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

K.P.M. van Winssen*, R.C. van Kleef, W.P.M.M. van de Ven

Institute of Health Policy and Management, Erasmus University Rotterdam, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands

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ABSTRACT

To counteract moral hazard in health insurance, insured can be offered a voluntary deductible (VD) in return for a premium rebate. In the Dutch mandatory basic health insurance however, only 11 per cent of the insured opted for a VD in 2014. Several determinants could affect the decision to opt for a VD. This paper examines one of these determinants: the financial profitability. A VD 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 VD 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 VD, most insured would obtain either the maximum loss (44 per cent) or the maximum gain (41 per cent). A VD 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 VD: provide insured with information regarding the VD and introduce a shifted deductible.

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 [1,2]. 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, which is relatively low compared to the 56 per cent of Swiss insured opting for a voluntary deductible in 2013 [3,4]. 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 [5,6,7]. Loss aversion could affect this decision [8] since a voluntary deductible implies a potential loss and losses are overweighted relative to gains [9]. 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 [10]. Previous research has shown that insured know little about their health insurance [11,12]

* Corresponding author. Tel.: +31 10 4088823.
E-mail address: vanwinssen@bmg.eur.nl (K.P.M. van Winssen).

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and that individuals misunderstand complex price schedules including premiums and cost sharing arrangements [13,14,15]. 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 [7].

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. 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.

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 up prior use of pharmaceuticals and prior hospital inpatient diagnoses, respectively [16]. The appendix (table A1) 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.

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.

4.1. Operationalisation

4.1.1. 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.,

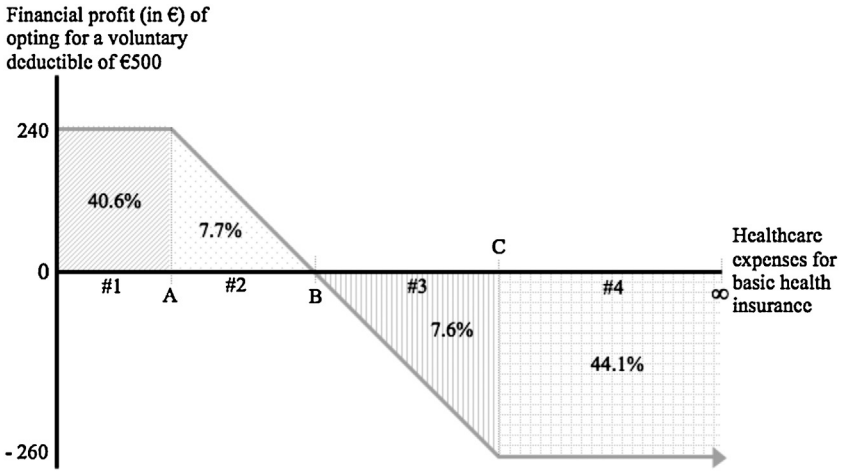

Fig. 1. Four scenarios of the profitability of a voluntary deductible of €500 (on top of the mandatory deductible) as a function of healthcare expenses, given the average premium rebate of €240 in 2014. The figures indicate the percentage of insured in each scenario based upon our empirical analyses. (A) Mandatory deductible amount (€360). (B) Mandatory deductible amount + average premium rebate (€600). (C) Mandatory deductible amount + voluntary deductible amount (€860). No. 1: Financial profit equals the maximum gain. No. 2: Financial profit equals a gain between zero and the premium rebate. No. 3: Financial profit equals a loss between zero and the voluntary deductible amount minus the premium rebate. No. 4: Financial profit equals the maximum loss

€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. [17] (see also [18,19]), 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. [17] (see also [18,19]), 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.

4.1.2. 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).

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. 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.

4.2.1. 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 [20]). 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.

4.2.2. 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.

5. Results

5.1. Profitability

Part one of Table 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 [3]. 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.

Part two of Table 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 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 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.

Table 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 (MHR). 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 MHR	Minimum PR (€180)	46.6
	Average PR (€240)	48.4
	Maximum PR (€300)	50.0
Including MHR (i.e., 1.36%)	Minimum PR (€180)	46.9
	Average PR (€240)	48.6
	Maximum PR (€300)	50.2
3 Mandatory deductible level[a]	€0	35.8
	€170	43.7
	€360	48.4

[a] 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 [21]. In case the mandatory deductible is €170, the average offered premium rebate in that year (i.e., €219) is applied.

Fig. 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.

5.2. Groups of insured

Table 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

Table 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
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 × 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

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 [22]. The chi-square tests confirm

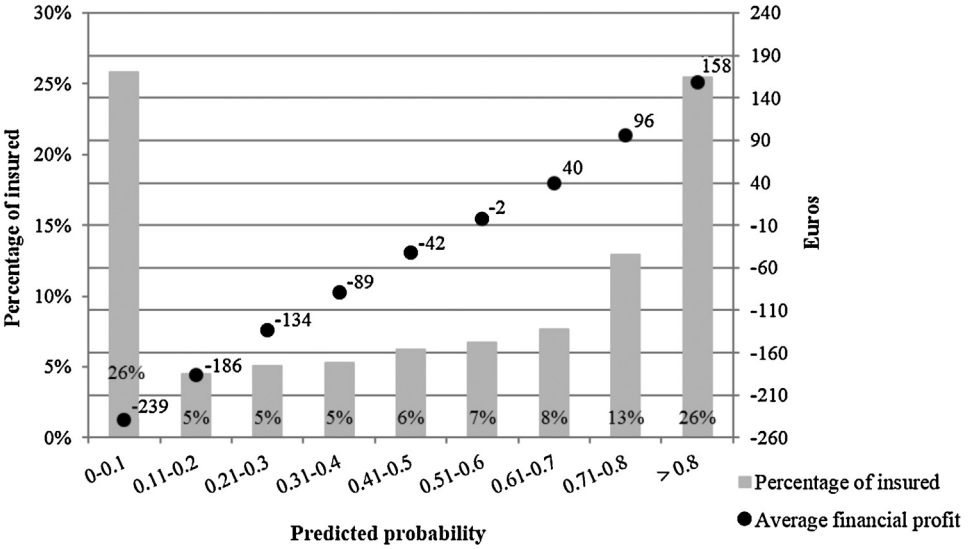

Fig. 2. Frequency distribution of the individual predicted probability that a voluntary deductible on top of the mandatory deductible is profitable given the average premium rebate in the Dutch basic health insurance in 2014 and the corresponding average financial profit.

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 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.

5.3. Individual predicted probabilities

The logit model (see Appendix Table A2) 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 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.

6. Conclusion and discussion

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 [3]. 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.

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. First, 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) to be representative. Second, 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 [23,24,25], 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 [26]. We expect the first effect to prevail the second effect since 6.5 per cent of the Dutch insured switched health insurer in 2014 [3] 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 [16,27,28] 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 [29]. 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.

7. Policy recommendations

7.1. Information

Only 11 per cent of the Dutch insured opted for a voluntary deductible in 2014 [3]. 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 [13,14,15]. 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. 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.

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 [30]. 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.

Conflict of interest statement

No conflict of interest exists.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.healthpol.2015.02