this chapter, there are two reasons to expect that this strategy will increase the number of insured opting for a voluntary deductible. Firstly, the savings account could serve as a prepayment vehicle that diminishes the attenuation of the payment on the pleasure of consumption, which could reduce the effect of debt aversion. Secondly, the earmarked savings account serves as a consumption commitment especially for out-of-pocket payments due to the voluntary deductible, which could reduce the effect of liquidity constraints. In the USA, savings into the HSA are encouraged by tax advantages. This could also be considered for the

[28] US dollars are converted to euros using an exchange rate of US$1 = €0.8262 (January 1, 2015).

savings account as described here to encourage insured to save for potential out-of-pocket payments due to the voluntary deductible.

4.5 IMPLICATIONS FOR MORAL HAZARD

The previous section discussed five potential strategies to increase the number of insured opting for a voluntary deductible and consequently to reduce moral hazard. Behavioural economics helps to explain the demand for voluntary deductibles, but also tells us that the design of the voluntary deductible could influence healthcare usage (Prelec and Loewenstein, 1998). To indicate the net effect on moral hazard a crucial question is: in what way does the design of the voluntary deductible (within the different strategies) influence the moral hazard reduction (assuming that the strategies increase the number of insured opting for a voluntary deductible)? Note that the reduction of moral hazard as a result of the voluntary deductible could regard both low-value and high-value care. The RAND Health Insurance Experiment showed, however, that on average the moral hazard reduction had no significant effect on most of the studied health indicators (Brook et al., 1983).

By presenting the voluntary deductible as the default option and by providing insured information regarding the voluntary deductible or regarding their healthcare expenses (i.e., strategies 1, 2, and 3), the voluntary deductible in itself is unchanged and therefore the individual moral hazard reduction due to the voluntary deductible is unchanged. However, since, as a result of these strategies, an increase in the number of insured opting for a voluntary deductible is expected (Johnson et al., 1993; Krieger and Felder, 2013; Marquis, 1981; Thaler and Benartzi, 2004; Thaler and Sunstein, 2009), an increase in the total moral hazard reduction is expected as well. When presenting the voluntary deductible as a no-claim rebate (i.e., strategy 4), the effect on the individual moral hazard reduction is unclear, since in case of a no-claim rebate insured only have the foresight of a potential rebate and do not experience actual out-of-pocket payments as they do with the current design of the voluntary deductible. It is unknown how many more insured would have to opt for a voluntary deductible in the form of a no-claim rebate in order to let the total moral hazard reduction increase. To determine the effect of offering a savings account in combination with a voluntary deductible (i.e., strategy 5) on moral hazard, it would be necessary to know whether the moral hazard reduction differs between actual out-of-pocket payments (i.e., the current design) and expenses from a savings account (i.e., strategy 5). Since the money is earmarked for healthcare expenses, individuals might be more eager to spend saved money

than out-of-pocket money. Therefore, what happens to the account balance at the end of the year is essential (e.g., transmitted to next year, paid to insured or lapsed). A related (and yet unanswered) question to this is how individuals value the account balance at the end of the year, taking into account discounting of money over time (Nyhus and Webley, 2006). As with strategy 4, it is unknown how many more insured would have to opt for a voluntary deductible as a result of combining it with a savings account to let the total moral hazard reduction increase. Overall, each strategy is intended to increase the number of insured opting for a voluntary deductible, which, ceteris paribus, increases the total moral hazard reduction due to the voluntary deductible. However, the effect of (some of) the strategies on the individual moral hazard reduction and consequently on the total moral hazard reduction needs further research.

4.6 CONCLUSIONS

Previous research shows that a large discrepancy exits between the percentage of insured for whom a voluntary deductible is expected to be profitable (i.e., about 48 per cent in the Netherlands in 2014) and the percentage of insured who actually opt for a voluntary deductible (i.e., 11 per cent in the Netherlands in 2014). If more insured would opt for a voluntary deductible, a larger reduction of moral hazard could, ceteris paribus, be reached. In this paper, six determinants of the decision to opt for a voluntary deductible are identified: loss aversion, risk attitude, ambiguity aversion, debt aversion, omission bias, and liquidity constraints. Subsequently, five potential strategies to increase the number of insured opting for a voluntary deductible are proposed: 1) present the voluntary deductible as the default option, 2) provide insured with information regarding the voluntary deductible, 3) provide insured with information regarding their healthcare expenses, 4) present the voluntary deductible in the form of a no-claim rebate, and 5) combine the voluntary deductible with a savings account. We believe that implementing the voluntary deductible as the default option and providing insured with information regarding the functioning of the voluntary deductible are the two most promising strategies to increase uptake of voluntary deductibles and to reduce moral hazard. Regarding the other strategies, further research on their effect on the moral hazard reduction would be necessary before implementing such strategies.

Part II The supplementary health insurance

Chapter 5

The demand for health insurance and behavioural economics: what is going on in the Dutch supplementary health insurance?

ABSTRACT

Traditional economic theory suggests that optimal health insurance design a) protects individuals against unpredictable high financial risks, b) provides access to otherwise unaffordable healthcare services, c) includes first-dollar cost-sharing, and d) incorporates individual caps on out-of-pocket expenses. The Dutch supplementary health insurance is far from this optimal design, since it does not meet any of these requirements. Nevertheless, many Dutch individuals take out this supplementary insurance, which raises the question why so many Dutch insured take out non-optimal supplementary health insurance. This paper identifies seven key aspects from behavioural economics to potentially explain the high uptake of non-optimal insurance in the Dutch supplementary health insurance market.

Firstly, four aspects – other than risk reduction and access to otherwise unaffordable healthcare services – are identified that could potentially provide a welfare gain from taking out supplementary insurance: loss aversion, ambiguity aversion, liquidity constraints and debt aversion. This paper poses that in the presence of either of these aspects or a combination, the welfare gain from taking out supplementary health insurance would be higher than in the absence of (one of) these aspects. Secondly, three behavioural economic aspects are identified that could potentially explain why insured make suboptimal choices regarding their supplementary health insurance. Firstly, due to limited knowledge concerning supplementary insurance, insured might be unaware what they exactly insure and what the costs for healthcare services are. Secondly, as a result of social comparison, insured might take out supplementary insurance just because their friends and family do so. Thirdly, decision avoidance might make insured automatically renew their current supplementary health insurance without critically reviewing whether they indeed want (and need) this insurance. Additionally, this paper provides several directions for further research and discusses policy implications regarding the design of health insurance and the support of the insured's decision-making process.

5.1 INTRODUCTION

A vast amount of traditional economic literature describes the advantages and disadvantages of taking out health insurance (e.g., Arrow, 1976, Manning and Marquis, 1996; Zeckhauser, 1970). On the one hand, the advantages of health insurance are the reduction of uncertainty regarding financial losses and the provision of access to healthcare services that would otherwise be unaffordable. The disadvantages of insurance, on the other hand, are moral hazard[29], the loading fee and the transaction costs related to purchasing the insurance and handling the claims. Regarding the design of health insurance, the literature shows that full insurance is far from optimal and that a mix of coverage and cost-sharing is preferred. Optimal designs of health insurance a) protect individuals against unpredictable high financial risks, b) provide access to otherwise unaffordable healthcare services, c) include first-dollar cost-sharing, and d) incorporate individual caps on out-of-pocket expenses. The Dutch supplementary health insurance, however, does not comply with these principles. This paper aims at explaining why insured take out this non-optimal supplementary health insurance.

Dutch individuals became obliged to buy basic health insurance for community-rated premiums from a private health insurer with the introduction of the Health Insurance Act in 2006 (Schut and Van de Ven, 2011). For healthcare service not (or partially) covered by basic insurance, insured can take out supplementary health insurance. Healthcare services covered by supplementary insurance include, among others, dental care, physiotherapy, durable medical equipment, alternative medicines, pharmaceuticals, care consumed in a foreign country, orthodontics and maternity care, as far as these benefits are not covered by basic health insurance. Contrary to the market for basic health insurance, the Dutch supplementary insurance market is a free market, which means that insurers are free to determine the premiums, coverage and cost-sharing arrangements. The Dutch supplementary health insurance deviates from the optimal insurance design as described by the traditional economic literature for several reasons. Firstly, the Dutch supplementary health insurance covers healthcare services that do not involve large losses and applies coverage limits. The latter implies that, after the limit is reached, all expenses have to be paid out-of-pocket by the insured, which – in case of care consumed in a foreign country or dental care after an accident, for example – could lead to substantial out-of-pocket expenses. As a result, the risk reduction resulting from the supplementary health insurance seems limited. Secondly, next to the

[29] Moral hazard refers to the change in health behaviour and healthcare consumption caused by the fact that the insurer reimburses (part of) the costs.

limited risk reduction, the Dutch supplementary insurance mostly provides access to already affordable healthcare services such as dental check-ups and regular consultations with the physiotherapist. These characteristics suggest that the consumers' welfare gain from the Dutch supplementary health insurance may be limited. Thirdly, the loading fee (about 17 per cent of the premium (Vektis, 2015c)), moral hazard and the transaction costs of the supplementary insurance are substantial. Substantial moral hazard can be expected, because most healthcare services are subject to first-dollar coverage, while substantial transaction costs could arise since many insurers offer many different supplementary insurance policies (i.e., more than 150 policies in 2015 (Duijmelinck and Van de Ven, 2015)), making the choice of supplementary health insurance time consuming. Consequently, the consumers' welfare loss from the Dutch supplementary health insurance may be substantial. Table 5.1 shows an overview in which the characteristics of the Dutch supplementary health insurance are compared to the characteristics of optimal insurance design as posed by the traditional economic literature.

Table 5.1. Characteristics of health insurance design: "optimal" versus the Dutch supplementary health insurance.

	Characteristic	Optimal insurance design	Dutch supplementary insurance
1.	What does the insurance provide protection against and what does it provide access to?	Unpredictable high financial risks and otherwise unaffordable healthcare services.	Mostly predictable low financial risks (e.g., dental check-ups and consultations at the physiotherapist). Some supplementary insurances provide protection against large expenses, but these are mostly maximised (e.g., dental expenses after an accident (up to about €10,000), care consumed in a foreign country)
2.	Is cost-sharing applied and if so, how?	Yes, in the form of first-dollar cost-sharing.	In general no; only dental insurances apply coinsurance of 20-25%.
3.	Are caps on out-of-pocket expenses applied and if so, how?	Yes, in the form of an individual cap.	No, after the coverage limits (e.g., nine treatments at a physiotherapist) are reached, insured pay the full expenses for healthcare services out-of-pocket.

Given the non-optimal design of the Dutch supplementary insurance, it is surprising to observe the popularity of the scheme: 84 per cent of the Dutch population took out supplementary insurance in 2015 (Vektis, 2015c). This paper therefore aims to indicate potential explanations of why so many Dutch insured take out this non-optimal supplementary health insurance. In order to do so, we will systematically study 1) the traditional economic literature on optimal

insurance design to see what optimal designs should look like (Section 5.2), 2) the behavioural economic literature to see whether other aspects – compared to those mentioned in the traditional economic literature – could provide a welfare gain to insured when taking out supplementary health insurance (Section 5.3.1), and 3) the behavioural economic literature to see whether certain aspects could indicate why insured make suboptimal choices (Section 5.3.2). Section 5.4 provides the conclusion, while some directions for further research and the policy implications are discussed in sections 5.5 and 5.6 respectively.

5.2 TRADITIONAL ECONOMIC THEORY ON OPTIMAL INSURANCE DESIGN

The essence of insurance can be found in the transfer of risk. Insurance implies that the insured pays a premium and in return receives some monetary amount from the insurer should an uncertain loss occur (Getzen, 2007). The welfare gain from this uncertainty reduction depends on the individual's degree of risk aversion (Pratt, 1964), which is affected by the presence of background risks (i.e., risks that cannot be avoided or insured against, such as labour income risks). Several studies show that background risks to wealth makes risk averse individuals behave in a more risk averse way with respect to any other independent risk (e.g., Eeckhoudt et al., 1996). This concept is called risk vulnerability (Gollier and Pratt, 1996) and causes insured to reduce their exposure to avoidable risks, for instance by increasing their insurance demand (Guiso and Paiella, 2008). Additionally, Nyman (1999) states that the benefits from health insurance cannot only be found in the transfer of risk, but also in the fact that insurance provides access to healthcare services that would otherwise not be affordable. On the other side, taking out health insurance may also have several disadvantages, namely moral hazard, the loading fee and transaction costs. Ultimately, health insurance design involves a trade-off between the gains from risk pooling and access to otherwise unaffordable healthcare services and the losses from moral hazard, the loading fee and transaction costs. Many researchers have studied the classical problem[30] of the trade-off between the gains from additional insurance and the efficiency losses from overconsumption of healthcare services (e.g., Arrow, 1976; Besley, 1988; Feldstein and Friedman, 1977; Pauly, 1974; Spence and Zeckhauser, 1971; Zeckhauser, 1970). All these studies show that full insurance is far from optimal and that a mix of coverage and cost-sharing is preferred. However, the results regarding this mix differ

[30] Note that in most studies regarding optimal insurance design, focus is put on the classical trade-off between risk reduction and moral hazard.

somewhat per study. We briefly mention the results of four studies regarding optimal insurance design.

Firstly, Arrow (1971) suggests that optimal insurance plans should have a stop-loss, which is a cap on total out-of-pocket expenses per individual or family. The empirical results of Manning and Marquis (1996) indicate that the optimal stop-loss would be rather large (i.e., larger than US$25,000[31]). Secondly, Manning and Marquis (1996) additionally show that plans with first dollar cost-sharing and a stop-loss appear to perform considerably better than pure stop-loss plans. For example, a plan with 25 per cent coinsurance and a stop-loss of €1,000 (i.e., the stop-loss is reached at healthcare expenses of €4,000) performs better than a plan with 100 per cent coinsurance and a stop-loss of €1,000 (i.e., similar to a deductible of €1,000, where the stop-loss is reached at healthcare expenses of €1,000). This is due to the fact that with pure stop-loss plans (i.e., the latter in the example) more insured exceed the limit and thereafter consume healthcare for free. Thirdly, Blomqvist (1997) indicates that relatively low co-payment percentages (i.e., up to a maximum of 7 per cent), even for individuals with only moderate healthcare expenses (i.e., up to $3,990[32]), are efficient. He additionally suggests that an optimal deductible, in his simulation, should be smaller than $320[33]. Fourthly, Buchanan et al. (1991) analyse different insurance plans and provide three conclusions relevant for our discussion. Firstly, they show that even fairly small deductible levels (even of US$100[34]) in combination with a 25 per cent coinsurance rate would be highly effective in curbing demand (i.e., defined as producing the smallest waste (which is the difference between total cost and the value of the purchased medical services)). This seems in accordance with Blomqvist (1997) who also states that relatively low cost-sharing arrangement could be effective. Secondly, they state that caps on out-of-pocket expenses of US$1,000–2,000[35] per person make good economic sense. Beyond this level the financial risk is greatly increased while demand is hardly reduced. Thirdly, they state that individual caps seem generally better than family caps. After all, with a

[31] Dollars of 1995 that correspond to €32,400 in 2015. US dollars from 1995 are firstly converted to US dollars in 2015 using a rate of 1.56855. Secondly, those US dollars are converted to Euros using an (non-healthcare specific) exchange rate of 0.82623 (1 January 2015).

[32] Dollars of 1997 that correspond to €4,881 in 2015. US dollars from 1997 are firstly converted to US dollars in 2015 using a rate of 1.48053. Secondly, those US dollars are converted to Euros using an (non-healthcare specific) exchange rate of 0.82623 (1 January 2015).

[33] Corresponding to €391 in 2015.

[34] Dollars of 1983 that correspond to €199 in 2015. US dollars from 1983 are firstly converted to US dollars in 2015 using a rate of 2.40586. Secondly, those US dollars are converted to Euros using an (non-healthcare specific) exchange rate of 0.82623 (1 January 2015).

[35] Corresponding to respectively €1,988 and €3,976 in 2015.

family cap, hospitalisation of one of the family members could take the whole family into a period of free care, while with an individual cap, the lower priced care (after the cap) is targeted at the sick individual only. Buchanan et al. (1991) overall state that, according to their analyses, the best policy has a small initial deductible (between US$100–300[36]) and a 25 per cent coinsurance rate up to an individual cap on out-of-pocket expenses of US$1,000[37]. In sum, although specifics sometimes differ, all studies point towards optimal designs of health insurance that a) protect individuals against unpredictable high financial risks, b) provide access to otherwise unaffordable healthcare services, c) include first-dollar cost-sharing either in the form of deductibles, coinsurance or a combination, and d) incorporate individual caps on out-of-pocket expenses.

An explanation of the high uptake of the Dutch supplementary insurance, related to optimal insurance design as proposed by traditional economics, could be that Dutch insured are extremely risk averse (Gorter and Schilp, 2012). This would imply that the consumer welfare gain from risk reduction would outweigh the substantial welfare loss from moral hazard, the loading fee and transaction costs. If this were true, however, one would expect (much) higher coverage limits than applied in the Dutch supplementary health insurance, since the gains from financial risk reduction would then be even larger than under the current design. Furthermore, an increase in risk aversion due to background risk could potentially explain the high uptake of the supplementary insurance. However, we consider it highly unlikely that there is substantial background risk that could have affected the demand for supplementary insurance in the last decade for over 84 per cent of the Dutch individuals. After all, the Dutch have significant social security such as child allowances, social welfare payments, comprehensive social health insurance, disability insurance and state pensions.

5.3 BEHAVIOURAL ECONOMICS

In addition to the traditional economic literature, key insights from behavioural economics may help explain the demand for health insurance. We provide two potential explanations for why so many Dutch insured take out non-optimal supplementary health insurance: 1) key aspects stemming from behavioural economics other than risk reduction and access to otherwise unaffordable healthcare services provide a welfare gain to individuals when taking out supplementary insurance, and/or 2) insured make suboptimal choices.

[36] Corresponding to respectively €199 and €596 in 2015.

[37] Corresponding to €1,988 in 2015.

5.3.1 Potential aspects that provide a welfare gain from taking out supplementary health insurance

Loss aversion

A first potential aspect that may provide a welfare gain to insured when taking out supplementary insurance is loss aversion, which is a key insight from the cumulative prospect theory developed by Tversky and Kahneman (1992). Loss aversion regards the phenomenon that 'losses loom larger than gains' and that 'the aggravation that one experiences in losing a sum of money appears to be greater than the pleasure associated with gaining the same amount' (Kahneman and Tversky, 1979). Wakker (2010) emphasises that loss aversion only plays a role in mixed prospects (i.e., where the outcome of a prospect is either a gain or a loss) and no role in pure gain and pure loss prospects. Loss aversion is denoted by λ and Tversky and Kahneman (1992) estimated λ to be 2.25, meaning that the pain of losses is felt 2.25 times as much as the joy of gains. In the health domain, Attema et al. (2013) estimated λ to be 1.18. The presence of loss aversion depends on the perception of the reference point and prospects coded as losses from this reference point are affected by loss aversion. The current state of wealth is often assumed to be the reference point in any decision, although the expected state could be the relevant reference point in some situations (Wilkinson, 2008). Additionally, Hershey and Schoemaker (1985) and Bleichrodt et al. (2001) found that one of the offered options is often taken as the reference point. Furthermore, Camerer (2004) states that by making one option in a decision the default option, this option serves as a reference point that individuals move away from only reluctantly. Samuelson and Zeckhauser (1988) add that loss aversion could cause individuals to be biased in favour of the status quo.

This means that the taken reference point concerning the decision to take out supplementary insurance (i.e., either supplementary insurance or no supplementary insurance) is essential to the effect of loss aversion. When taking out supplementary health insurance (especially via the internet), Dutch insurers guide individuals through the different choices they have to make: which basic health insurance, which deductible level and which supplementary insurance to apply for. With respect to the choice of the supplementary insurance, some insurers attach virtual labels to one of the offered policies stating 'most commonly chosen (in your situation)', nudging insured to take out supplementary insurance by carefully setting the default option. Next to the fact that most insured already had supplementary insurance in the previous year (i.e., their current state of wealth), this might additionally provide individuals with a reference point equal to having a supplementary insurance. From this reference point, the decision to take out supplementary insurance concerns a mixed

prospect, meaning that the insured could either lose the premium paid or gain the healthcare services reimbursed (i.e., when taking out supplementary insurance). As a result of this loss aversion, an aversion to potential out-of-pocket expenses for healthcare services not covered by supplementary insurance (i.e., in case of not taking out supplementary insurance) could be created and a preference for the status quo (i.e., having supplementary insurance)[38] could arise. This would imply that in the presence of loss aversion, the welfare gain from taking out supplementary health insurance would be higher than in the absence of loss aversion.

Ambiguity aversion

A second potential aspect that may provide a welfare gain from taking out supplementary insurance is ambiguity aversion (sometimes also referred to as uncertainty aversion). Ambiguity aversion captures individuals' preference for prospects with known probabilities over prospects with unknown probabilities and was first presented by Ellsberg (1961). In a hypothetical experiment individuals were confronted with two urns. The first urn contained 100 red and black balls in an unknown ratio and the second urn contained exactly 50 red and 50 black balls. The majority of respondents preferred to bet on either red or black in urn two rather than in urn one, although the expected outcome for both urns was the same, indicating ambiguity aversion. Frisch and Baron (1988) add that missing information that is relevant and could be known creates uncertainty about probabilities. Ritov and Baron (1990) show the presence of ambiguity aversion in healthcare in a study on children's vaccination, where the vaccination reduces the risk of dying from a specific disease, but simultaneously might have adverse health effects. When ambiguity about the risk of adverse health effects was caused by missing information (i.e., a child had a high or no risk of adverse effects, but it was impossible to find out which) individuals were more reluctant to vaccinate, indicating ambiguity aversion. From ambiguity aversion it then follows that individuals will value provision of any information that reduces their ambiguity, even if it will not change their decision, while standard economic theory predicts that the demand for information depends on its value in making decisions. Ellsberg (1961) adds that individuals often perceive the status quo as the situation with low variation and that ambiguities of the new situation are more salient than those of the current situation.

When deciding to take out supplementary health insurance, ambiguity aversion might create a preference for taking out supplementary insurance.

[38] Note that this could also imply that for insured whose perceived reference point includes no supplementary insurance, a preference for this status quo could arise meaning that they do not take out supplementary insurance in the next year.

This is caused by the fact that uncertainty (or ambiguity) is present regarding the choice option of not taking out supplementary insurance. After all, insured do not know (and are bad at estimating) their probability that healthcare expenses occur that could have been covered by supplementary insurance. With supplementary insurance this type of ambiguity is absent and could therefore provide a welfare gain.

Liquidity constraints

Liquidity constraints are a third potential aspect that may provide a welfare gain from taking out supplementary insurance to insured. Liquidity constraints imply that individuals do not have the financial possibilities to free up an (substantial) amount of money at some point in time. For instance, if individuals do not take out supplementary insurance, but unexpectedly need several treatments from a healthcare provider that are not covered by basic health insurance, they might not be able to pay the bill they receive. This might be due to the fact that they are financially illiquid. Since this situation could be prevented, at least for healthcare services that are covered by supplementary insurance, individuals might be more inclined to take out supplementary health insurance. Of course, individuals then have to pay a (additional) monthly premium but they prevent the unpleasant situation where they cannot pay a large bill (or even forego care) due to liquidity constraints. This would imply that in the presence of liquidity constraints, the welfare gain from taking out supplementary insurance would be higher than in the absence of liquidity constraints.

Debt aversion

A fourth potential aspect that may provide a welfare gain from taking out supplementary insurance is debt aversion. Debt aversion stems from mental accounting theory (Thaler, 1985; Thaler, 1999) and is shown by individuals' preference to prepay for consumption and to get paid for work after completion. Prelec and Loewenstein (1998) predict strong debt aversion because individuals tend to create linkages between consumption of goods or services and the payment for these goods or services. Essentially, individuals dislike the feeling of 'having the meter running'. A phenomenon called the flat rate bias indicates that individuals prefer flat-rate pricing schemes even if they pay more for the same usage (Prelec and Loewenstein, 1998; Thaler, 1999). This is for instance shown by a preference for unlimited internet access at a fixed monthly price over paying per megabyte. Debt aversion is explained by two motives: a) individuals hope to enjoy the product or service untroubled from payment concerns and b) individuals want to avoid the unpleasant experience of paying for consumption that has been enjoyed already.

So, debt aversion predicts that insured prefer flat-rate pricing schemes (e.g., basic health insurance or supplementary health insurance) and dislike paying for healthcare after consumption. After all, with supplementary insurance, healthcare services (up to a maximum) do not have to be paid after usage, but are prepaid through a monthly flat rate. Without supplementary insurance, the individual receives the bill after usage of the healthcare service, which is not preferred as a result of debt aversion. This would imply that in the presence of debt aversion, the welfare gain from taking out supplementary insurance would be higher than in the absence of debt aversion.

5.3.2 Making a suboptimal choice

The fact that many Dutch insured take out non-optimal supplementary health insurance might be explained by an increase in welfare as a result of the above-mentioned behavioural economic aspects. However, another explanation might be found in the fact that insured make suboptimal choices. Following the theory of rational consumer behaviour, an individual would take out supplementary health insurance if his expected healthcare expenses (under the supplementary insurance) are larger than the premium for supplementary health insurance. Some insured might indeed take out supplementary insurance because they know they will financially profit from it. For instance, if an insured knows for certain that he will need nine treatments at the physiotherapist, it is financially more profitable for him to buy a (cheap) supplementary insurance policy than it is to pay for the nine treatments out-of-pocket. Research shows, however, that in 2013 only 70 per cent of the Dutch insured with a supplementary insurance, indeed filed bills to their insurer for reimbursement (Vektis, 2015b). This means that still another 30 per cent of the insured pays a monthly premium for supplementary insurance, but never submits any claims. Therefore, next to a potential welfare gain, an alternative explanation for the high uptake of supplementary health insurance in the Netherlands might be that a large number of insured make suboptimal choices due to several behavioural economic aspects, meaning that individuals take out supplementary insurance, while theoretically *not* taking out supplementary insurance would be 'optimal'.

Limited knowledge

A first potential aspect that could indicate why insured make a suboptimal choice when taking out supplementary insurance may be individuals' limited knowledge regarding supplementary health insurance policies. After all, insured are known to have limited knowledge about their health insurance (Hsu et al., 2004; Reed et al., 2009) and to misunderstand complex price schedules including premiums and cost-sharing arrangements (Baicker et al., 2012; Lieb-

man and Zeckhauser, 2004; Marquis, 1981). Dutch individuals, for instance, do not know what type of health policy they have and are ignorant with respect to aspects such as deductibles, coverage and healthcare providers covered (Pricewise, 2014). Especially insured with lower education, young insured and elderly insured have limited knowledge about these concepts. As a result, the Dutch minister of Health, Welfare and Sports has announced to improve the information to individuals concerning quality and expenses of healthcare (Skipr, 2015).

Because of two reasons it could be expected that limited knowledge indeed affects the insured's decision regarding supplementary health insurance. Firstly, it could be expected that insured do not (exactly) know what they insure against by taking out supplementary insurance. Insured could for instance not know which benefits are covered and which coverage limits and cost-sharing arrangements apply. They might feel like they insure unpredictable and large potential losses, but might be unaware that they are (also) insuring regular dental check-ups. Secondly, it could be expected that insured do not know the costs of healthcare services that are (not) covered by insurance. This makes it hard for insured to make their own trade-off between the premium for supplementary insurance and the healthcare services covered by supplementary insurance, potentially causing them to make a suboptimal choice. Additionally, making this trade-off might be complex and might impose a high cognitive burden. This could especially be the case for individuals with low levels of numeracy and/or health literacy.

Social comparison

A second potential aspect that could explain why insured take out supplementary insurance regards social comparison. Friedl et al. (2014) propose that social comparison might be a factor affecting individuals' willingness to purchase insurance. This social comparison is modelled via preferences where utility depends both on one's own payoff as well as the payoff of relevant peers (Fehr and Schmidt, 1999). In their study on peer effects in risk taking, Lahno and Serra-Garcia (2015) state that imitation is the most frequent form of peer effect and that a norm to conform to the peer may explain why peer choices indeed matter. Richter et al. (2014) therefore state that individuals reflect upon what their peers (e.g., family and friends) decide and might think 'if my peers are purchasing insurance, I should purchase insurance for myself as well'. The behaviour of peers might potentially affect the decision to take out supplementary insurance as well: "if many of my friends and family take out supplementary insurance, I will do too, but if almost nobody takes out insurance, I am also not going to take out supplementary insurance". We additionally wonder what the

effect of the media could be on the decision to take out supplementary health insurance. After all, the last few years, the Dutch media paid much attention to the decision to take out supplementary insurance. They advised individuals to critically review their supplementary insurance and decide whether a supplementary health insurance would be necessary. The Dutch Association for Consumers (i.e., "De Consumentenbond") even advised insured to potentially not take out supplementary insurance and to save the premium, which could be used in case any healthcare services are needed. A relevant question in this case would be whether individuals view the media as relevant peers. As long as many insured take out supplementary insurance, social comparison could potentially explain why many insured take out supplementary insurance.

Decision avoidance

Decision avoidance is a third potential aspect that could indicate why insured make a suboptimal choice concerning their supplementary insurance. Decision avoidance manifests itself, according to Anderson (2003), as a tendency to avoid making a choice by postponing it or by seeking an easy way out that involves no action or no change. Several underlying factors could contribute to decision avoidance.

Firstly, omission bias could result in decision avoidance. Ritov and Baron (1992) explain status quo bias (i.e., individuals' tendency of doing nothing or maintaining one's current or previous decision (Samuelson and Zeckhauser, 1988)) by the fact that changing the status quo requires an act, while maintaining the status quo only requires an omission. They define omission bias as a reluctance to take action to change the current state. Due to this omission bias, insured may automatically renew their current health insurance policy, which mostly includes a supplementary insurance.

A second underlying factor contributing to decision avoidance regards choice and information overload. Research in both economics and psychology questions whether more choice is always in the consumer's interest. Consumers could be overwhelmed by too much choice (Iyengar and Lepper, 2000). Frank and Lamiraud (2009) additionally state that the relationship between the individual's satisfaction with a decision and the size of the choice set is an inverted U-shape. In first instance, individuals are more satisfied with their decision because more options (up to a certain point) imply a decision that is more closely related to their preferences, while after a certain point more options cause dissatisfaction because the decision-making process was difficult and frustrating and individuals are unsure whether they made the "right" decision (Iyengar and Lepper, 2000). Particularly when choice involves health and money – both part of the decision to take out supplementary health insurance – consumers

facing many choices may revert to the status quo even if superior options are available (Kunreuther et al., 2002). With respect to the Dutch supplementary insurance, many different insurers offer many different types of insurances, with different benefit packages, for different premiums, with different cost-sharing arrangements and reimbursement maximums. This could cause the individual to be overwhelmed by too much choice and subsequently make the insured defer the choice and eventually not make any decision at all (Frank and Lamiraud, 2009).

A third underlying factor of decision avoidance regards search and transaction costs. Consumer search is costly and a rational consumer will search until the cost of additional searching outweighs its expected benefits (Frank and Lamiraud, 2009). Also, the information or cognitive overload theory argues that, as the choice set grows, the cost of one's information processing increases (Eppler and Mengis, 2003). Even if consumers use shortcuts, information-processing costs grow with the choice set. Transaction and search costs, with respect to the supplementary insurance, regard the time and effort it takes for an individual to determine whether or not to take out supplementary health insurance and, if so, which supplementary insurance to take out (Strombom et al., 2002). Search and transaction costs might be very high since insured have many decisions and trade-offs to make regarding their supplementary insurance. This could, again, cause insured to automatically renew their current health insurance policy.

A fourth underlying factor of decision avoidance regards regret avoidance, which implies that whenever choice can induce regret, individuals have a tendency to eliminate the choice (Thaler, 1980). Regret avoidance helps explain individuals' preference for first-dollar coverage, since many individuals find decisions that involve a trade-off between healthcare and money unpleasant (Thaler, 1980). Consequently, insured (again) might take out supplementary insurance, because they may regret not taking out supplementary insurance if healthcare expenses do occur and have to be paid for out-of-pocket while it would, in retrospect, have been financially profitable to take out supplementary insurance. In sum, decision avoidance could cause insured to make suboptimal choices regarding their supplementary insurance.

5.4 CONCLUSION

Traditional economic theory suggests that optimal insurance design a) protects individuals against unpredictable high financial risks, b) provides access to otherwise unaffordable healthcare services, c) includes first-dollar cost-

sharing, and d) incorporates individual caps on out-of-pocket expenses. The Dutch supplementary health insurance is far from this optimal design, since it does not meet any of these requirements. Nevertheless, many Dutch insured take out this supplementary health insurance. This intriguing paradox suggests that additional aspects – compared to those mentioned in the traditional economic literature – may play a role in the demand for health insurance. We have identified seven key aspects from behavioural economics to potentially explain the high uptake of non-optimal insurance in the Dutch supplementary health insurance market.

Firstly, we mention four potential aspects – other than risk reduction and access to otherwise unaffordable healthcare services – that could provide a welfare gain from taking out supplementary insurance: loss aversion, ambiguity aversion, liquidity constraints and debt aversion. This paper poses that in the presence of either loss aversion, ambiguity aversion, liquidity constraints, debt aversion or a combination of these aspects, the welfare gain from taking out supplementary insurance would be higher than in the absence of (one of) these aspects. Next to an increase in welfare, an alternative explanation for the high uptake of the Dutch supplementary insurance might be that insured make suboptimal choices. We mention three behavioural economic aspects that could potentially explain why insured make suboptimal choices regarding their supplementary insurance: limited knowledge, social comparison and decision avoidance. Firstly, due to limited knowledge about the supplementary insurance, insured might be unaware what they exactly insure against and what the costs for healthcare services are. Secondly, as a result of social comparison (i.e., peer effects), insured might take out supplementary insurance just because their friends and family do so. Thirdly, due to decision avoidance insured might automatically renew their current supplementary insurance without critically reviewing whether they indeed want (and need) this insurance. The final sections of this paper provide several directions for further research and some policy implications.

5.5 FURTHER RESEARCH

It should be emphasised that the behavioural economic aspects presented in this paper are potential explanations for the observed behaviour. Further (empirical) research is needed to determine whether, and to what extent, the potential extensions to the theory on optimal insurance design and the ideas on consumer choice hold true in practice. We see at least five directions for further research. Firstly, research could be performed regarding the question whether

insured with an insurance policy in the current year indeed are more inclined to take out insurance in the next year (correcting for health status and other background characteristics such as gender, age and social economic status). In this way, the potential effect of loss aversion and decision avoidance on the demand for insurance could be tested. Secondly, research could study the effect of providing insight into the probability of using healthcare services covered by health insurance on the decision to take out insurance, such as is done by Wakker et al. (2007). Such a study could look into the aspects of ambiguity aversion, limited knowledge and social comparison. Thirdly, it could be interesting to perform a discrete choice experiment with respect to design aspects of health insurance, to see which aspects insured value most and what an optimal insurance design would look like to them. Fourthly, research could study the effect of providing information about health insurance (i.e., what does it cover, what cost-sharing arrangements apply, etc.) on the decision to take out insurance. This could provide insights regarding the direct effect of information on the demand for insurance. Fifthly, it would be important to study how the different research areas presented in this paper (i.e., traditional economics versus behavioural economics) relate to each other. For instance, Gollier and Pratt (1996) show that adding a background risk to an individual's initial wealth makes him desire a certain lottery which he disliked before the background risk was added. This seems quite similar to what Kahneman and Tversky (1979) present in their paper when they add 1,000 ILS[39] to an individual's initial wealth and show that the answer to the same lottery reverses. Both these results may relate to an individual's reference point when making (insurance) decisions and could provide a better understanding of insurance demand. The mentioned directions for further research could contribute to better insurance designs and could help facilitate the insured's decision-making process.

5.6 POLICY IMPLICATIONS

5.6.1 Alternative design

Although further research is necessary, we wonder what the design of the supplementary insurance would look like in case these aspects indeed affect the demand for health insurance. In that case, a potential design of optimal supplementary health insurance may be such that it 1) provides protection against unpredictable and large losses (e.g., dental care after an accident), 2) has first-euro cost-sharing with an individual cap on out-of-pocket expenses, and 3) provides the option to save for predictable small losses. Due to the first aspect

[39] ILS = New Israeli Shekel

of this policy, insured are covered for unexpected large potential losses that are not already covered by basic insurance instead of covered for healthcare expenses that might be predictable and relatively small (e.g., consultations at the dentist). This type of coverage could mean a welfare increase to insured since the risk reduction resulting from this insurance is larger than with the current design of the supplementary insurance. It could also affect ambiguity aversion since with such a policy, insured do know what they are insured against and know that all unexpected large losses are reimbursed. Due to the second aspect of this policy, which is based upon the results from the study by Buchanan et al. (1991), individuals might be more incentivised to contain their healthcare spending. This could potentially counteract moral hazard. The individual cap on out-of-pocket expenses protects insured from bills they cannot pay and makes sure that not too high expenses need to be paid in order to receive care. With the third aspect of this policy, insured are provided with the possibility to save for expenses that are predictable and small (e.g., dental consultations or regular treatments at the physiotherapist) instead of insuring against these expenses, as in currently the case. Note that with saving, the individual does not pay for the (high) moral hazard and high loading fee that characterises supplementary insurance policies. This third aspect could affect debt aversion since the savings account could serve as a prepayment vehicle that diminishes the attenuation of the payment on the pleasure of consumption. It might also affect liquidity constraints since an earmarked savings account could serve as a consumption commitment especially for predictable small losses not covered by insurance or cost-sharing. It could also affect loss aversion since with a savings account loss aversion is no longer present since insured only lose the savings in return for consumed healthcare services while they otherwise keep the savings and could potentially transfer it to next year's expenses.

5.6.2 Facilitating the insured's decision-making process

Next to an alternative design of supplementary insurance, the results of this paper may lead to potential strategies to facilitate the individual's decision-making process. Again, note that further research regarding the effects of the mentioned behavioural economic aspects on insurance demand is necessary. However, in case insured indeed make suboptimal choices due to several behavioural economic aspects, facilitating their decision-making process might help them make more optimal choices. Firstly, information could be provided to insured concerning the design and coverage of the current supplementary insurance. This strategy provides insights into the reimbursement and the type of healthcare services actually covered. As a result, insured might potentially be more equipped to determine whether they actually want and need to take

out this type of insurance. Ignorance could be affected with this strategy since it provides insured with transparent information on the actual insurance policy they take out and empowers them to make a decision regarding the supplementary insurance that best fits their needs.

A second potential strategy to facilitate the insured's decision-making process is to provide insured with information on group and individual usages of healthcare services covered by supplementary insurance. Information could be provided on how often insured (i.e., on the individual or group level) consume certain healthcare services not covered by basic insurance. This also provides insured with information on the (average) costs of these healthcare services. Such a strategy could affect ambiguity aversion since it provides insured with information on the probability that they will consume healthcare expenses that could be covered by supplementary insurance. It could additionally affect social comparison since insured could be provided with information on the average healthcare usage of their relevant peers (i.e., individuals with for instance the same age and gender).

A third potential strategy to facilitate well informed decision-making is standardisation of the health insurance policies. This strategy could be similar to the standardisation of the set of benefits in Medigap in the United States of America in 1992, where insurers may only offer one out of ten standardised policies. Rice et al. (1997) show that as a result of this standardisation insured are better able to make informed choices. A step in this direction is already made by 'Health Insurers the Netherlands' (all Dutch insurers are member of this association), in their plan of action where they state to intend to provide clear policies to insured (ZN, 2015).

Chapter 6

Can premium differentiation counteract adverse selection in the Dutch supplementary health insurance? A simulation study

ABSTRACT

Many Dutch insurers do still apply community-rating and open enrolment for supplementary health insurance, although it is offered at a free market. Theoretically, this should result in adverse selection. Historically, almost all Dutch insured purchased supplementary insurance. There are, however, four indications that adverse selection has started to occur on the Dutch supplementary insurance market. This paper studies 1) the effect of adverse selection on the premium for supplementary insurance over time and 2) whether premium differentiation would be able to counteract adverse selection. We do this by simulating the uptake and premium development of supplementary insurance over 25 years using data on healthcare expenses and background characteristics from 110,261 insured. For the operationalisation of adverse selection, it is assumed that only insured for whom supplementary insurance is expected not to be beneficial will consider opting out of the insurance. Therefore, we calculate for each insured the financial profitability and make plausible assumptions about the premium set by the insurer, the individual's risk attitude and the probability to opt out or opt in. The simulation results show that adverse selection might result in a substantial increase in premium and a decline in insurance uptake. They additionally show that if insurers were to increase the premium in anticipation of adverse selection, both the decline in insurance uptake and the increase in premium become steeper than when insurers do not do this. Finally, this paper shows that if insurers would apply highly refined risk-rating adverse selection could be counteracted.

6.1 INTRODUCTION

By the Health Insurance Act (2006) Dutch inhabitants are obliged to take out basic health insurance from a private health insurer of their choice, which covers a basic benefit package determined by the government. For healthcare services not covered by basic insurance, insured can voluntarily purchase supplementary health insurance. Healthcare services covered by supplementary insurance include, among others, dental care for adults, physiotherapy, durable medical equipment, alternative medicines, pharmaceuticals, care consumed in a foreign country, orthodontics and maternity care, as far as these benefits are not covered by basic health insurance. Contrary to basic insurance, supplementary insurance in the Netherlands is offered at a free market. Instead of the requirements of community-rating and open enrolment that hold for the basic health insurance, insurers on the supplementary insurance market are free to apply risk-rating and selective underwriting. Nevertheless, as a result of societal pressure, many insurers do still apply community-rating and open enrolment. Theory predicts that these circumstances lead to adverse selection (Rothschild and Stiglitz, 1976). This paper focuses on adverse selection on the Dutch supplementary health insurance market.

Adverse selection refers to the tendency that, within each premium risk group, high-risk individuals have a larger incentive to buy supplementary insurance or to extend their coverage compared to low-risk individuals. It arises as a result of asymmetric information[40] between the insured and the insurer (Chiappori and Salanié, 2013; Dionne et al., 2013). More specifically, the (applicant) insured has information regarding his risk that the insurer does not have, is not willing to use or is not allowed to use for risk rating or selective underwriting (Akerlof, 1970; Pauly, 1986; Neudeck and Podczeck, 1996). Two conditions are necessary for adverse selection to arise (e.g., Bakker, 1997; Cave, 1985; Marquis, 1992; Rothschild and Stiglitz, 1976; Wilson, 1977). Firstly, insured need to be able to better forecast their expected healthcare expenses than the insurer is able to reflect into the premium. Secondly, this forecast needs to affect the demand for insurance. As a result of adverse selection, insurer's profit is less than anticipated and the premium of supplementary insurance has to be increased. In the next year, this premium increase provides an incentive for low-risk individuals (within their premium risk group) to leave the supplementary insurance policy or to reduce their coverage. This continuing process

[40] Van de Ven and Van Vliet (1995) emphasise that, in case of adverse selection, asymmetric information is often used as a more general term for consumer information surplus. Consumer information surplus implies that individuals know their individual risk deviates from the average risk within their risk group (i.e., the risk group used by the insurer to differentiate the premium).

may lead to a so-called adverse selection or death spiral[41]. Adverse selection may have considerable consequences, since it might cause a competitive health insurance market to become unstable (Rothschild and Stiglitz, 1979). In stable markets, both low-risk and high-risk individuals purchase the insurance policy especially designed for them. In unstable markets, due to adverse selection, individuals might select the wrong health policy (i.e., the policy that is not optimal given their expected healthcare expenses and preferences) (Cutler and Zeckhauser, 1998). Additionally, insurers could, in an attempt to counteract adverse selection, manipulate their offerings to deter the sick and attract the healthy insured (Cutler and Zeckhauser, 1998). These manipulations might impose welfare losses since they deny both low-risk and high-risk individuals the coverage they would like most.

Historically, almost all Dutch individuals purchased supplementary health insurance (Vektis, 2016). There are, however, four indications that adverse selection has started to occur in the Dutch supplementary health insurance. Firstly, the percentage of individuals with supplementary insurance decreased from 93 per cent in 2006 to 84 per cent in 2016 (Vektis, 2016). Additional research shows that the majority of individuals without supplementary insurance (i.e., 72 per cent in 2014) did not purchase supplementary insurance because they expected not to need the healthcare services covered (Reitsma-van Rooijen and De Jong, 2014). Secondly, individuals with a supplementary insurance take out insurance policies with less comprehensive coverage than before (Vektis, 2015c; Gezondheidsnet, 2012). In 2011, for instance, 75 per cent of the insured took out coverage for dental care, while in 2012 this reduced to 65 per cent. Additionally, 66 per cent of the insured took out coverage for physiotherapy in 2011, while this reduced to 49 per cent in 2012 (Gezondheidsnet, 2012). Thirdly, insurers' total technical result on supplementary insurance policies reduced substantially, from 321 million in 2008 to 33 million in 2014 (Vektis, 2015a). Fourthly, more and more insurers stop offering supplementary insurance policies providing coverage for healthcare services mostly used by high-risk individuals (e.g., unlimited coverage for physiotherapy), while premiums for policies that do offer this coverage increased considerably (Zorgwijzer, 2015). There are several potential explanations for the increase of adverse selection, such as changes in an individual's financial conditions, changes in the basic benefit package and changes in the entitlement to reimbursement. Additionally, two developments may lead to a further increase of adverse selection in the upcoming years. Firstly, media attention that urges insured to critically

[41] For empirical evidence on adverse selection see for instance: Ellis, 1985; Geurts and Rutten, 1987; Godfried et al., 2001; Marquis, 1992; Marquis and Phelps, 1987; Short and Taylor, 1989; Wolfe and Goddeeris, 1991.

review their need of purchasing supplementary health insurance, to reduce unnecessary coverage and to search for the lowest premiums increases (e.g., Consumentenbond, 2014b; Independer, 2015b and 2015c and 2015d; Kassa, 2012 and 2015; Radar, 2013a and 2013b). This may potentially encourage healthy individuals to opt out of the supplementary insurance, causing an increase in adverse selection. Secondly, it might be expected that insurers over the last few years have tried to limit the increase in premium for supplementary health insurance by reducing their profit. However, insurers may no longer be able to do this, since the technical result on supplementary health insurances has reduced significantly. This might imply that (substantial) premium increases could be expected for supplementary health insurance in the upcoming years causing an increase in adverse selection. To counteract adverse selection, insurers are allowed to apply premium differentiation[42], although currently only very few Dutch insurers do this.

Against this background, this paper studies 1) the effect of adverse selection on the premium for supplementary insurance over time and 2) whether premium differentiation would be able to counteract adverse selection. This is studied by simulating the uptake and premium development of supplementary health insurance over time using data on healthcare expenses and background characteristics from 110,261 insured. The next two sections, respectively, discuss the data and methods used for the empirical simulations. The results are presented in section 6.4. Sections 6.5 and 6.6, respectively, present the conclusion and provide points for discussion, directions for further research and policy implications.

6.2 DATA

For the simulations of adverse selection over time and the potential of premium differentiation to counteract adverse selection, we use individual-level information on healthcare expenditure and risk characteristics from the Achmea Health Database. The dataset contains 110,261 individuals who had the same supplementary health insurance policy during the entire period 2006–2011. Their supplementary insurance covers dental expenses and healthcare services not covered by basic health insurance (e.g., physiotherapy, alternative medi-

[42] With premium differentiation, the premium for each insurance policy is adjusted to the individual's risk (Van de Ven and Schut, 2011). As the differentiation is more refined, risk pools are less heterogeneous, implying less asymmetric information. Van de Ven and Van Vliet (1995) for instance show that the use of risk factors like age, gender, health indicators, prior healthcare expenditures, supplementary insurance and region, reduces the consumer information surplus by about 80 per cent in case of deductible choice.

cine, care consumed in a foreign country, etc.). In 2011, the annual premium for this policy was almost €500, while the average premium for supplementary insurance in the Netherlands in that year was little over €300 (Vektis, 2015c). In the Netherlands, children can be insured on the supplementary health insurance policy of one of the parents without any additional costs. This means that children do not actually have a direct demand for supplementary insurance. Therefore, we only included adult insured (i.e., 18 years or older on January 1, 2006) into our analyses.

The Achmea Health Database contains administrative data from a large Dutch health insurer who operates particularly in the western and eastern parts of the Netherlands. The data contains individual-level information on insurance claims[43], both for basic insurance and supplementary insurance, aggregated at and categorized into the following thirteen types of healthcare services: GP-care, pharmacy, inpatient care, hospital admissions, outpatient care, dental care, maternity care, durable medical equipment, physiotherapy, mental care, care consumed in a foreign country, alternative medicines and glasses. Furthermore, the database includes an encrypted ID-number and (per year) information on the year of birth, sex, ethnicity, degree of urbanisation in the residential area and in which Pharmacy-based Cost Group (PCG) and/or Diagnoses-based Cost Group (DCG)[44] the insured is classified for the risk equalisation scheme.

Appendix 6 provides an overview of some background characteristics of the Dutch population and compares these to the characteristics of our sample. It shows that more insured in the data are classified into a PCG or DCG and that the data includes a smaller share of insured up to the age of 40 and a larger share of insured over the age of 40 compared to the entire Dutch population. This will however not affect our results since the simulations only take into account who is relatively healthy or unhealthy compared to the entire sample; i.e., is the individual a low-risk or high-risk within the relevant premium risk group (see section 6.3).

6.3 METHODS

6.3.1 Simulation process

Using the above-mentioned data, we will simulate the uptake and premium development of supplementary health insurance over time and study the po-

[43] The insurance claims are corrected for inflation.

[44] PCGs and DCGs are risk adjusters used as a proxy for health status based upon prior use of pharmaceuticals and prior hospital inpatient diagnoses respectively (Van Kleef et al., 2013).

tential of premium differentiation to counteract adverse selection. In general, we will simulate per year who takes out a supplementary insurance and who does not[45] (see Fig. 6.1). We use year t-1 (i.e., 2007) as our base year in which 100 per cent of the insured still have their supplementary health insurance policy. From that year, we start the simulation process and study the effect of adverse selection on the premium. In year t, two flows of insured are simulated. Firstly, a share of the insured for whom purchasing supplementary insurance is expected not to be financially beneficial will opt out due to adverse selection (i.e., line #1 in Fig. 6.1). Secondly, the remainder of this group will not opt out of the policy and a share of insured is expected to benefit from purchasing supplementary insurance and will therefore keep the policy (i.e., line #2 in Fig. 6.1). This process leaves us with a group of insured with and without supplementary health insurance in year t, from which the premium for year t+1 is based upon the average claims of the group of insured with supplementary insurance in year t. As a result, four flows of insured are simulated in year t+1. Firstly, for a share of insured who have supplementary insurance in year t, purchasing supplementary insurance is expected not to be financially beneficial in year t+1 and a share of this group will opt out of the policy due to adverse selection (i.e., line #3 in Fig. 6.1). Secondly, the remainder of this group will not opt out of the policy and a share of insured who have supplementary insurance in year t is expected to benefit from purchasing supplementary health insurance in year t+1 and will therefore keep the policy (i.e., line #4 in Fig. 6.1). Thirdly, for a share of insured who do not have supplementary insurance in year t, purchasing supplementary health insurance is expected to be financially beneficial in year t+1. Meaning that they will opt back into the insurance policy (i.e., line #5 in Fig. 6.1). Fourthly, for a share of insured who do not have supplementary insurance in year t, purchasing supplementary insurance is expected not to be financially beneficial in year t+1. Therefore, they will remain out of the insurance policy (i.e., line #6 in Fig. 6.1). The simulation process from year t+1 will be continued up to year t+25 to provide insights over an extensive period of time. This is done by continuously 'looping' the available years in our data, meaning that we use the same five years (i.e., 2007 to 2011) over and over

[45] Note that we select insured who have had the same supplementary insurance policy in the period 2006–2011 and that we use exactly these insured to simulate adverse selection. This might seem paradoxical since these insured did not opt out of the policy in the period 2006–2011 and we simulate that a share of them will opt out of the policy. We consider this group of insured, however, as a pool of insured in which at a certain point in time the trend of adverse selection as observed in the Dutch supplementary health insurance occurs.

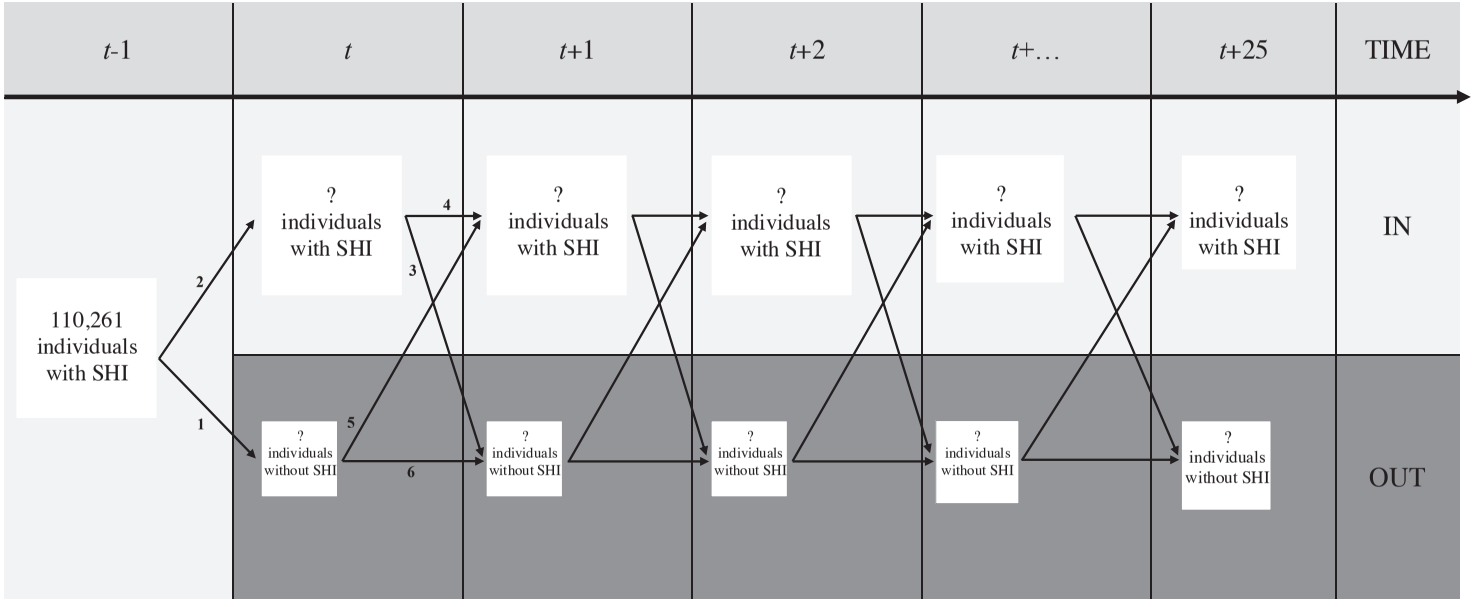


Fig. 6.1 The simulation process.

again to create a simulation of 25 years[46]. Since the healthcare expenses in our data are corrected for inflation, this looping process gives no shocks in total healthcare expenses over the years[47].

As mentioned already, we are interested in the effect of adverse selection on the premium development and the potential of premium differentiation to counteract adverse selection. The operationalisation of adverse selection can be done in many different ways, such as by creating an outflow of insured based upon background characteristics (e.g., insured without any illness will opt out of the policy), based upon the lowest predicted healthcare expenses and based upon a number of years no claims have been filed for supplementary health insurance. In this paper, we simulate that insured for whom purchasing supplementary health insurance is not expected to be financially beneficial are subject to adverse selection and potentially opt out. Lines #1 and #3 in figure 6.1 represent this. In the Netherlands, the percentage of insured with supplementary health insurance decreased with about one per cent each year over the last decade (Vektis, 2016). In order to simulate a continuation of this trend and study the effect on the premium, we have to make a decision regarding the probability that an insured for whom purchasing supplementary health insurance is expected not to be beneficial will opt out of the policy. Our analyses have shown that in order to simulate the continuation of adverse selection this probability must be set at 0.05. Subsequently, we simulate that from the group of insured for whom purchasing supplementary health insurance is expected not to be financially beneficial randomly five per cent opts out. Note that since we select insured who opt out randomly (from the group for whom purchasing supplementary health insurance is expected not to be beneficial), we provide a lower bound of adverse selection, compared to selecting, for instance, the five per cent of insured with the lowest predicted expenses. The simulation of this continuation might provide an underestimation of adverse selection in the Dutch supplementary health insurance. After all, adverse selection does not only imply that insured opt out of the policy, but it could also imply that insured reduce their coverage. This reduction of coverage is one of the indications that adverse selection has started to occur in the Dutch supplementary health insurance. Therefore, we also simulate stronger adverse selection by increasing the probability to opt out to 0.1.

[46] I.e., 2006 in the data is year t-2 in the simulations, 2007 is year t-1, 2008 is year t, 2009 is year t+1, 2010 is year t+2, 2011 is year t+3, 2007 is year t+4, 2008 is year t+5, 2009 is year t+6, 2010 is year t+7, 2011 is year t+8, 2007 is year t+9, etc.

[47] Additionally, this looping process does not result in any problems concerning the background characteristics of insured when going from the year 2011 to 2007, because insured have the appropriate risk factors and corresponding predicted claims for each year, also when the looping process continues.

6.3.2 Financial profitability

A crucial parameter in our simulations concerns the financial profitability of purchasing supplementary health insurance, which is determined by the individuals' predicted claims, the premium set by the insurer and the insured's risk attitude. These aspects and the corresponding assumptions are discussed below.

Predicted claims

The amount of claims that the insured expects to have for supplementary health insurance will for a large part determine whether purchasing supplementary health insurance might be beneficial. If an insured expects no claims for supplementary insurance, he might be less inclined to purchase insurance compared to a situation in which he expects many claims for supplementary health insurance. To determine these predicted claims for each insured, several models were tested (see appendix 7). Since all models seem to perform equally well, we use the most commonly applied GLM with a log-link and a gamma distribution (Beeuwkes-Buntin and Zaslavsky, 2004). The dependent variable is the total healthcare expenses under supplementary insurance in year *t*. The independent variables indicate several background characteristics that are included in the database: an age and gender interaction, classification into a PCG and / or DCG in year *t* (based upon information from year *t*-1), degree of urbanisation in the residential area, ethnicity, in which vigintile the insured was classified based upon healthcare expenses for basic insurance in year *t*-1 and in which percentile the insured was classified based upon healthcare expenses for supplementary insurance in year *t*-1. For the years 2007 to 2011 we use this model to determine the predicted claims for each specific year.

Premium

Next to the predicted claims, the premium determines the financial profitability of purchasing supplementary insurance. Theoretically, the premium set by the insurer is determined as the predicted claims (as predicted by the insurer) plus a loading fee (for each premium risk group). In our data, we only have information on the premium in 2011. However, we want to simulate insurance uptake over 25 years and therefore, we determine the premium as the average reimbursed claims plus a loading fee. The loading fee for each year is based upon the average loading fee[48] in the Netherlands in the period 2008–2011 and is 23 per cent. This implies that the premium in year *t*+1 is determined as the average claims (in the relevant risk group) in year *t* plus a 23 per cent loading

[48] The average loading fee concerns the difference between the average annual reimbursed expenses under supplementary insurance and the average annual premium for supplementary insurance for the years 2008 to 2011 (Vektis, 2014).

fee. Note that we apply a constant percentage for the loading fee over the years and over the premium risk groups, while insurers are free to (and will most likely apply) different loading fees each year and for each premium risk group depending upon their own business model.

Insurers could anticipate upon adverse selection by increasing their premium (and still apply community-rating). After all, low-risk individuals within their premium risk group tend to leave the supplementary health insurance or reduce their coverage, while high-risk individuals within the same premium risk group tend to keep the supplementary health insurance. Therefore, we will also perform a simulation in which we simulate that insurers anticipate upon adverse selection by increasing their premium in advance.

Although many insurers do still apply community-rating, Dutch insurers are allowed to apply premium differentiation to counteract adverse selection. In order to study the potential of premium differentiation to counteract adverse selection, three types of premium differentiation are distinguished: gender[49], age and individual predicted claims. For age, we differentiate between two premium risk groups: one for insured between the ages of 18 and 32 and one for insured older than 32. These groups were chosen since the data showed the largest difference in claims for this classification. With the differentiation to individual predicted claims, which is similar to fully risk-rating the premium, insured are faced with an individual premium based upon their individual predicted claims (as mentioned above) plus a loading fee. Note that this differentiation is based upon the maximum information (at least in our data) insured themselves have to predict claims. Table 6.1 shows the number of insured in each premium risk group and the average claims in 2011.

Table 6.1 Average claims for different premium risk groups.

		N	Average claims 2011
Community-rating		110,261	€ 221
Gender	**Male**	49,814	€ 179
	Female	60,447	€ 256
Age	**18-32**	9,975	€ 190
	32+	100,286	€ 224

Risk attitude

Next to the insured's predicted claims and the premium set by the insurer, the insured's risk attitude determines whether purchasing supplementary

[49] Note that, in practice, the law prohibits insurers to apply premium differentiation to gender due to non-discrimination issues.

health insurance is expected to be beneficial (Van de Ven and Van Praag, 1981; Manning and Marquis, 1996). A rational risk neutral insured would purchase supplementary health insurance if his predicted claims equal or exceed the premium. So, if the premium for supplementary health insurance is, for instance, €500, a risk neutral insured would only purchase this insurance if his predicted claims are at least €500. Insured are, however, not risk neutral regarding uncertain choices in health insurance (Kahneman and Tversky, 1979). In these situations, most insured are known to be risk averse, implying that the insured prefers a certain prospect (x) to any risky prospect with expected value x. So, a risk averse insured is willing to pay an additional risk premium to insure himself for healthcare services covered by (supplementary) insurance. In the previous example, if the insured is for instance willing to pay a risk premium of €100, he would purchase supplementary insurance if his predicted claims plus the risk premium of €100 are at least €500. The insured's degree of risk aversion determines the risk premium the insured is willing to pay. As risk aversion becomes larger, the risk premium the insured is willing to pay becomes larger.

We use the measure of risk aversion (r) as developed by Pratt (1964) to determine the risk premium for our simulations. Several researchers have estimated this measure. Van de Ven and Van Praag (1981) found an average r-value of 0.0067 among high-income people in the Netherlands. Marquis and Holmer (1986) report r-values of 0.00094 and 0.00113. Finally, Van Kleef et al. (2006) use r-values of 0.003 and 0.005 to determine the insured's demanded compensation for opting for a voluntary deductible. Based upon the formula by Pratt (1964), we use the following formula to determine the risk premium the average insured is willing to pay:

$$RP = 0{,}5 \times S^2 \left(E(\overline{HCE}(SHI))\right) \times r \qquad (1),$$

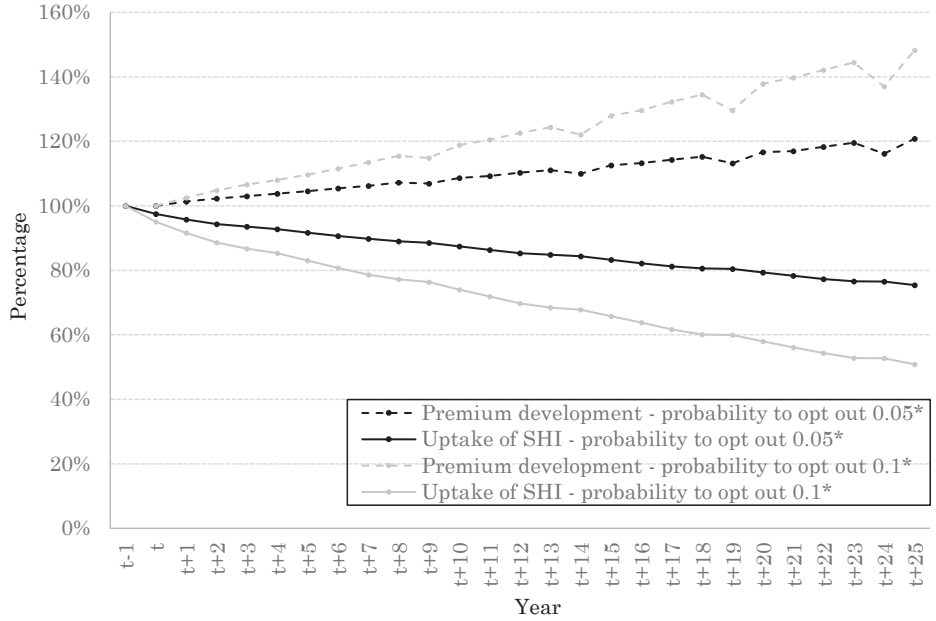
where the risk premium (RP) is determined as 0.5 times the variance of the average expected claims ($\overline{HCE}$ (healthcare expenses)) under supplementary health insurance (SHI) times the risk aversion measure (r). Since, in our data, we have information on the variance of the supplementary insurance claims for the period 2006–2011, we determined the demanded risk premium for the highest variance level (i.e., 28,703 in 2010) and the smallest variance level (i.e., 24,596 in 2011) using both the largest (i.e., 0.0067 (Van de Ven and Van Praag, 1981)) and the smallest mentioned r-value (i.e., 0.00094 (Marquis and Holmer, 1986)). This results in, respectively, a lower bound and upper bound of the risk premium of €12 and €96. Note that the upper bound is based upon the average r-value as found by Van de Ven and Van Praag (1981) for high-income people.

They, however, show that the *r*-value differs substantially between low-income and high-income people (i.e., varying from 0.0049 for high-income people to 0.0079 for low-income people). To compensate for the variation in these results, we simulate risk aversion using a risk premium of €100. Using this risk premium, we simulate that insured with predicted claims plus a risk premium of €100 smaller than the premium (in their premium risk group) are subject to adverse selection and might potentially opt out of the supplementary health insurance. The results of the simulations are presented in the next section.

6.4 RESULTS

6.4.1 Adverse selection

Graph 6.1 shows the results of the simulation of the effect of adverse selection on the uptake and the premium development of supplementary health insurance. The black lines indicate a continuation of adverse selection following the current trend in the Dutch supplementary health insurance, where on average the uptake of supplementary health insurance decreases with one per cent each year. It additionally shows that if adverse selection would be larger (i.e., the grey lines), potentially because the one per cent decrease over the last decade represents a lower bound of adverse selection since insured might have reduced their coverage (instead of opting out), the decline in insurance uptake is much steeper than with a continuation of the trend. Furthermore, the continuation of the current trend of adverse selection results in an increase in premium over 25 years of 21 per cent (i.e., the black dotted line), while larger adverse selection results in a premium increase of 50 per cent over 25 years (i.e., the grey dotted line). The fact that the lines, representing the insurance uptake and the premium development, increasingly diverge is caused by the fact that, as expected with adverse selection, the group that still purchases supplementary insurance becomes less and less healthy compared to the years before. This implies that the reimbursed healthcare expenses increase and consequently, that the premium increases.



Graph 6.1 Effect of adverse selection on the premium for supplementary health insurance (SHI)[50]. * Within the group of insured for whom purchasing supplementary insurance is not expected to be beneficial, the probability to opt out (resulting from adverse selection) is, respectively, 0.05 (black) and 0.1 (grey).

[50] The 'bumps' in the lines are caused by the fact that in the year 2011 (i.e., years *t*+3, *t*+8, *t*+13, *t*+18, *t*+23 in the simulation) the distribution of healthcare expenses differs from the other years in that fewer insured have very high claims and insured within the group of insured with few claims on average have somewhat higher claims. Additionally, this might partially be due to the fact that in 2010 the average reimbursed claims for care consumed in a foreign country where substantially higher than for the other years, implying that the average reimbursed claims in 2011 are smaller compared to 2010. This cost pattern is however very specific for the year 2011, and is not a result of the looping process we apply.

6.4.2 Anticipation upon adverse selection

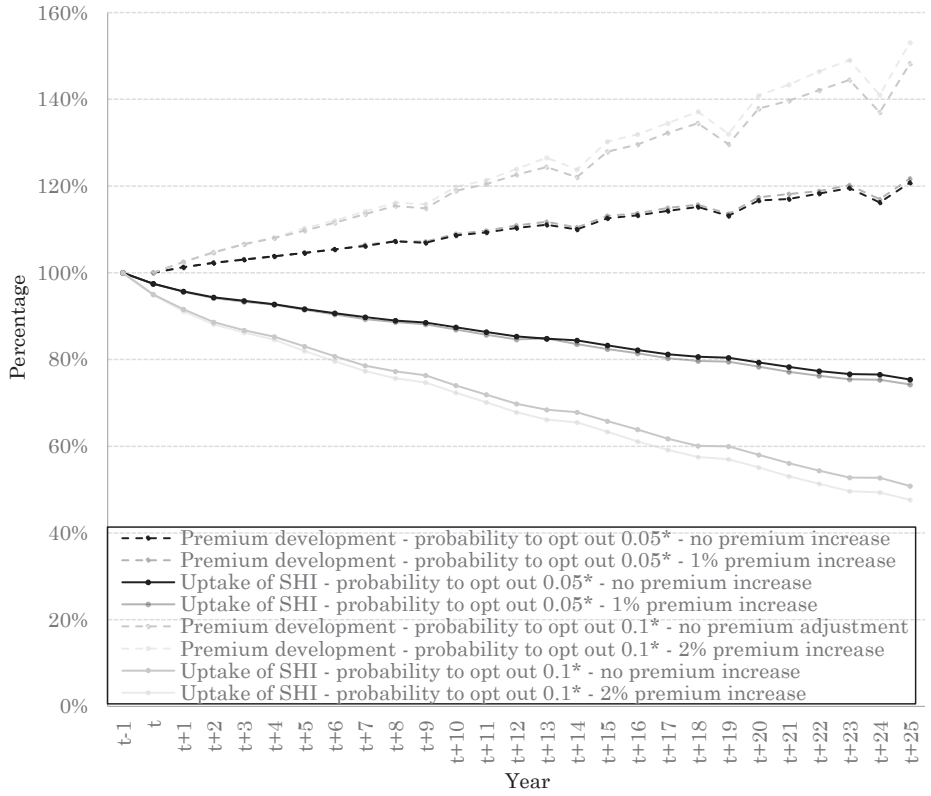
Graph 6.2 shows the simulation results in case insurers would anticipate upon adverse selection by increasing the premium and still apply community-rating, where the darker lines are equal to the lines in graph 6.1. Note that we apply different percentages for the premium increase matching about the average increase in premium as shown in graph 6.1[51]. Graph 6.2 shows that the insurance uptake is lower in case the insurer increases its premium in anticipation of adverse selection compared to the situation where the insurer does not increase its premium, although the difference is not large. This is due to the fact that as the premium increase is larger, purchasing supplementary insurance is expected not to be financially beneficial for a larger share of insured, implying that more insured will opt out of the policy as a result of adverse selection. This means that by anticipating upon adverse selection by increasing the premiums, adverse selection might increase. Additionally, graph 6.2 shows that the premium increase is larger in case insurers anticipate upon adverse selection compared to the situation where they do not do this. This is caused by the fact that due to the premium increase, a larger share of insured opts out since purchasing supplementary insurance is no longer expected to be beneficial to them. This causes higher premiums because the risk pool on average becomes less healthy compared to the situation where the insurer did not increase its premium.

6.4.3 Premium differentiation

Graphs 6.3A and 6.3B show the results of the simulations of the potential of premium differentiation to counteract adverse selection, where the darker lines are equal to those in graph 6.1 (and graph 6.2). The graphs show that premium differentiation to either gender or age has almost no effect on the uptake of supplementary health insurance. This results from two effects that more or less cancel one another out. Firstly, in case of age differentiation for example, purchasing supplementary insurance becomes more beneficial to younger insured compared to community-rating. Secondly, at the same time, within the group of older insured, the relatively healthy insured leave the supplementary health insurance. Only in graph 6.3B, the differentiation to gender seems to be able to modestly slow down the decline in insurance uptake. Additionally, in graphs

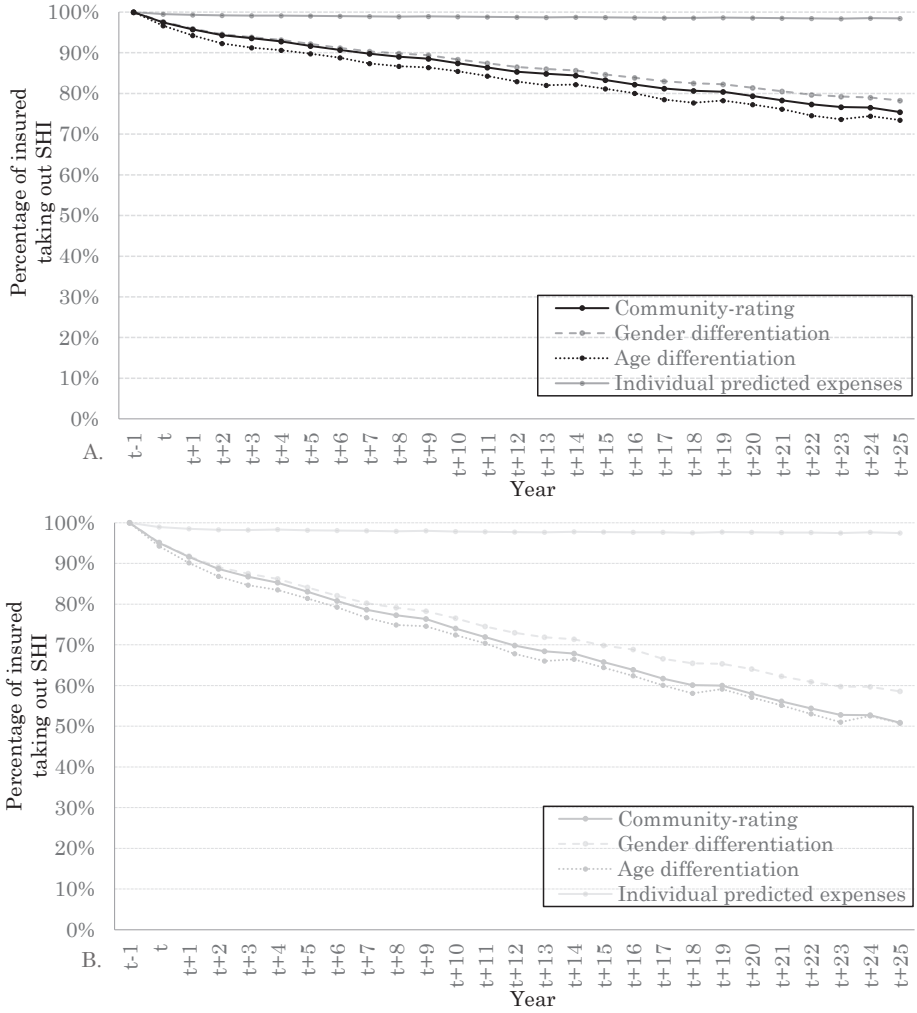
[51] Graph 6.1 shows that a continuation of the current trend results in an increase in premium of 21 per cent over 25 years, which is about a one per cent premium increase each year. So, for the continuation of adverse selection where insurers anticipate upon adverse selection by increasing the premium in advance, we apply a premium increase of one per cent each year. Additionally, for the simulation in which adverse selection is larger, the increase in premium is about 50 per cent over 25 years. Therefore, for the simulation of larger adverse selection where insurers anticipate upon adverse selection by increasing the premium in advance, we apply a premium increase of two per cent each year.

6.3A and 6.3B a fully risk-rated premium completely stabilises the insurance uptake at about 98 per cent[52]. Since individuals are then confronted with an individual premium, purchasing supplementary health insurance is expected to be beneficial to a larger share of insured, and therefore adverse selection does not seem to occur, compared to the situation with community-rating.



Graph 6.2 Effect of adverse selection on the premium for supplementary health insurance (SHI) in case insurers increase their premium in anticipation of adverse selection.
***** Within the group of insured for whom purchasing supplementary insurance is not expected to be beneficial, the probability to opt out (resulting from adverse selection) is, respectively, 0.05 and 0.1.

[52] Note that the uptake is not 100 per cent, as might be expected, since, in our simulations, the risk premium insured are willing to pay (i.e., €100 as the default option) is independent of the insured's predicted claims while the loading fee (i.e., 23 per cent of the average claims in a specific year) is dependent upon the average claims.



Graphs 6.3A and 6.3B Effect of premium differentiation on the uptake of supplementary health insurance (SHI) if within the group of insured for whom purchasing supplementary insurance is not expected to be beneficial, the probability to opt out (resulting from adverse selection) is, respectively, 0.05 (graph 6.3A) and 0.1 (graph 6.3B). See table 6.1 for details on the premium risk groups.

6.5 CONCLUSION

The Dutch supplementary health insurance is offered at a free market. Nevertheless, many insurers do still apply community-rating and open enrolment. Theoretically, this should result in adverse selection. Historically, almost all Dutch insured purchased supplementary health insurance. There are, however,

several indications that adverse selection has started to occur on the Dutch supplementary insurance market. This paper studies how adverse selection could affect the premium of supplementary insurance over time and whether premium differentiation would be able to counteract adverse selection. In order to do so, the uptake and premium development of supplementary insurance over time is simulated using data on healthcare expenses and background characteristics from 110,261 insured. For the operationalisation of adverse selection, it is assumed that only insured for whom purchasing supplementary health insurance is expected not to be beneficial will consider to opt out of the supplementary insurance. Firstly, the simulation results show that as adverse selection continues in the same trend, the premium would increase 21 per cent in 25 years, while if adverse selection would be larger, the premium would increase 50 per cent in 25 years. Secondly, the simulations show that if insurers were to increase the premium in anticipation of adverse selection, both the decline in insurance uptake and the increase in premium would become steeper compared to the situation where insurers do not increase their premium. Finally, the simulations show that if insurers were to apply full risk-rating instead of community-rating, the uptake of insurance would stabilise at about 98 per cent. This implies that with highly refined risk-rating of the premium, insurers could potentially be able to counteract adverse selection.

6.6 DISCUSSION

This section discusses the assumptions made for the empirical simulations and it presents some directions for further research related to these assumptions. Furthermore, it provides some policy implications of the results presented in this paper.

6.6.1 Assumptions and further research

Regarding the empirical assumptions, we provide four points for discussion. Firstly, in this paper the insured's decision to purchase supplementary insurance is based upon the predicted financial profitability of supplementary insurance for one year only. However, one could imagine that insured have more information than is reflected in our calculated predicted claims, for instance for planned medical care like maternity care, orthodontics and physiotherapy. In such cases, the information asymmetry between the insured and the insurer is larger compared to the simulations in this paper, and consequently the decline in insurance uptake and the increase in premium might be steeper.

Secondly, the increase in the premium resulting from adverse selection only affects the size of the group for whom purchasing supplementary health insurance is expected not to be beneficial. It does not affect the probability that an insured for whom purchasing supplementary insurance is expected not to be beneficial will opt out. Our simulations therefore provide an underestimation of adverse selection. After all, one could imagine that the further away the premium is from the predicted claims (and the risk premium), the larger the probability that an insured would opt out since the potential financial profit of opting out becomes larger.

Thirdly, in the simulations in this paper insurers do not apply selective underwriting. This paper simulates insurance uptake and the premium in this way since in the Netherlands all insurers have incorporated a guaranteed renewability in each supplementary health insurance (Roos and Schut, 2012). This implies a guaranteed renewal of the supplementary health insurance with an equal adjustment of the premium and insurance conditions for all current insured with that specific supplementary insurance (Van de Ven and Schut, 2011). However, next to premium increases and premium differentiation, another way for insurers to anticipate upon adverse selection concerns selective underwriting. In that case, insurers adjust the accepted risk to the stated premium of a certain insurance policy (Van de Ven and Schut, 2011). This could for instance be done by refusing applicants or by excluding pre-existing medical conditions from coverage for new contracts, but also for their current enrolees. However, if insurers were to apply selective underwriting, they would probably refuse high-risk individuals from purchasing their insurance policy, which decreases adverse selection, implying that only low-risk individuals can purchase supplementary health insurance. As a result, there might be a large decline in insurance uptake due to refused applicants, but thereafter the decline in insurance uptake might be less steep than simulated in this paper due to less adverse selection. Further research concerning the effect of selective underwriting on adverse selection might provide important insights.

Fourthly, we assume that the insured is willing to pay a risk premium of €100 to purchase supplementary health insurance. Although this risk premium is based upon prior research concerning risk aversion in health insurance, we are unable to state with certainty whether this risk premium captures the (Dutch) insured's real level of risk aversion. If insured would for instance be more risk averse – thus willing to pay a larger risk premium – than simulated within this paper, the outflow of insured would, ceteris paribus, be smaller resulting in a slower increase of the premium since there is less adverse selec-

tion[53]. The opposite holds true in case insured would be less risk averse than simulated within this paper. Further research into the degree of risk aversion and its effect on (supplementary) insurance uptake, premium development and subsequently on the emergence of adverse selection is necessary.

6.6.2 Policy implications

Our main conclusion is that adverse selection could result in a substantial increase in premium for supplementary health insurance over time. If insurers would want to anticipate upon this emergence of adverse selection or even counteract adverse selection, they need to move towards equivalence. To do so, they have three options. Firstly, they could start applying premium differentiation instead of community-rating. The results in this paper have shown that a differentiation to gender or age (which is modestly done by a few Dutch insurers) might barely have an effect on the uptake of supplementary insurance. This implies that insurers would have to use (more) refined risk-rating of the premium to be able to counteract adverse selection. In that case, however, supplementary health insurance might become unaffordable for some insured. Secondly, insurers could apply (strong) selective underwriting with which the accepted risk would be much better adjusted to the stated premium than without selective underwriting. As a result, less adverse selection could occur. This however implies that some insured will no longer be accepted for the supplementary health insurance policy they might want to purchase. Thirdly, insurers could change the design of the supplementary health insurance altogether in an attempt to counteract adverse selection. Previous research has shown that the design of the Dutch supplementary health insurance is far from optimal, since it only provides a limited reduction of financial uncertainty and provides access to already affordable healthcare services (Van Winssen et al., 2016). In an attempt to provide a larger welfare gain to insured from purchasing supplementary health insurance, the design of supplementary insurance could be adjusted in a way that it does a) provide protection against unpredictable and large financial losses (e.g., dental care after an accident), b) has first-euro cost-sharing with an individual cap on out-of-pocket expenses (i.e., in order to reduce moral hazard and protect insured from out-of-pocket expenses they cannot afford), and c) provides the option to save for predictable small losses such as dental check-ups (i.e., in order to make sure that insured have enough

[53] Note that if we would want to simulate the effect of risk attitude on the premium development in case of a continuation of adverse selection as observed in the Dutch supplementary health insurance (i.e., on average a one per cent decrease in insurance uptake each year), we would not only need to adjust the risk premium the insured is willing to pay but also need to adjust the probability to opt out of the supplementary health insurance since the probability to opt out depends upon the assumptions regarding the insured's risk attitude.

money available for these healthcare services and are not limited by liquidity constraints). Such a change in the design of the supplementary health insurance would also imply that decisions regarding the basic benefit package might become more important.

The mentioned options insurers have to counteract adverse selection are currently only very limitedly applied by insurers due to a fear of reputation loss. This shows an interesting tension on the Dutch supplementary health insurance market. On the one hand, if insurers would continue offering supplementary health insurance in the way they have done the last decade, supplementary health insurance may eventually no longer be offered due to adverse selection. On the other hand, if insurers would want to anticipate upon adverse selection, they might be compelled to apply highly refined risk-rating and selective underwriting, which might imply that supplementary insurance is no longer available for everyone. The latter strategy is not in conflict with the view of the Dutch government that solidarity in the supplementary health insurance is no goal of the government, despite the fact that the Dutch society does expect solidarity for supplementary insurance (e.g., Consumentenbond, 2014a and 2015; Independer, 2015a; Radar, 2013c and 2015). It is therefore important to realise that, in the long run, solidarity cannot be achieved on a free competitive health insurance market.

Chapter 7

Conclusions and discussion

This chapter summarises the main conclusions of the preceding chapters by answering the research questions as formulated in the introduction including the central research question of this dissertation: *"What are potential explanations for the low demand for voluntary deductibles in basic health insurance and the high demand for supplementary health insurance?"*. It additionally provides some policy implications of this dissertation and some directions for further research.

7.1 THE VOLUNTARY DEDUCTIBLE

Q1. How profitable is a voluntary deductible in health insurance for the consumer?

The results in chapter 2 showed that given the average premium rebate, a voluntary deductible of €500 on top of the mandatory deductible would have been profitable for 48 per cent of the insured in 2014. In practice, only 11 per cent of the insured indeed opted for a voluntary deductible in that year. If the whole population would have opted for a voluntary deductible in 2014, 44 per cent would have ended up with the maximum loss and 41 per cent with the maximum gain. This implies that any positive premium rebate would make a voluntary deductible profitable for the latter group of insured. The bivariate group analyses showed that a) a voluntary deductible is more profitable for males than for women, b) profitability of the voluntary deductible decreases with age, c) a voluntary deductible is more profitable for insured who are not classified in a PCG or DCG than for insured who are and d) a voluntary deductible is more profitable for insured with low past healthcare expenses than for insured with high past healthcare expenses. The multivariate binary logistic regression analysis showed that 26 per cent of the insured has a predicted probability that a voluntary deductible would be profitable between 0.0 and 0.1 with an average financial result of €-239. At the same time, another 26 per cent has a predicted probability larger than 0.8 with an average financial result of €158. Given the result that a voluntary deductible would in retrospect have been profitable for almost one in two insured while only about one in ten per cent of the insured indeed opted for a voluntary deductible, apparently other reasons than financial profitability might play an important role in the decision to opt for a voluntary deductible.

Q2. What would the premium look like when differentiated to either the duration of the contract for which the voluntary deductible holds or the number of previous years insured have opted for a voluntary deductible?

Two strategies could be introduced to reduce adverse selection. Firstly, insurers could differentiate the premium according to the duration of the contract for which the voluntary deductible holds (i.e., the ex-ante approach). Secondly, insurers could differentiate the premium according to the number of previous years insured have opted for a voluntary deductible (i.e., the ex-post approach). It is hypothesised that the longer the period for which the voluntary deductible holds or the more previous years an insured has opted for a voluntary deductible, the lower the premium will be. This would incentivise insured to opt for a voluntary deductible for a longer period or for another consecutive year, resulting in a larger reduction of moral hazard (ceteris paribus). The results in chapter 3 showed that only without risk equalisation insurers would be able to offer a decreasing premium with the duration of the contract or with the number of previous consecutive years insured have opted for a voluntary deductible. With moderate, sophisticated or perfect risk equalisation, the premiums are expected to increase for both the ex-ante and ex-post differentiation. These results are due to the fact that as either the duration of the contract or the number of years insured have opted for a voluntary deductible increases, the insurance claims decrease but the risk equalisation payments increase, which overall increases the premium. Given these results, the feasibility of these strategies to counteract adverse selection in the Dutch health insurance market remains questionable.

Q3. Which determinants could affect deductible uptake in health insurance and which strategies could increase deductible uptake?

Chapter 4 identified six determinants of the decision to opt for a voluntary deductible, next to the financial profitability: loss aversion, risk attitude, ambiguity aversion, debt aversion, omission bias and liquidity constraints. Loss aversion is only expected to make insured forego the voluntary deductible if they evaluate the decision to opt for a voluntary deductible in a one-stage process while excluding the premium. In that case, the pattern of risk attitudes predicts risk averse behaviour. Irrespective of the insured's perspective, ambiguity aversion may arise since the probability distribution of healthcare expenses is largely unknown, which may explain why insured forego deductibles. Debt aversion may explain why insured do not opt for voluntary deductibles, since in case of a deductible healthcare is consumed first and paid after. Omission bias might play a role since individuals are reluctant to take action to change their current plan, which is necessary for the uptake of deductibles. Finally, liquidity con-

straints are expected to influence the decision to opt for a voluntary deductible and increase both loss aversion and risk aversion. From these determinants, five potential strategies to increase the number of insured opting for a voluntary deductible and consequently reduce moral hazard are proposed: 1) present the voluntary deductible as the default option, 2) provide insured with information regarding the voluntary deductible, 3) provide insured with information regarding their healthcare expenses, 4) present the voluntary deductible in the form of a no-claim rebate, and 5) combine the voluntary deductible with a savings account. Chapter 4 proposed implementing the voluntary deductible as the default option and providing insured with information regarding the functioning of the voluntary deductible as the two most promising strategies to increase uptake of voluntary deductibles and to reduce moral hazard.

7.2 THE SUPPLEMENTARY HEALTH INSURANCE

Q4. Why do so many Dutch insured take out non-optimal supplementary health insurance?

Traditional economic theory suggests that optimal insurance design a) protects individuals against unpredictable high financial risks, b) provides access to otherwise unaffordable healthcare services, c) includes first-dollar cost-sharing, and d) incorporates individual caps on out-of-pocket expenses. The Dutch supplementary health insurance seems to be far from this optimal design, since it does not meet any of these requirements (see table 1.1). Nevertheless, many Dutch insured take out this supplementary health insurance. Subsequently, chapter 5 identified seven key aspects from behavioural economics that might potentially explain the high uptake of non-optimal insurance in the Dutch supplementary health insurance market. The chapter poses that in the presence of either loss aversion, ambiguity aversion, liquidity constraints, debt aversion or a combination of these aspects, the welfare gain from purchasing supplementary health insurance would be higher than in the absence of (one of) these aspects. Next to an increase in welfare, an alternative explanation for the high uptake of the Dutch supplementary health insurance presented in chapter 5 might be that insured make suboptimal choices. This could be due to limited knowledge, social comparison and decision avoidance. Firstly, due to limited knowledge about the supplementary insurance, insured might be unaware what they exactly insure against and what the costs for healthcare services are. Secondly, as a result of social comparison, insured might take out supplementary insurance just because their friends and family do so. Thirdly, due to decision avoidance insured might automatically renew their current

supplementary health insurance without critically reviewing whether they indeed want and need this insurance.

Q5. How could adverse selection affect the premium for supplementary insurance over time and would premium differentiation be able to counteract adverse selection?

Although the Dutch supplementary health insurance is offered at a free market, many insurers do still apply community-rating and open enrolment. Theoretically, such circumstances should result in adverse selection. There are several indications that adverse selection has started to occur on the Dutch supplementary insurance market. To counteract adverse selection, insurers are allowed to apply premium differentiation, but due to societal pressure only few insurers modestly do this. Chapter 6 studied how adverse selection could affect the premium of supplementary insurance over time and whether premium differentiation would be able to counteract adverse selection. The simulation results in chapter 6 firstly showed that adverse selection might result in a substantial increase in the premium between 21 and 50 per cent in 25 years. Additionally, chapter 6 showed that if insurers were to increase the premium in anticipation of adverse selection, both the decline in insurance uptake and the increase in premium become steeper than when insurers do not do this. Finally, the simulation results in chapter 6 showed that highly refined risk-rating could counteract adverse selection.

7.3 EXPLANATIONS FOR THE DEMAND FOR HIGH HEALTH INSURANCE COVERAGE

Insurance demand in the Netherlands is among the highest of the world, which also holds for the demand for health insurance. Dutch insured are obliged to purchase basic health insurance but, nevertheless, also voluntarily demand high health insurance coverage. This is for instance shown by the fact that only 12 per cent of the Dutch individuals opted for a reduction of health insurance coverage in the form of a voluntary deductible and at the same time 84 per cent of the Dutch individuals chose an extension of health insurance coverage in the form of supplementary health insurance in 2016. From traditional economics this might be explained by risk aversion. However, since the risk reduction resulting from not opting for a voluntary deductible and from purchasing supplementary health insurance seem to be limited, this dissertation wonders whether other aspects – than risk aversion – might explain the demand for high health insurance coverage. The central research question reads “What are

potential explanations for the low demand for voluntary deductibles in the basic health insurance and the high demand for supplementary health insurance?".

To answer this question, the traditional economic literature and behavioural economic literature have been studied and empirical analyses have been performed using real world data from a large Dutch health insurer containing individual-level information on healthcare expenses and risk characteristics for six years. This dissertation studied financial profitability and several behavioural economic aspects as potential explanations for the demand for high health insurance coverage.

Both chapter 2 and chapter 6 showed that financial profitability, of either the voluntary deductible or the supplementary health insurance, is important in explaining the low demand for voluntary deductibles and the high demand for supplementary health insurance but that it cannot alone explain the demand for high health insurance coverage. The empirical analyses from chapter 2 of this dissertation showed that opting for a voluntary deductible would have been financially beneficial for one in two insured in retrospect while only 12 per cent of the insured indeed opted for a voluntary deductible. Furthermore, regarding the supplementary health insurance, research has shown that only 70 per cent of the insured with supplementary insurance in 2013 actually filed bills to their insurer for reimbursement.

Next to the financial profitability, eight key aspects stemming from the behavioural economic literature, are identified that could explain the low demand for voluntary deductibles and the high demand for supplementary insurance: i.e., loss aversion, risk attitude, ambiguity aversion, debt aversion, decision avoidance, limited knowledge, liquidity constraints and social comparison (as shown in chapters 4 and 5). Firstly, loss aversion implies that individuals dislike incurring losses and experience that "losses loom larger than gains". By purchasing high health insurance coverage, individuals could prevent the negative feelings associated with loss aversion. This makes loss aversion a potential explanation for the demand for high health insurance coverage.

Secondly, as stated in the cumulative prospect theory, individuals' risk attitude could be represented in a fourfold pattern depending upon whether the prospect under question regards a loss or a gain and whether it regards an issue with a high or low probability. This pattern states that individuals are risk-averse for losses with small probabilities, such as the healthcare expenses that occur as a result of consuming healthcare services for which health insurance provides protection. Risk aversion therefore might, as known from traditional economics as well, potentially explain why individuals demand high health insurance coverage.

Thirdly, ambiguity aversion captures individuals' preference for prospects with known probabilities over prospects with unknown probabilities. Healthcare consumption and the amount of healthcare expenses strongly vary among individuals and are to a large extent uncertain. Therefore, if individuals were not to insure (or demand little health insurance coverage), they are confronted with this uncertainty regarding (the amount of) healthcare expenses to be paid. On the other hand, if individuals purchase insurance, they know for certain they have to pay the premium and that healthcare expenses will be reimbursed. Therefore, ambiguity aversion might be another potential explanation for the demand for high health insurance coverage.

Fourthly, debt aversion implies that individuals have a preference to prepay for consumption and to get paid for work after completion. This implies that individuals dislike paying for healthcare after consumption and prefer flat-rate pricing schemes. Consequently, debt aversion could potentially explain why individuals demand high health insurance coverage. After all, with high health insurance coverage individuals do not have to pay for healthcare consumption afterwards and pay a flat-rate (i.e., the premium).

Fifthly, decision avoidance regards the tendency that individuals avoid making a choice by postponing it or by seeking an easy way out that involves no action or no change. Omission bias is one of the underlying factors of decision avoidance and implies that individuals are reluctant to take action to change their current state. For the demand for health insurance coverage, decision avoidance (and omission bias as an underlying factor) implies that as long as individuals have demanded high insurance coverage in the past, they will most probably do so in the future, simply because they do not want to make any new choices and therefore renew their current health insurance policy with the corresponding high insurance coverage.

Sixthly, as a result of limited knowledge regarding health insurance coverage, individuals might be unaware what they actually buy insurance for. They might for instance be unaware of the limited value of purchasing health insurance in terms of risk reduction, since supplementary health insurance mostly provides access to already affordable healthcare services and since coverage limits are applied. Regarding the voluntary deductible, individuals might simply be unaware how the voluntary deductible works, how it relates to other cost-sharing arrangements and which healthcare services are excluded from the deductible. Consequently, individuals' limited knowledge might potentially explain why they demand high health insurance coverage.

Seventhly, individuals might not have enough financial resources to free up a substantial amount of money to pay for healthcare services that fall below the voluntary deductible or that could be covered by supplementary health

insurance. This indicates that another potential explanation for the demand for high health insurance coverage might be found in liquidity constraints and that individuals prefer to not have a voluntary deductible and to purchase supplementary insurance to avoid the problem of not being able to pay the healthcare bill.

Finally, social comparison might potentially explain why individuals demand high healthcare coverage. After all, if all their friends and family do not opt for a voluntary deductible and purchase supplementary insurance, then maybe so should they.

In sum, this dissertation showed that next to risk aversion, as stated by traditional economics, several other explanations, mostly stemming from behavioural economics, could potentially be found for the low demand for voluntary deductibles in the basic health insurance and the high demand for supplementary health insurance. If these other determinants indeed affect the demand for high health insurance coverage, two relevant subsequent questions might be: 1) How could these insights affect the design of health insurance and 2) How to best facilitate the individual's decision-making process regarding health insurance coverage? The next section, therefore, elaborates on the policy implications of this dissertation with respect to the design of the voluntary deductible, the design of the supplementary health insurance and the individual's decision-making process.

7.4 POLICY IMPLICATIONS

7.4.1 The design of the voluntary deductible

This dissertation has indicated several behavioural economic aspects that might, next to financial profitability, explain the low uptake of voluntary deductibles in the Dutch basic health insurance. Remember that voluntary deductibles are introduced to insured, not only in the Netherlands but also in Germany, Switzerland and the US, to reduce moral hazard. However, if few insured actually opt for a voluntary deductible, such as is the case in the Netherlands, the moral hazard reduction might be limited. The results from this dissertation regarding the determinants that potentially affect the decision to opt for a voluntary deductible lead to two promising strategies to change the design of the voluntary deductible. With these redesigns of the voluntary deductible the number of insured opting for a voluntary deductible could potentially be increased which consequently could, ceteris paribus, lead to a larger reduction in moral hazard.

Firstly, as presented in chapter 4, the voluntary deductible could be presented as the default option. This implies that, when individuals buy insurance, the policy includes by default a voluntary deductible for the associated premium (i.e., with the premium rebate already deducted from the premium). Such a policy would not be mandatory because individuals would be able to commute the voluntary deductible for an increase in premium. This strategy intends to shift the individual's reference point when deciding how much health insurance coverage to purchase from 'not opting for a voluntary deductible' to 'opting for a voluntary deductible'. According to the literature, this design could increase the number of insured opting for a voluntary deductible (Johnson et al., 1993; Krieger and Felder, 2013; Moshinsky and Bar-Hillel, 2010; Thaler and Benartzi, 2004; Thaler and Sunstein, 2009), since it potentially diminishes the effect of loss aversion, it potentially encourages risk seeking behaviour and it uses omission bias to potentially make individuals retain the voluntary deductible. Firstly, this redesign of the voluntary deductible might diminish the effect of loss aversion, since, seen from the new reference point, the decision to opt for a voluntary deductible could be considered a pure loss prospect (i.e., the deductible can be commuted for an increase in premium). In case of pure loss prospects, loss aversion is absent (Wakker, 2010) and therefore does not affect the decision to opt for a voluntary deductible if a voluntary deductible is the default option. Secondly, with such a redesign of the voluntary deductible that implies a shift in reference point, risk seeking behaviour might be expected since commuting the voluntary deductible implies a certain loss. Thirdly, this redesign might make more individuals inclined to retain the voluntary deductible due to omission bias. After all, if having a voluntary deductible is set as the default option, it might be expected that more insured would opt for a voluntary deductible than under an opt-in design. Redesigning the voluntary deductible to the default option could therefore be considered a strong nudge. Additionally, the nudging power of this default option could be reinforced if the option comes with some implicit or explicit suggestion that it represent the norm (related to norm-theory and social comparison) or the recommended course of action (Thaler and Sunstein, 2009).

Secondly, the voluntary deductible could be presented in the form of a no-claim rebate. In that case, the individual pays a premium for the health insurance policy and receives a fixed amount of money at the end of the contract period if no healthcare expenses are claimed (i.e., the no-claim rebate). If healthcare expenses are, however, claimed, the individual receives no rebate. In other words, compared to a situation with a 'normal' deductible, individuals pay the full premium (i.e., the premium they would have paid if they had not opted for a voluntary deductible) and receive a no-claim rebate equal to the amount of the

original voluntary deductible if no healthcare expenses are claimed. Compared to the current design of the voluntary deductible, the potential loss (i.e., the premium increase) and gain (i.e., the no-claim rebate minus the premium increase) are essentially unchanged, but explicitly integrated. With this redesign of the voluntary deductible, both the effect of loss aversion and debt aversion on the decision to opt for a voluntary deductible could be affected, which could result in more individuals opting for a voluntary deductible. The increased effect of loss aversion that results from the premium increase is expected to be small due to marginal sensitivity. The effect of debt aversion on the decision to opt for a voluntary deductible could be diminished in this redesign since the individual is not in debt with the insurer, but the insurer is potentially in debt with the individual. Additionally, the effect of debt aversion may be reduced in the redesign since the individual pays for healthcare expenses ex-ante instead of ex-post. Note, however, that the individual moral hazard reduction might be different between the current design of the voluntary deductible and a no-claim rebate and that further research in this respect would be necessary.

A final remark regarding the redesign of the voluntary deductible is that it would be important to keep in mind that the voluntary deductible amount should not become a barrier to seek healthcare. This is an important aspect to take into consideration, since we already observe many payment arrangements for the mandatory deductible alone in the Netherlands (AD, 2016). When presenting strategies to increase the number of insured opting for a voluntary deductible (see chapter 4), this dissertation already provided a potential solution for this: the possibility to save for healthcare expenses that fall below the voluntary deductible. Such Health Savings Accounts are increasingly popular in the USA, Singapore, South Africa and China (Hurley and Guindon, 2008). In the USA, the savings accounts are combined with high deductible health plans, which is similar to what is proposed here. Individuals could for instance put the received premium rebate on this savings account in order to pay for healthcare services that fall below the deductible. The effect of liquidity constraints on the decision to opt for a voluntary deductible and as a problem for paying the deductible or seeking healthcare could be reduced since an earmarked savings account could serve as a consumption commitment specifically for the out-of-pocket expenses due to the voluntary deductible.

7.4.2 The design of the supplementary health insurance

Next to explanations for why few individuals voluntarily choose to lower their health insurance coverage, this dissertation also provides explanations for why many individuals voluntarily choose to increase their health insurance coverage by purchasing supplementary health insurance. Traditionally, health

insurance design implies a trade-off between the gains from risk pooling and the losses from moral hazard. In this respect, the literature shows that full insurance is far from optimal and that a mix of coverage and cost-sharing is preferred. The design of the Dutch supplementary health insurance deviates from the optimal insurance design as proposed by traditional economics. Firstly, the Dutch supplementary insurance covers healthcare services that do not involve large losses and it applies coverage limits. Consequently, the risk reduction resulting from the supplementary health insurance seems to be very limited. Secondly, the Dutch supplementary insurance provides access to already affordable healthcare services such as dental check-ups, where, from a theoretical point of view, one would expect that insurance provides access to otherwise unaffordable healthcare services. This suggests that the individual's welfare gain from purchasing supplementary insurance may be limited. Additionally, moral hazard, the loading fee and the transaction costs of the supplementary insurance are substantial, suggesting that for many individuals the welfare loss from the Dutch supplementary health insurance might be large. If the current design of the Dutch supplementary health insurance is indeed not optimal, what should an optimal design of supplementary insurance look like?

Taken the results from chapter 5 into account, an alternative design of the supplementary health insurance would: 1) provide protection against unpredictable and large financial losses (e.g., dental care after an accident), 2) have first-euro cost-sharing with an individual cap on out-of-pocket expenses, and 3) provide the option to save for predictable small losses. Such a design of the supplementary health insurance might provide a larger welfare gain to individuals when purchasing it than the current supplementary health insurance. After all, this design is much closer to the most important value of health insurance, namely that insurance should provide protection against events with low probabilities and high corresponding costs. With this design of the supplementary insurance, individuals are covered for unexpected large potential losses that are not already covered by basic insurance instead of covered for healthcare expenses that might be predictable and relatively small, such as dental check-ups. This could also affect the effect of ambiguity aversion since with this new design, individuals do know what they are insured against and know that all unexpected large losses are reimbursed. By additionally implementing first-euro cost-sharing, individuals might be more incentivised to contain their healthcare spending, which could potentially counteract moral hazard. The individual cap on out-of-pocket expenses moreover protects individuals from bills they cannot pay and makes sure that not too high expenses need to be paid in order to receive healthcare. Furthermore, implementing a savings option provides individuals with the possibility to save for expenses

that are predictable and small instead of insuring against these expenses, as is the case with the current design. The savings option could affect the effect of debt aversion since the savings account could serve as a prepayment vehicle that diminishes the attenuation of the payment on the pleasure of consumption. It might also affect the effect of liquidity constraints since an earmarked savings account could serve as a consumption commitment specifically for healthcare services that are predictable and have low healthcare costs that are not covered by insurance or subject to cost-sharing. The savings option could finally also affect the effect of loss aversion since in that case loss aversion might no longer be present because individuals only lose the savings in return for consumed healthcare services while they otherwise keep their savings or could transfer it to next year's expenses.

7.4.3 Facilitating the individual's decision-making process

Next to the redesign of the voluntary deductible and the supplementary health insurance in order to affect the demand for health insurance coverage, this dissertation shows that the demand for health insurance coverage could also be affected by facilitating the individual's decision-making process. If individuals indeed make suboptimal choices regarding health insurance coverage due to several behavioural economic aspects, facilitating their decision-making process might help them to make more optimal choices. This dissertation leads to several recommendations regarding the facilitation of the individual's decision-making process.

Firstly, individuals could be provided with understandable and transparent information regarding the design of health insurance, or in the context of this dissertation, regarding the voluntary deductible and supplementary health insurance. With respect to the voluntary deductible, information could for instance explain the functioning of the voluntary deductible (i.e., that the possibility to opt for a voluntary deductible in return for a premium rebate exists and that some healthcare expenses, such as the GP and maternity care, are excluded from the deductible), and the relation between the voluntary deductible and other cost-sharing arrangements. With respect to the supplementary health insurance, information could for instance explain the functioning of the supplementary health insurance and the coverage – both in type of healthcare services covered and the amount of coverage – it provides. Providing such information to individuals might increase their knowledge regarding health insurance and might make them more equipped and more empowered to make decisions concerning the amount of health insurance coverage that best fits their needs.

Secondly, individuals could be provided with information on group and individual usages of healthcare services covered by the voluntary deductible and the supplementary insurance. In that case, information could be provided on how often individuals consume certain healthcare services and the healthcare expenses associated with this consumption. This could be done on the individual-level based upon insurer information from prior years, but also on the group-level based upon background characteristics such as age, gender and chronic illness. With this strategy, individuals might get a better understanding of their necessity of demanding high health insurance coverage than when this information is lacking.

Thirdly, health insurance policies could be standardised. This might be similar to the standardisation of the set of benefits in Medigap in the USA. Since 1992, American insurers may only offer one out of ten standardised polices. This has shown to make individuals more equipped to make informed choices (Rice et al., 1997). Especially regarding the decision to purchase supplementary health insurance, which is currently characterised by many choice options by many different labels of health insurers, this could simplify the individual's decision-making process.

7.5 DIRECTIONS FOR FURTHER RESEARCH

This dissertation has indicated several behavioural economic aspects that might, next to financial profitability, explain the low demand of voluntary deductibles in the Dutch basic health insurance and the high demand for supplementary health insurance. Further research is necessary to provide more insights into the effects of these determinants on the demand for health insurance coverage and the implications for health insurance design and the facilitation of the individual's decision-making process. This section provides several directions for further research. Firstly, this dissertation has greatly benefited from combining traditional economics with behavioural economics. After all, not everything can be explained from a traditional economic point of view and not everything can be explained from a behavioural economic point of view. The value of this dissertation mostly lies in the combination of the two in studying potential explanations for the demand for high health insurance coverage. Therefore, this dissertation emphasises the importance of continuing combining the insights from both economic fields in further research concerning the demand for health insurance coverage.

Secondly, an important direction for further research would be the quantification of the effect of the indicated behavioural economics explanations for

the demand for high health insurance coverage. This dissertation has provided eight key aspects stemming from behavioural economics that could potentially explain why individuals demand high health insurance coverage. However, further research would be necessary to show whether, how and to what extent these aspects indeed affect the demand for health insurance coverage.

Thirdly, nudging is considered to be a powerful tool in influencing individuals' behaviour in a predictable way. The idea behind nudging is to move individuals in directions that will make their lives better without forcing them (Thaler and Sunstein, 2009). Any aspect of the choice architecture that alters individuals' behaviour in a predictable way without forbidding any options or significantly changing their economic incentives is considered a nudge. Nudges are not considered to be mandates and should be easy and cheap to avoid. Nudges (e.g., presenting the voluntary deductible as the default option) are also in this dissertation mentioned as tools to affect individuals' choice behaviour when it comes to the demand for health insurance coverage. Further research regarding the potential of nudges in health insurance to affect behaviour and regarding its effect on choice in health insurance would be of great importance to further increase both the individual and societal welfare gain from health insurance.

Fourthly, from the behavioural economic aspects that have been indicated to potentially explain the demand for high health insurance coverage, a first recommendation presented within this dissertation regards the potential redesign of the voluntary deductible and the supplementary health insurance. An important step within this redesign could be to perform a discrete choice experiment with respect to the design of health insurance in general. Such an experiment could study which design aspects of health insurance individuals find most important and could consequently lead to important insights with respect to an optimal design of health insurance.

Fifthly, related to the redesign of health insurance, it would be important to study the effects of a different design of health insurance on moral hazard. Especially when redesigning the voluntary deductible, which is implemented in order to reduce moral hazard, it would be important to first study in what way a different design (e.g., a default option or a no-claim rebate) affects moral hazard. In such studies, both the individual reduction in moral hazard (i.e., for the individual insured) and the total moral hazard reduction (i.e., the reduction of all individuals taken together) should be taken into account. After all, some strategies might lower the individual reduction of moral hazard, but could increase the number of insured opting for a voluntary deductible, which may lead to a higher total reduction of moral hazard than before the redesign.

Sixthly, a better facilitation of the individual's decision-making process regarding health insurance coverage was presented as a second recommendation within this dissertation. Wakker et al. (2007), however, showed that providing individuals with information regarding healthcare consumption actually increased adverse selection. Therefore, additional research in this direction would be necessary to provide insights into the effect of providing information – both on the design and functioning of insurance as on healthcare consumption – on the individual's decision concerning health insurance coverage. This could for instance be done by a small experiment where individuals are first asked to state their preferred amount of health insurance coverage, after which they are provided with information concerning the design of health insurance, the functioning of health insurance or the consumption of healthcare. Subsequently, individuals might again be asked about their preferred amount of health insurance coverage.

Appendices

APPENDIX 1. CHARACTERISTICS OF THE ACHMEA HEALTH DATABASE

Table A1 Characteristics of the Achmea Health Database

	2011
N	808,189
% male	45.9
% non-native[a]	18.6
% in a PCG	28.9
% in a DCG	4.7
% adults with a voluntary deductible	0.90
Average total healthcare expenses under basic insurance (€)	2,890
Average age	50.9

[a] Non-native indicates Turkish, Moroccan and Surinamese descent.

APPENDIX 2. RESULTS OF THE MULTIVARIATE BINARY LOGISTIC REGRESSION ANALYSIS.

Table A2 Results of the multivariate binary logistic regression on whether a voluntary deductible of €500 on top of a mandatory deductible of €360 would be profitable given the average premium rebate of €240 (0 = not profitable, 1 = profitable) in the Dutch basic health insurance in 2014. Presented are odds ratios and p-values in parentheses.

Variable			Binary logistic regression	
Intercept			0.180	(0.000)
Gender – age classes (reference is male 18-24)	Male	25-29	0.883	(0.000)
		30-34	0.843	(0.000)
		35-39	0.817	(0.000)
		40-44	0.764	(0.000)
		45-49	0.732	(0.000)
		50-54	0.677	(0.000)
		55-59	0.642	(0.000)
		60-64	0.632	(0.000)
		65-69	0.573	(0.000)
		70-74	0.513	(0.000)
		75-79	0.456	(0.000)
		80-84	0.422	(0.000)
		84+	0.378	(0.000)
	Female	18-24	0.599	(0.000)
		25-29	0.494	(0.000)
		30-34	0.528	(0.000)
		35-39	0.591	(0.000)
		40-44	0.633	(0.000)
		45-49	0.585	(0.000)
		50-54	0.556	(0.000)
		55-59	0.577	(0.000)
		60-64	0.560	(0.000)
		65-69	0.528	(0.000)
		70-74	0.481	(0.000)
		75-79	0.442	(0.000)
		80-84	0.433	(0.000)
		84+	0.443	(0.000)
PCG (reference is not classified in PCG)			0.347	(0.000)
DCG (reference is not classified in DCG)			0.000	(0.912)
Ethnicity (reference is non-native)			1.153	(0.000)

Table A2 (continued)

Variable			Binary logistic regression	
Urbanisation (reference is very poorly urbanised region)	Very highly urbanised region		0.862	(0.000)
	Highly urbanised region		0.872	(0.000)
	Moderately urbanised region		0.913	(0.000)
	Poorly urbanised region		0.953	(0.003)
Profitability in previous years	Profitable in	2006	1.594	(0.000)
		2007	1.651	(0.000)
		2008	1.923	(0.000)
		2009	2.282	(0.000)
		2010	4.216	(0.000)
	Profitable in x previous years	$x = 1$	2.055	(0.000)
		$x = 2$	1.779	(0.000)
		$x = 3$	1.430	(0.000)
		$x = 4$	1.134	(0.000)
Nagelkerke R^2			0.533	
N			807,366	

APPENDIX 3. SEVERAL MODELS TO ESTIMATE THE PREDICTED HEALTHCARE EXPENSES AND ACCORDINGLY RANK INSURED

Several models are tested to determine the predicted healthcare expenses of individuals in year *t* based upon their background characteristics.

1. Ordinary least squares
2. Ordinary least squares with a log transformation of healthcare expenses
3. Generalised linear model with a gamma distribution and a log link
4. Generalised linear model with a gamma distribution and a power -1 link
5. Generalised linear model with a gamma distribution and a power 0.5 link
6. Generalised linear model with a normal distribution and a log link.

Table A3 shows the Spearman correlation coefficients of the predicted healthcare expenses with the actual healthcare expenses in year *t* for all models. Table A3 shows these correlation coefficients for both the entire dataset and a subset of the sample. This subset regards the half of insured with the lowest actual healthcare expenses in year *t*. We also determined the correlation coefficient for this subset to see whether our preferred model would also perform well for the healthiest insured since these would be the insured we would select to opt for a voluntary deductible. Since the second model, the OLS with a log transformation of healthcare expenses, has the highest correlation coefficient on both the entire dataset and the subset of the sample, this model is used to determine the predicted healthcare expenses of all insured in year *t* and rank insured accordingly.

Table A3 Spearman correlation coefficient of the predicted healthcare expenses according to the different models with the actual healthcare expenses in year *t* for the entire dataset and for the half of insured with the lowest actual healthcare expenses.

		Entire dataset	Subset of sample
0	Actual healthcare expenses in year *t*	1.0000	1.0000
1	OLS	0.6857	0.3814
2	OLS with log transformation of THCE[a]	0.7384	0.5192
3	GLM with gamma distribution and log link	0.7327	0.5021
4	GLM with gamma distribution and power -1 link	0.5928	0.4730
5	GLM with gamma distribution and power 0.5 link	0.7326	0.5010
6	GLM with normal distribution and log link	0.6947	0.4356

[a] THCE = total healthcare expenses under basic insurance

APPENDIX 4. INDEPENDENT VARIABLES INCLUDED IN STATISTICAL MODEL

Table A4 provides a description of the independent variables that are included in the model. The six models mentioned in appendix 3 were also tested with the same independent variables as mentioned in Table A4 but with the past total healthcare expenses in year t-*1* included as a continuous variable (instead of included as dummy variables for the vigintiles). However, with this operationalisation of the past total healthcare expenses, the correlation coefficients were much lower (e.g., the correlation coefficient for the second model was 0.6480).

Table A4 Description of the independent variables of the model to determine the expected healthcare expenses in year *t*.

Independent variables	Description	Number of variables in the model
Age / gender	28 classes (i.e., 14 classes for males and 14 classes for females) with age in 5-year classes starting from 18-24 years up to an age of 84. Insured older than 84 years are also included in a separate risk class.	27[a]
PCG	1 class to indicate whether an insured is classified into a PCG in year *t*. Individuals are assigned to a PCG when they used at least 180 daily dosages of a specific drug in year *t*-1.	1
DCG	1 class to indicate whether an insured is classified into a DCG in year *t*. Individuals are assigned to a DCG when they had a hospital admission in year t-1 for a specific diagnosis.	1
Urbanisation	5 classes to indicate the degree of urbanisation in the insured residential area based upon a four digit zip code	4[a]
Ethnicity	1 class to indicate whether the insured is native or non-native. Non-native insured include insured with a Turkish, Moroccan and Surinamese descent.	1
Past healthcare expenses	20 classes that indicate the vigintile of total healthcare expenses under basic insurance the insured incurred in year *t*-1.	19[a]

[a] The number of variables included in the model is for some independent variables one less than the number of defined classes, because one variable for each independent variable is a reference group for all included dummy variables per independent variable.

APPENDIX 5. SENSITIVITY CHECK ON THE RANK OF INSURED FOR THE EX-ANTE DIFFERENTIATION

See Tables A5 and A6.

Table A5 Composition of the premium according to the ex-ante differentiation for a voluntary deductible of €1,000 where the rank of insured is determined using only the information known at the beginning of year *t* without any risk equalisation.

%		$\overline{HCE}$	$\overline{IC}$[a]	$\overline{MHR}$	$\overline{OOP}$	**P**[a]
50	**NVD**		€3,289			€3,289
50	**VD**		€128	€113	€257	€128
10	**VD 1-year contract**		€232	€187	€406	€232
10	**VD 2-year contract**	€1,894	€162	€139	€314	€162
10	**VD 3-year contract**		€114	€103	€238	€114
10	**VD 4-year contract**		€79	€77	€185	€79
10	**VD 5-year contract**		€53	€57	€143	€53

[a] Note that since a situation without risk equalisation is shown, no risk equalisation payment is in place and the insurance claims equal the premium.

$\overline{HCE}$ = average healthcare expenses
$\overline{IC}$ = average insurance claims
$\overline{MHR}$ = average moral hazard reduction
$\overline{OOP}$ = average out-of-pocket expenses
P = premium
NVD = insured without a voluntary deductible
VD = insured with a voluntary deductible

Table A6 Composition of the premium according to the ex-ante differentiation for a voluntary deductible of €1,000 where the rank of insured is determined using only the information known at the beginning of year *t* with perfect risk equalisation.

%		$\overline{IC}$[a]	$\overline{REP}$	**P**[a]
50	**NVD**	€3,289	€-1,395	€1,894
50	**VD**	€128	€1,396	€1,524
10	**VD 1-year contract**	€573	€1,069	€1,301
10	**VD 2-year contract**	€35	€1,279	€1,441
10	**VD 3-year contract**	€19	€1,439	€1,553
10	**VD 4-year contract**	€12	€1,553	€1,632
10	**VD 5-year contract**	€1	€1,641	€1,694

$\overline{IC}$ = average insurance claims
$\overline{REP}$ = risk equalisation payment, determined according to equation (2a) or (2b) given the $\overline{MHR}$ and $\overline{OOP}$ shown in table A5
P = premium
NVD = insured without a voluntary deductible
VD = insured with a voluntary deductible

APPENDIX 6. COMPARING THE DUTCH POPULATION AND THE SAMPLE IN 2011.

Table A7 Comparing characteristics between the Dutch population and the insured within the data. For comparison reasons, children are included into this analysis.

	2011	
	The Netherlands	**Data**
PCG (yes)	21.4%	26.5%
DCG (yes)	8.7%	4.8%
0-18 years[a]	23.5%	16.2%
19-40 years	25.0%	20.5%
41-65 years	35.9%	37.5%
66 years and older	15.6%	25.8%
N	16,655,799	140,557

[a] The numbers regarding the Dutch population regard insured between the age of 0 and 20.

APPENDIX 7. DIFFERENT MODELS TO ESTIMATE HEALTHCARE EXPENSES UNDER SUPPLEMENTARY HEALTH INSURANCE.

Several models are tested to determine the predicted healthcare expenses for supplementary health insurance of individuals in year *t* based upon their background characteristics.

1. Ordinary Least Squares
2. Generalized Linear Model with a gamma distribution and a log link
3. Generalized Linear Model with a normal distribution and a log link.
4. Generalized Linear Model with a poisson distribution and a log link.

Table A8 shows different summary statistics of all models. Since the differences regarding these statistics among the different models are minimal, we apply the most commonly recommended and used Generalized Linear Model with a gamma distribution and a log link to determine the predicted claims for supplementary health insurance for each individual for each year.

Table A8 Summary statistics of the different models tested to estimate the predicted claims for supplementary health insurance for individuals in year *t*-1.

		Mean expenses	Minimum expenses	Maximum expenses	Average expenses			R^2	Mean Absolute Prediction Error
					1st tertile	2nd tertile	3rd tertile		
0	Actual healthcare expenses in year *t*-1	221.04	0	21,010.59	0	100.12	566.37		
1	OLS	221.04	-25.13[a]	754.97	89.95	182.83	390.36	0.1874	199.06
2	GLM with gamma distribution and log link	222.68	36.57	1,235.62	92.72	175.74	399.62	0.2078	199.89
3	GLM with normal distribution and log link	221.11	49.29	1,023.97	97.10	176.53	389.76	0.1912	199.44
4	GLM with poisson distribution and log link	221.04	46.47	985.46	95.68	176.14	391.36	0.1927	199.27

[a] Only 36 insured had negative predicted claims, which makes up for 0.033 per cent of the data.

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Summary

HIGH HEALTH INSURANCE COVERAGE

The Netherlands belong to the countries with the highest insurance density in the world. This does not only hold for insurance in general, but also for health insurance specifically. This is shown by the fact that 84 per cent of the Dutch insured opted for an extension of health insurance coverage in the form of a supplementary insurance, while, at the same time, only 12 per cent of the Dutch insured opted for a reduction of health insurance coverage in the form of a voluntary deductible in 2016. From the traditional economic literature, this might be explained by risk aversion. Risk averse individuals will want to protect themselves from the possibility of having to need a substantial amount of money to purchase the necessary healthcare treatments. This dissertation questions whether risk aversion alone can explain the demand for high health insurance coverage as expressed by the low demand for voluntary deductibles and the high demand for supplementary health insurance. After all, the value in terms of reduction of uncertainty regarding financial losses is limited in those cases. For instance, Dutch individuals can opt for the highest voluntary deductible of €500 and get a premium rebate of €300 in return, which implies that little financial risk (i.e., €200) is left. This implies that Dutch insured are willing to pay €300 in order to commute a deductible of €500. Furthermore, Dutch insured are for instance willing to purchase supplementary health insurance covering dental expenses up to a maximum of €250 per individual per year for an annual premium of €180 per individual. Additionally, the Dutch supplementary insurance mostly provides access to already affordable healthcare services such as dental check-ups and regular consultations with the physiotherapist. These examples illustrate that other aspects than risk aversion are likely to affect the demand for health insurance coverage as well.

The goal of this dissertation, therefore, is to identify potential explanations for the low demand for voluntary deductibles in basic health insurance and the high demand for supplementary health insurance. In order to do so, the traditional economic literature and the behavioural economic literature are studied. Furthermore, several empirical analyses and simulations are performed using real world data from a large Dutch health insurer containing individual-level information on healthcare expenses and risk characteristics for six years. The insights provided within this dissertation regarding which aspects potentially drive the demand for health insurance coverage could be used to optimise the design of health insurance – and more specifically the design of voluntary deductibles and the supplementary health insurance – and to better facilitate the individual's decision-making process concerning the demand for health insurance coverage.

THE VOLUNTARY DEDUCTIBLE IN THE BASIC HEALTH INSURANCE

Chapter 2 studies the financial profitability of opting for a voluntary deductible as a potential explanation for the low uptake of voluntary deductibles. The results of the empirical analyses in chapter 2 showed that given the average premium rebate, a voluntary deductible of €500 on top of the mandatory deductible of €360 would have been profitable for 48 per cent of the insured in 2014 in retrospect. If the whole population would have opted for the highest voluntary deductible in 2014, 44 per cent would have ended up with the maximum loss (i.e., €-260) and 41 per cent with the maximum gain (i.e., €240). The bivariate group analyses showed that a voluntary deductible is more profitable for males than for females, more profitable for insured who are not chronically ill than for insured who are and more profitable for insured with low past healthcare expenses than for insured with high past healthcare expenses. Additionally, the analyses showed that profitability of the voluntary deductible decreases with age. Based upon these results, chapter 2 concludes that apparently other reasons than financial profitability might play an important role in the decision to opt for a voluntary deductible.

Voluntary deductibles are offered to insured in the Netherlands and several other countries, such as Germany, Switzerland and the US, to counteract moral hazard. Moral hazard refers to the change in health behaviour and consumption caused by the fact that the health insurer reimburses the costs. Given the fact that only 12 per cent of the Dutch insured opted for a voluntary deductible, it is expected that the moral hazard reduction resulting from this deductible is quite limited. Economic theory predicts that rational consumer behaviour causes individuals to opt for a voluntary deductible only if their expected expenses under the deductible fall (far) below the premium rebate. This phenomenon is referred to as adverse selection and implies that low-risk individuals (such as young and healthy individuals) are more inclined to opt for a voluntary deductible than high-risk individuals (such as old and unhealthy individuals). This kind of behaviour would also imply that individuals do not opt for a voluntary deductible in a (incidental) year they expect (high) healthcare expenses. To reduce this adverse selection, insurers could apply premium differentiation to either the duration of the contract for which the voluntary deductible holds (i.e., the ex-ante differentiation) or the number of previous years insured have opted for a voluntary deductible (i.e., the ex-post differentiation). It is hypothesised that the longer the period for which the voluntary deductible holds or the more previous years insured have opted for a voluntary deductible, the lower the premium can be. This could incentivise

insured to opt for a voluntary deductible for a longer period or more consecutive years. Consequently, this could imply a larger reduction in moral hazard since insured then also opt for a voluntary deductible in (incidental) years they expect (high) healthcare expenses. *Chapter 3* studies what the premiums look like when differentiated to either the duration of the contract for which the voluntary deductible holds or the number of previous years insured have opted for a voluntary deductible. The results in chapter 3 show that only without risk equalisation[54] insurers would be able to offer a decreasing premium with the duration of the contract or with the number of previous consecutive years insured have opted for a voluntary deductible. With moderate, sophisticated or perfect risk equalisation, the premiums are expected to increase for both the ex-ante and ex-post differentiation. These results are due to the fact that as either the duration of the contract or the number of years insured have opted for a voluntary deductible increases, the insurance claims decrease but the risk equalisation payments increase, which overall increases the premium. Given these results, the feasibility of these strategies to counteract adverse selection in the Dutch health insurance market remains questionable.

The results in chapter 2 already showed that, in retrospect, a voluntary deductible would have been financially profitable for about one in two insured, while only 12 per cent of the insured in 2016 actually opted for a voluntary deductible. Therefore, *chapter 4* identifies six potential other determinants that affect the decision to opt for a voluntary deductible from the behavioural economic field: 1) loss aversion, 2) risk attitude, 3) ambiguity aversion, 4) debt aversion, 5) omission bias and 6) liquidity constraints. Firstly, loss aversion could make insured forego the voluntary deductible because they dislike the feeling of potentially losing the deductible amount. Secondly, insured are expected to behave risk averse with respect to the decision to opt for a voluntary deductible and might therefore not opt for a voluntary deductible. Thirdly, since the probability distribution of healthcare expenses is to a large extend unknown to individuals, ambiguity aversion[55] might arise, which may explain why insured forego deductibles. Fourthly, debt aversion may explain why insured do not opt for voluntary deductibles, since in case of a deductible healthcare is consumed first and paid after. Fifthly, omission bias might play a role since individuals

[54] Risk equalisation prospectively compensates insurers for predictable differences in expenses between insured.

[55] Ambiguity aversion regards individuals' preference for prospect with known probabilities over prospect with unknown probabilities. Ellsberg first showed this in a hypothetical experiment in 1961, where individuals were confronted with two urns. The first urn contained exactly 100 red and black balls, but in an unknown ratio, while the second urn contained exactly 50 red and 50 black balls. The majority of the respondents preferred to bet on either red or black in urn two rather than in urn one, indicating ambiguity aversion.

are reluctant to take action to change their current plan, which is necessary for the uptake of deductibles. Finally, liquidity constraints are expected to make insured forego the voluntary deductible since potentially a substantial amount of money needs to be paid out-of-pocket. From these determinants, five potential strategies to increase the number of insured opting for a voluntary deductible and consequently reduce moral hazard are proposed: 1) present the voluntary deductible as the default option, 2) provide insured with information regarding the voluntary deductible, 3) provide insured with information regarding their healthcare expenses, 4) present the voluntary deductible in the form of a no-claim rebate, and 5) combine the voluntary deductible with a savings account.

THE SUPPLEMENTARY HEALTH INSURANCE

The design of health insurance involves a trade-off between the gains from risk pooling and the losses from moral hazard, the loading fee and the transaction costs. Traditional economic theory suggests that optimal insurance design a) protects individuals against unpredictable high financial risks, b) provides access to otherwise unaffordable healthcare services, c) includes first-dollar cost-sharing, and d) incorporates individual caps on out-of-pocket expenses. The Dutch supplementary health insurance seems to be far from this optimal design. Firstly, this is due to the fact that the welfare gain from purchasing supplementary insurance seems to be limited since coverage limits are applied and since the healthcare services that are covered do not involve large losses, which implies that they are already affordable. Secondly, the welfare loss from the supplementary insurance might be significant, since moral hazard is expected to be large since no cost-sharing arrangements are introduced. Furthermore, the loading fee is large and transaction costs are substantial since many different insurers offer many different supplementary insurance policies. Nevertheless, many Dutch insured take out this supplementary insurance. *Chapter 5* identified seven key aspects from behavioural economics that might potentially explain the high uptake of this non-optimal insurance. This chapter poses that in the presence of either loss aversion, ambiguity aversion, liquidity constrains, debt aversion or a combination of these aspects, the welfare gain from purchasing supplementary health insurance would be higher than in the absence of (one of) these aspects. Next to an increase in welfare, an alternative explanation for the high uptake of the Dutch supplementary health insurance might be that insured make suboptimal choices. This could be due to limited knowledge, social comparison and decision avoidance. Firstly, due to limited knowledge about the supplementary insurance, insured might be

unaware what they exactly insure against and what the costs for healthcare services are. Secondly, as a result of social comparison, insured might take out supplementary insurance just because their friends and family do so. Thirdly, due to decision avoidance insured might automatically renew their current supplementary health insurance without critically reviewing whether they indeed want and need this insurance.

Despite the fact that the supplementary health insurance is offered at a free market (in contrast to the basic health insurance), many Dutch insurers do still apply community-rating and open enrolment. Theoretically, such circumstances should result in adverse selection, where high-risk individuals (within each premium risk group) have a larger incentive to purchase supplementary health insurance or to extend their coverage compared to low-risk individuals. Historically, almost all Dutch individuals purchased supplementary insurance. There are, however, four indications that adverse selection has started to occur in the Dutch supplementary health insurance. Firstly, the percentage of individuals with supplementary insurance decreased from 93 per cent in 2006 to 84 per cent in 2016. Secondly, individuals with supplementary health insurance take out insurance policies with less comprehensive coverage than before. Thirdly, insurers' total technical result on supplementary insurance policies reduced substantially since 2008. Fourthly, more and more insurers stop offering supplementary health insurance policies providing coverage for healthcare services mostly used by high-risk individuals, while the premium for policies that do offer this coverage increased considerably. To counteract this adverse selection, insurers are allowed to apply premium differentiation, but due to societal pressure only few insurers modestly do this. *Chapter 6* studied how adverse selection could affect the premium of supplementary insurance over time and whether premium differentiation would be able to counteract adverse selection. The simulation results in chapter 6 firstly showed that adverse selection might result in a substantial increase in the premium between 21 and 50 per cent in 25 years. Additionally, the results show that if insurers were to increase the premium in anticipation of adverse selection, both the decline in insurance uptake and the increase in premium become steeper than when insurers do not do this. Finally, the simulation results in chapter 6 showed that highly refined risk-rating could counteract adverse selection.

POLICY IMPLICATIONS

This dissertation shows that next to risk aversion, as proposed by the traditional economic literature, several other behavioural economic aspects could

be identified that might potentially explain why few Dutch insured opt for a voluntary deductible in the basic health insurance and why so many Dutch insured purchase supplementary health insurance. These aspects regard the financial benefit, loss aversion, ambiguity aversion, decision avoidance, limited knowledge regarding the health insurance, liquidity constraints and social comparison. If these determinants indeed affect the demand for high health insurance coverage, two relevant subsequent question might be: a) How could these insights affect the design of the voluntary deductible and the supplementary health insurance, and b) How to best facilitate the individual's decision-making process regarding health insurance coverage.

With respect to the voluntary deductible, the design could be adjusted in such a way that the number of insured opting for a voluntary deductible could potentially increase, which consequently could, ceteris paribus, lead to a larger reduction in moral hazard. Firstly, the voluntary deductible could be presented as the default option. This implies that, when individuals buy insurance, the policy includes by default a voluntary deductible for the associated premium. Such a policy would not be mandatory since individuals would be able to commute the voluntary deductible for an increase in premium. This redesign could increase the number of insured opting for a voluntary deductible since the effect of loss aversion on the decision to opt for a voluntary deductible might potentially be diminished. Furthermore, with this redesign risk seeking behaviour might be expected since commuting the voluntary deductible implies a certain loss. Moreover, this redesign might make more individuals inclined to retain the voluntary deductible due to omission bias. Secondly, the voluntary deductible could be presented in the form of a no-claim rebate. In that case, the individual pays a premium for the health insurance policy and receives a fixed amount of money at the end of the contract period if no healthcare expenses are claimed (i.e., the no-claim rebate). If healthcare expenses are, however, claimed, the individual receives no rebate. Compared to the current design of the voluntary deductible, the insured pays the full premium (i.e., the premium he would have paid if he had not opted for a voluntary deductible) and receives a no-claim rebate equal to the original deductible amount if no healthcare expenses are claimed. With this redesign of the voluntary deductible it is expected that more insured would opt for a voluntary deductible than under the current design since the effect of loss aversion and debt aversion on the decision to opt for a voluntary deductible might be reduced. Note, however, that the individual reduction of moral hazard might be different between the current design of the voluntary deductible and a no-claim rebate.

With respect to the supplementary health insurance, this dissertation shows that the Dutch supplementary health insurance substantially deviates

from what an optimal insurance theoretically looks like. If the current design of the Dutch supplementary health insurance is indeed not optimal, what should an optimal design of supplementary insurance look like? An alternative design of the supplementary insurance would: 1) provide protection against unpredictable and large financial losses (e.g., dental care after an accident), 2) have first-euro cost-sharing with an individual cap on out-of-pocket expenses, and 3) provide the option to save for predictable small losses. Such a design of the supplementary health insurance might provide a larger welfare gain to individuals when purchasing it than the current supplementary health insurance. After all, this design is much closer to the most important value of health insurance, namely that insurance should provide protection against events with low probabilities and high corresponding costs.

The insights from this dissertation could finally lead to facilitating the individual's decision-making process regarding health insurance coverage in order for them to make more optimal choices. This could firstly be done by providing insured with understandable and transparent information regarding the voluntary deductible and the supplementary insurance. Such information could for instance explain the functioning of the voluntary deductible, the relation between the voluntary deductible and other cost-sharing arrangements and explain the coverage the supplementary health insurance provides both in terms of types of healthcare services covered and the amount of coverage. Secondly, the individual's decision-making process could be facilitated by providing insured with information on group and individual usages of healthcare services covered by the voluntary deductible and the supplementary insurance. In that case, information could be provided on how often individuals consume certain healthcare services and the healthcare expenses associated with this consumption. With this strategy, individuals might get a better understanding of their necessity to opt for a voluntary deducible or to purchase supplementary insurance. In general, providing insured with information could increase individual's knowledge regarding health insurance, which might make them able to make more optimal decisions regarding the amount of health insurance coverage that best fits their needs.

This dissertation has identified several determinants stemming from behavioural economics that, next to the financial profit, might be able to explain why few insured opt for a voluntary deductible in the Dutch basic health insurance and many insured purchase supplementary insurance. Further research into the effect of these determinants on the demand for health insurance coverage and its implications for the design of health insurance and the facilitation of the individual's decision-making process remains, however, necessary.

Samenvatting

HOGE ZORGVERZEKERINGSDEKKING

Nederland behoort wereldwijd tot de landen met de hoogste verzekeringsdekking. Dit geldt niet alleen voor verzekeringen in het algemeen, maar ook voor zorgverzekeringen. Dit laatste is terug te zien in het feit dat in 2016 maar liefst 84 procent van de Nederlanders kiest voor een uitbreiding van de basisverzekeringsdekking in de vorm van een aanvullende zorgverzekering en tegelijkertijd slechts 12 procent van de Nederlanders kiest voor een beperking van de verzekeringsdekking in de vorm van een vrijwillig eigen risico. Vanuit de economische literatuur kan dit gedrag mogelijk verklaard worden door risico-aversie. Risico-averse individuen willen zich namelijk zo goed mogelijk verzekeren tegen de kans dat zij substantiële kosten moeten maken om (noodzakelijke) zorg te verkrijgen. In dit proefschrift wordt de vraag gesteld of risico-aversie de enige verklaring is voor de vraag naar hoge zorgverzekeringsdekking (en dus de lage vraag naar het vrijwillig eigen risico en de hoge vraag naar de aanvullende verzekering). Immers, de risicovermindering van het niet kiezen voor een vrijwillig eigen risico en van het kopen van een aanvullende verzekering lijkt beperkt. Zo kunnen Nederlandse verzekerden voor het hoogste vrijwillig eigen risico bedrag van €500 bijvoorbeeld €300 premiekorting krijgen. Dit betekent dat feitelijk slechts een financieel risico van €200 resteert. Anders gezegd: de meeste Nederlanders zijn bereid om €300 te betalen om een eigen risico van €500 af te kopen. Daarnaast zijn Nederlanders bijvoorbeeld bereid een tandartsverzekering te kopen voor een jaarlijkse premie van €180 per persoon met een maximale dekking van €250 per persoon per jaar. Daar komt bij dat de Nederlandse aanvullende verzekering vooral toegang verschaft tot reeds betaalbare zorgvormen, zoals tandartscontroles en reguliere behandelingen van de fysiotherapeut. Deze voorbeelden laten zien dat andere determinanten dan risico-aversie mogelijk een rol spelen in de vraag naar een hoge zorgverzekeringsdekking.

Het doel van dit proefschrift is dan ook het identificeren van mogelijke verklaringen voor de beperkte vraag naar het vrijwillig eigen risico in de basiszorgverzekering en de grote vraag naar aanvullende zorgverzekeringen. Dit gebeurt door het bestuderen van de traditionele economische literatuur en de gedragseconomische literatuur. Daarnaast worden empirische analyses en simulaties uitgevoerd op basis van een gegevensbestand van een grote Nederlandse zorgverzekeraar met daarin informatie over zorgkosten en diverse achtergrondkenmerken op verzekerde-niveau over een periode van zes jaar. De inzichten van dit proefschrift over de mogelijke factoren die de vraag naar zorgverzekeringsdekking beïnvloeden, kunnen worden gebruikt om de vormgeving van zorgverzekeringen in het algemeen – en het vrijwillig eigen risico en de

aanvullende verzekering in het bijzonder – te optimaliseren en het keuzeproces van de verzekerde te ondersteunen.

HET VRIJWILLIG EIGEN RISICO IN DE BASISZORGVERZEKERING

In *hoofdstuk 2* wordt gekeken naar het financiële profijt van het kiezen voor een vrijwillig eigen risico als mogelijke verklaring voor het lage percentage verzekerden dat kiest voor een vrijwillig eigen risico. De resultaten van de analyses in hoofdstuk 2 laten zien dat, gegeven de gemiddelde premiekorting in Nederland in 2014, een vrijwillig eigen risico van €500 bovenop het verplicht eigen risico van €360 achteraf bezien financieel profijtelijk zou zijn geweest voor 48 procent van de verzekerden. Wanneer iedere Nederlander voor een maximaal vrijwillig eigen risico zou hebben gekozen in 2014, dan zou achteraf bezien 44 procent het maximale verlies lijden (namelijk €-260) en 41 procent de maximale winst behalen (namelijk €240). Analyses op groepsniveau laten zien dat een vrijwillig eigen risico aantrekkelijker is voor mannen dan voor vrouwen, aantrekkelijker is voor mensen zonder chronische aandoening dan voor mensen met een chronische aandoening en aantrekkelijker is voor mensen met lage zorgkosten in het verleden dan voor mensen met hoge zorgkosten in het verleden. Ook laten deze analyses zien dat het financiële profijt van het vrijwillig eigen risico afneemt naarmate de leeftijd toeneemt. Gebaseerd op deze resultaten wordt in hoofdstuk 2 de conclusie getrokken dat andere factoren dan het financiële profijt mogelijk ook een rol spelen bij het wel of niet kiezen voor een vrijwillig eigen risico.

Het vrijwillig eigen risico is in Nederland, maar ook in verschillende andere landen zoals Duitsland, Zwitserland en de VS, ingevoerd om moral hazard tegen te gaan. Moral hazard is het gebruikmaken van meer of duurdere medische diensten, veroorzaakt door het feit dat de verzekering (een gedeelte van) de kosten vergoedt. Aangezien slechts 12 procent van de Nederlanders kiest voor een vrijwillig eigen risico, kan worden verwacht dat de totale afname in moral hazard beperkt is. De economische literatuur laat zien dat rationeel consumentengedrag ervoor zorgt dat individuen alleen kiezen voor een vrijwillig eigen risico wanneer hun verwachte zorgkosten onder het eigen risico flink onder de premiekorting liggen. Dit wordt adverse selectie genoemd en houdt in dat laagrisicoverzekerden (zoals jongeren en gezonde mensen) eerder geneigd zijn te kiezen voor een vrijwillig eigen risico dan hoogrisicoverzekerden (zoals ouderen en ongezonde mensen). Adverse selectie betekent ook dat verzekerden niet zullen kiezen voor een vrijwillig eigen risico in een (incidenteel) jaar waarin

ze (hoge) zorgkosten verwachten. Om adverse selectie tegen te gaan kunnen verzekeraars de premiekorting differentiëren naar de duur van het contract waarvoor het vrijwillig eigen risico geldt (ex-ante differentiatie genoemd) of naar het aantal jaren dat iemand heeft gekozen voor een vrijwillig eigen risico (ex-post differentiatie genoemd). Het is hierbij de verwachting dat hoe langer de contractduur voor het vrijwillig eigen risico of hoe groter het aantal jaren dat een verzekerde heeft gekozen voor een vrijwillig eigen risico, hoe hoger de premiekorting en dus hoe lager de premie zal zijn. Dit zou verzekerden moeten stimuleren om te kiezen voor een langere contractduur voor het vrijwillig eigen risico of om nog een jaar te kiezen voor het vrijwillig eigen risico. Als gevolg hiervan kan de moral hazard reductie groter worden omdat individuen ook voor een vrijwillig eigen risico kiezen in een (incidenteel) jaar waarin ze (hoge) zorgkosten verwachten. In *hoofdstuk 3* wordt gekeken hoe de premies er in het geval van een ex-ante of ex-post differentiatie uit zouden komen te zien. De resultaten van de empirische analyses laten zien dat verzekeraars alleen zonder risicoverevening[56] in staat zouden zijn om de premie te verlagen naarmate de contractduur voor het vrijwillig eigen risico langer is of het aantal jaren dat iemand heeft gekozen voor het vrijwillig eigen risico hoger is. De premies zullen naar verwachting toenemen voor zowel de ex-ante als de ex-post differentiatie in het geval van matige, goede of perfecte risicoverevening. Dit komt doordat, wanneer de contractduur of het aantal jaren dat iemand voor een vrijwillig eigen risico kiest toeneemt, de claims weliswaar afnemen, maar de risicovereveningsbijdrage toeneemt, waardoor de premie uiteindelijk toeneemt. Deze resultaten trekken de mogelijkheid van deze strategieën om adverse selectie tegen te gaan in twijfel.

De resultaten in hoofdstuk 2 toonden reeds dat, achteraf bezien, een vrijwillig eigen risico voor ongeveer een op de twee verzekerden financieel aantrekkelijk is, terwijl slechts 12 procent van de verzekerden in 2016 kiest voor een vrijwillig eigen risico. Op basis van de gedragseconomie identificeert *hoofdstuk 4* daarom zes andere mogelijke determinanten voor de keuze voor een vrijwillig eigen risico: 1) verliesaversie, 2) risicohouding, 3) ambiguïteitaversie, 4) schuldaversie, 5) onwil om actie te ondernemen om te veranderen en 6) liquiditeitsbeperkingen. Allereerst kan verliesaversie ervoor zorgen dat verzekerden geen vrijwillig eigen risico kiezen, omdat ze het mogelijke financiële verlies van het eigen risico bedrag als onprettig ervaren. Ten tweede zullen verzekerden zich waarschijnlijk risico-avers gedragen met betrekking tot de keuze voor een vrijwillig eigen risico en daarom niet kiezen voor een vrijwillig eigen risico. Ten derde kan, omdat de kansverdeling van zorgkosten voor verzekerden

[56] Risicoverevening compenseert verzekeraars vooraf voor voorspelbare kostenverschillen tussen verzekerden.

grotendeels onbekend is, ambiguïteitaversie[57] verklaren waarom verzekerden niet kiezen voor een vrijwillig eigen risico. Ten vierde kan schuldaversie ervoor zorgen dat verzekerden niet kiezen voor een vrijwillig eigen risico, omdat de gemaakte kosten onder het vrijwillig eigen risico pas worden betaald nadat de zorg genuttigd is. Ten vijfde kan een onwil om actie te ondernemen om zaken te veranderen ervoor zorgen dat verzekerden niet kiezen voor een vrijwillig eigen risico omdat het kiezen voor een vrijwillig eigen risico een handeling van de verzekerde vraagt. Tenslotte kunnen liquiditeitsbeperkingen ervoor zorgen dat verzekerden niet kiezen voor een vrijwillig eigen risico, omdat mogelijk een substantieel bedrag uit eigen zak betaald moet worden. Gebaseerd op deze gedragseconomische factoren, draagt hoofdstuk 4 vijf mogelijke strategieën aan om het aantal verzekerden dat kiest voor een vrijwillig eigen risico te verhogen en zodoende moral hazard te verminderen: 1) het vrijwillig eigen risico vormgeven als een systeem waarbij de elke verzekerde sowieso een vrijwillig eigen risico heeft, maar ook de mogelijkheid krijgt deze af te kopen, 2) verzekerden informatie geven over (de werking van) het vrijwillig eigen risico, 3) verzekerden informatie geven over hun (verwachte) zorgkosten, 4) het vrijwillig eigen risico vormgeven als een no-claim teruggaveregeling en 5) het vrijwillig eigen risico combineren met een spaarrekening.

DE AANVULLENDE ZORGVERZEKERING

Bij de vormgeving van zorgverzekeringen moet een afweging worden gemaakt tussen de voordelen van verzekeren (i.e., het poolen van risico's) en de nadelen van verzekeren (i.e., moral hazard, premieopslag en transactiekosten). De traditionele economische literatuur laat zien dat optimale verzekeringen a) bescherming bieden tegen onvoorspelbare hoge financiële risico's, b) toegang verschaffen tot zorgvormen die anders onbetaalbaar zouden zijn, c) eigen be-

[57] Ambiguïteitaversie betreft de voorkeur van mensen voor keuzesituaties met bekende kansen ten opzichte van keuzesituaties met onbekende kansen. Dit werd voor het eerst aangetoond in een hypothetische experiment van Ellsberg uit 1961, waarin mensen werden geconfronteerd met twee vazen. De eerste vaas bevatte precies 100 rode en zwarte ballen, maar de verhouding tussen de beide kleuren was onbekend, terwijl de tweede vaas precies 50 rode en 50 zwarte ballen bevatte. De meerderheid van de mensen gaf de voorkeur aan het wedden op rood of zwart in de tweede vaas in plaats van wedden op rood of zwart in de eerste vaas, waaruit blijkt dat zij een aversie hebben voor ambiguïteit.

talingen aan de voet hebben[58], en d) een individueel maximum stellen aan de eigen betalingen. Vergeleken met de optimale vormgeving zoals gesteld in de literatuur, lijkt de vormgeving van de Nederlandse aanvullende zorgverzekering verre van optimaal. Ten eerste lijken de voordelen van de aanvullende verzekering beperkt, omdat er vergoedingslimieten gelden en de meeste zorgvormen die gedekt worden door de aanvullende verzekering geen grote financiële gevolgen hebben en dus al toegankelijk zijn. Ten tweede zijn de nadelen relatief groot. Moral hazard is naar verwachting substantieel, omdat de meeste zorgvormen die gedekt worden door de aanvullende zorgverzekering geen eigen betaling kennen. Daarnaast is de opslag op de premie voor de aanvullende zorgverzekering groot en zijn de transactiekosten voor het kiezen van een aanvullende verzekering hoog, omdat verzekeraars veel verschillende polissen aanbieden. Ondanks deze suboptimale vormgeving kiezen veel Nederlanders voor een aanvullende zorgverzekering.

In *hoofdstuk 5* worden zeven aspecten uit de gedragseconomie geïdentificeerd die mogelijk kunnen verklaren waarom zoveel Nederlanders kiezen voor deze suboptimale verzekering. Allereerst is het mogelijk dat als gevolg van verliesaversie, ambiguïteitaversie, liquiditeitsbeperkingen en/of schuldaversie de welvaartswinst van het hebben van een aanvullende zorgverzekering groter is dan wanneer (één van) deze factoren afwezig zouden zijn. Een andere mogelijke verklaring voor het grote aantal verzekerden dat een aanvullende zorgverzekering koopt is dat verzekerden suboptimale keuzes maken. Dit zou het gevolg kunnen zijn van beperkte kennis over de aanvullende zorgverzekering, sociale vergelijking en/of het vermijden van beslissingen. Allereerst zouden verzekerden door beperkte kennis over de aanvullende zorgverzekering mogelijk niet goed weten waar ze zich precies voor verzekeren en wat de kosten voor de verschillende zorgvormen zijn. Ten tweede is het mogelijk dat verzekerden, door sociale vergelijking, simpelweg een aanvullende verzekering nemen omdat vrienden en familie dat ook doen. Ten derde is het mogelijk dat verzekerden, doordat zij het nemen van (lastige) beslissingen vermijden, hun huidige zorgverzekering automatisch vernieuwen zonder kritisch te kijken of ze ook daadwerkelijk een aanvullende zorgverzekering willen en nodig hebben.

[58] Een eigen betaling aan de voet houdt in dat de eigen betaling direct vanaf de eerste euro aan zorgkosten geldt. Een voorbeeld van een eigen betaling aan de voet betreft het verplicht eigen risico van €385 dat in Nederland in 2016 geldt. Hierbij betalen verzekerden de eerste €385 aan zorgkosten uit eigen zak (met uitzondering van kosten voor de huisarts en kraamzorg). Een ander voorbeeld betreft een procentuele bijbetaling aan de voet, waarbij de verzekerde van iedere euro aan zorgkosten een vaststaand percentage uit eigen zak betaalt tot een bepaald maximum. Ook deze procentuele bijbetaling geldt dan vanaf de eerste euro die aan zorgkosten wordt uitgegeven.

Ondanks dat de aanvullende verzekering in Nederland wordt aangeboden op een vrije markt (in tegenstelling tot de basisverzekering), kiezen bijna alle zorgverzekeraars ervoor om nagenoeg iedereen te accepteren voor een aanvullende verzekering en om weinig tot geen premiedifferentiatie toe te passen. Theoretisch gezien zou dit moeten leiden tot adverse selectie, waarbij binnen elke premierisicogroep hoogrisicoverzekerden een grotere prikkel hebben dan laagrisicoverzekerden om zich aanvullend te verzekeren of hun dekking uit te breiden. Hoewel in het verleden bijna iedere Nederlander voor een aanvullende zorgverzekering koos, zijn er momenteel vier indicaties dat dergelijke adverse selectie al aan het optreden is in de Nederlandse markt voor de aanvullende zorgverzekering. Ten eerste is het percentage mensen dat een aanvullende verzekering afsluit gedaald van 93 procent in 2006 naar 84 procent in 2016. Ten tweede kiezen verzekerden met een aanvullende zorgverzekering voor steeds minder uitgebreide pakketten. Ten derde is het totale technische resultaat van verzekeraars op de aanvullende zorgverzekering substantieel afgenomen sinds 2008. Ten vierde stoppen steeds meer verzekeraars met het aanbieden van polissen die dekking bieden voor zorgvormen die voornamelijk worden gebruikt door hoogrisicoverzekerden en stijgen de premies van de polissen die deze zorg nog wel aanbieden aanzienlijk. Om deze adverse selectie tegen te gaan mogen verzekeraars de premie differentiëren naar achtergrondkenmerken van verzekerden, maar als gevolg van maatschappelijke druk kiest bijna geen enkele verzekeraar hiervoor. In *hoofdstuk 6* zijn empirische simulaties uitgevoerd om na te gaan hoe adverse selectie de premie in de loop van de tijd kan beïnvloeden en of premiedifferentiatie in staat is om adverse selectie tegen te gaan. De resultaten in dit hoofdstuk laten zien dat adverse selectie kan resulteren in een substantiële stijging van de premie, namelijk met tussen 21 en 50 procent na 25 jaar. Ook laten de resultaten zien dat wanneer verzekeraars zouden anticiperen op adverse selectie door de premie vooraf te verhogen, zowel de afname in het aantal mensen dat een aanvullende zorgverzekering koopt als de toename in de premie nog sterker zouden zijn dan wanneer verzekeraars dit niet zouden doen. Tenslotte laten de resultaten in hoofdstuk 6 zien dat een zeer verfijnde premiedifferentiatie adverse selectie zou kunnen tegengaan.

BELEIDSAANBEVELINGEN

Dit proefschrift laat zien dat naast risico-aversie, zoals aangedragen in de traditionele economische literatuur, verschillende andere gedragseconomische factoren aangewezen kunnen worden als mogelijke verklaring waarom weinig mensen in Nederland kiezen voor een vrijwillig eigen risico in de basiszorgver-

zekering en veel mensen een aanvullende zorgverzekering aanschaffen. Deze factoren betreffen het financiële profijt, verliesaversie, ambiguïteitaversie, schuldaversie, het vermijden van beslissingen, beperkte kennis over zorgverzekeringen, liquiditeitsbeperkingen en sociale vergelijking. Wanneer deze factoren inderdaad de vraag naar zorgverzekeringsdekking beïnvloeden, is het interessant om te bekijken hoe 1) deze inzichten de vormgeving van het vrijwillig eigen risico en de aanvullende verzekering kunnen beïnvloeden en 2) het keuzeproces van de verzekerde het best ondersteund kan worden.

Met betrekking tot het vrijwillig eigen risico zou de vormgeving zodanig veranderd kunnen worden dat meer mensen zullen kiezen voor een vrijwillig eigen risico zodat, ceteris paribus, een grotere afname van moral hazard bewerkstelligd wordt. Hiertoe zou allereerst het vrijwillig eigen risico gepresenteerd kunnen worden als de standaardoptie, waarbij verzekerden de mogelijkheid hebben om het vrijwillig eigen risico af te kopen door middel van een premiestijging. Het aantal mensen dat kiest voor een vrijwillig eigen risico zou hierdoor mogelijk kunnen stijgen, omdat 1) het effect van verliesaversie op de keuze voor een vrijwillig eigen risico wordt weggenomen, 2) risicozoekend gedrag van de verzekerde met deze vormgeving wordt gestimuleerd (het afkopen van het vrijwillig eigen risico is immers een zeker verlies, terwijl het behouden van het vrijwillig eigen risico ook een kans op winst met zich meebrengt) en 3) het hebben van een vrijwillig eigen risico in dit geval geen actie van de verzekerde verlangt. Een tweede manier om meer mensen voor een vrijwillig eigen risico te laten kiezen is door het vrijwillig eigen risico vorm te geven als een no-claim teruggave. In dat geval betaalt de verzekerde een premie voor de zorgverzekering en ontvangt aan het einde van de contractperiode een vaststaand bedrag – de no-claim teruggave – wanneer er geen zorgkosten worden geclaimd. Wanneer er wel zorgkosten worden geclaimd, ontvangt de verzekerde geen of een lagere no-claim teruggave. In vergelijking met het huidige systeem, betaalt de verzekerde in het geval van de no-claim teruggave de volledige premie (dat wil zeggen: de premie die hij zou hebben moeten betalen wanneer hij niet had gekozen voor een vrijwillig eigen risico) en kan hij een bedrag zo groot als het vrijwillig eigen risico terugkrijgen wanneer geen zorgkosten worden geclaimd. Met deze alternatieve vormgeving van het vrijwillig eigen risico zullen naar verwachting meer mensen kiezen voor een vrijwillig eigen risico, omdat verliesaversie en schuldaversie de keuze voor een vrijwillig eigen risico minder zullen beïnvloeden. Het is echter de vraag of het effect op de moral hazard reductie gelijk is voor de huidige vormgeving van het vrijwillig eigen risico en de vormgeving in het geval van een no-claim teruggave.

Met betrekking tot de aanvullende verzekering laat dit proefschrift zien dat de Nederlandse aanvullende verzekering substantieel afwijkt van hoe een

optimale verzekering er theoretisch gezien uitziet. Wanneer de Nederlandse aanvullende zorgverzekering inderdaad niet optimaal is, rijst de vraag hoe een optimale verzekering er uit zou kunnen zien. In dat geval zou een aanvullende zorgverzekering 1) verzekerden beschermen tegen onvoorspelbare en grote financiële uitgaven (zoals tandartskosten na een ongeluk), 2) eigen betalingen aan de voet introduceren met een individueel maximum aan eigen betalingen en 3) de mogelijkheid bieden om te sparen voor voorspelbare kleine verliezen (zoals tandartscontroles). Een dergelijke vormgeving van de aanvullende zorgverzekering kan leiden tot een grotere welvaartswinst voor verzekerden dan de huidige vormgeving, omdat het beter aansluit bij het grootste voordeel van het afsluiten van een verzekering, namelijk bescherming bieden tegen gebeurtenissen met een kleine kans, maar met zeer hoge kosten tot gevolg.

Tenslotte kunnen de inzichten in dit proefschrift leiden tot ondersteuning van verzekerden bij het maken van keuzes (met betrekking tot te kopen verzekeringsdekking) die beter aansluiten bij hun voorkeuren. Dit keuzeproces kan ondersteund worden door twee vormen van informatievoorziening. Allereerst zouden verzekerden duidelijke en transparante informatie moeten krijgen over het vrijwillig eigen risico en de aanvullende zorgverzekering. Dergelijke informatievoorziening zou betrekking kunnen hebben op hoe het vrijwillig eigen risico werkt en hoe het zich verhoudt tot andere eigen betalingen in de zorg (zoals het verplicht eigen risico), maar ook op wat de aanvullende verzekering precies aan dekking biedt, zowel in termen van type zorgvormen als de hoeveelheid dekking. Ten tweede zou het keuzeproces ondersteund kunnen worden door verzekerden te informeren over zorggebruik op zowel individuniveau als op groepsniveau. Dergelijke informatie zou kunnen laten zien hoe vaak individuen bepaalde zorgvormen consumeren en welke kosten daarmee gepaard gaan. Hierdoor krijgen verzekerden beter inzicht in de eigen noodzaak tot het al dan niet kiezen voor een vrijwillig eigen risico en/of het aanschaffen van een aanvullende zorgverzekering.

Dit proefschrift heeft verschillende gedragseconomische determinanten geïdentificeerd die, naast het financiële profijt, mogelijk kunnen verklaren waarom relatief weinig mensen voor een vrijwillig eigen risico in de Nederlandse basiszorgverzekering kiezen en relatief veel mensen een aanvullende zorgverzekering afsluiten. Verder onderzoek naar het effect van deze determinanten op de vraag naar zorgverzekeringsdekking en de implicaties daarvan voor de vormgeving van zorgverzekeringen en het ondersteunen van het keuzeproces van verzekerden blijft echter noodzakelijk.

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PhD Portfolio

Name	K.P.M. (Kayleigh) van Winssen
Department	institute of Health Policy and Management (iBMG)
PhD Period	September 2011 – August 2016
Promotor	Prof. dr. W.P.M.M. van de Ven
Copromotor	dr. R.C. van Kleef

PhD training	**Year**
A successful doctoral track / "Klaar in 4 jaar"	2011
Training in Problem-based Learning (Dutch PGO)	2011
Studievaardigheden	2012
Gesprekstechnieken en coachingsvaardigheden	2012
Academic writing in English	2012
Begeleiden van schrijfopdrachten	2012
Geven van onderwijs I: kleine groepen	2012
Beoordelen van schrijfopdrachten	2012
Patient Preferences in the Delivery of Healthcare	2013
Toetsing I: beoordeling en feedback	2013
Mediatraining for PhDs (Eva Kuit)	2013
Geven van onderwijs II: plenaire bijeenkomsten	2014
Droomwerk coaching (Bureau Dolly)	2015
Employability	2015

Seminars and conferences	**Year**
Health Policy Workshop "Incentives in health insurance: the role of cost sharing", Utrecht (Dutch Healthcare Authority (NZa), the Dutch Bureau for Economic Policy Analysis (CPB) and the Tilburg Law and Economics Center of Tilburg University (TILEC))	2011
Meeting "Zorgsparen", Soest (PGGM)	2011
European Conference on Health Economics, Zürich	2012
Meeting "Marktwerking: een mond vol tanden?", Amsterdam (NVSST)	2012
Netwerkbijeenkomst "Slimme eigen betalingen en zorgsparen", Rotterdam (iBMG)	2013
LOLA Health Economics Study Group, Nunspeet	2013
Symposium "Aanvullende verzekering", Den Haag (Ministry of Finance)	2013
European Conference on Health Economics, Dublin	2014

Presentations	Year
iBMG, Rotterdam	2012
NVSST Meeting “Marktwerking: een mond vol tanden?”, Amsterdam	2012
Netwerkbijeenkomst “Slimme eigen betalingen en zorgsparen”, Rotterdam	2013
iBMG, Rotterdam	2013
iBMG, Rotterdam	2014
European Conference on Health Economics, Dublin	2014
iBMG, Rotterdam	2015
iBMG, Rotterdam	2016

Media performance	Year
Radio interview “Radio 1”: Verhogen eigen risico scheelt helft verzekerden geld	2014
Radio interview “RTV Rijnmond”: Helft verzekerden laat geld liggen door eigen risico	2014
Radio quote “3FM”: Veel mensen profijt van hoger eigen risico	2014
Several news websites (e.g., Nu.nl, Skipr, Vara Kassa, Radar, Financieel Dagblad)	2014
Article in “Reformatorisch Dagblad”: je kunt tientjes besparen op zorgpolis	2014
Article in “Erasmus magazine”: De kwestie: je kunt honderden euro’s besparen op je zorgverzekering	2014
Article in “Healthy”: Slim kiezen van je zorgverzekering	2015
Article in “Margriet”: Je geld of je gezondheid?	2016

Teaching activities	Period
Multivariate Analyses (Bachelor 2), lecturer and tutor working groups	2011-2013 & 2015
Zorgverzekeringen en Zorgstelsel (Bachelor 3 & Pre-master), tutor working groups	2011-2014
Schrijf- en onderzoeksvaardigheden (Pre-master), supervisor	2012-2014
Mentor first-year bachelor students (Bachelor 1)	2012-2016
Stage (Bachelor 1), tutor working groups and supervisor	2013-2016
Patient Preferences in the Delivery of Healthcare (Master), supervisor	2014
Kwantitatief leeronderzoek (Pre-master), supervisor	2016

Dutch publications
Van Winssen, K.P.M., Van Kleef, R.C., Van de Ven, W.P.M.M.: Zorgsparen reduceert zorgkosten. ESB 97(4643), 548-551 (2012)
Van Winssen, K.P.M., Van Kleef, R.C., Van de Ven, W.P.M.M.: Naschrift bij: Zorgsparen reduceert zorgkosten. ESB 97(4646), 647 (2012)
Van Winssen, K.P.M., Van Kleef, R.C., Van de Ven, W.P.M.M.: Vrijwillig eigen risico profijtelijker dan gedacht. ESB 99(4696), 658-661 (2014)

Non-peer reviewed English publications
Van Winssen, K.P.M., Van Kleef, R.C., Van de Ven, W.P.M.M.: Saving for healthcare: an interesting option to increase the attractiveness of voluntary deductibles. Health and Ageing Newsletter of the Geneva Association N°28 (2013)
Van Winssen, K.P.M., Van Kleef, R.C., Van de Ven, W.P.M.M.: Why do so many individuals choose suboptimal supplementary health insurance in the Netherlands? Working Paper iBMG 2015.02 (2015)

Additional activities	Period
Member of the housing committee	2013-2015
Member of the activities committee	2013-2016
Reviewer for The European Journal of Health Economics	2016

About the author

Kayleigh van Winssen (1988) studied Health Sciences from 2007 to 2010 and obtained her master's degree in Health Economics, Policy and Law with a specialisation in Health Economics in 2011 at the Erasmus University Rotterdam. From 2011 to 2016, she worked at the institute of Health Policy and Management (iBMG) on her PhD research on determinants of the demand for health insurance coverage. The results of this research are published in several (peer-reviewed scientific) journals, including the European Journal of Health Economics, Health Policy and Economische Statistische Berichten. In addition, she presented her work at (inter)national (scientific) conferences, including the European Conference on Health Economics in 2014 (Dublin, Ireland). During the first years of her PhD, Kayleigh practised acrobatics at the sub top level, culminating in a second place at the National Championships in 2013. After a compelled stop with acrobatics, Kayleigh found a new challenge in Tang Soo Do – a Korean martial art – in which she became National Champion orange belt (2014) and green belt (2015) for adult women.

As a teacher, Kayleigh was involved in different courses of the bachelor and pre-master program Health Sciences and master program Health Economics, Policy and Law at the Erasmus University Rotterdam. She was a tutor and lecturer for the course "Multivariate analyses" and a tutor for the course "Health Insurance and Healthcare System". Furthermore, she supervised several pre-master theses and master students with a DCE-study (course "Patient Preferences in the Delivery of Health Care"). Additionally, she was a mentor for first-year students (2012–2016) and supervised their internships.

Besides her research and teaching activities, Kayleigh was a member of the housing committee from 2013 to 2015, a member of the activities committee from 2013 to 2016 and a reviewer for the European Journal of Health Economics.

The health insurance density in the Netherlands is among the highest in the world. This is shown by the fact that, in 2016, only 12 per cent of the Dutch insured opted for a reduction of health insurance coverage in the form of a voluntary deductible, while, at the same time, 84 per cent of the Dutch insured opted for an extension of health insurance coverage in the form of a supplementary health insurance. On the cover of this dissertation, this is illustrated by two individuals in a grocery store with the same basket of goods. The young women, however, reduces her basket by putting a product back onto the shelf (illustrating the voluntary deductible), while the old man extends his basket by adding a product (illustrating the supplementary insurance). This dissertation questions whether risk aversion alone can explain the low uptake of voluntary deductibles and the high uptake of supplementary insurance, since the value in terms of reduction of financial uncertainty regarding financial losses is limited in those cases. Therefore, this dissertation aims to identify potential explanations for the demand for high health insurance coverage. The insights provided within this dissertation could be used to optimise the design of health insurance and more specifically the design of voluntary deductibles and the supplementary insurance and to better facilitate the individual's decision-making process concerning the demand for health insurance coverage.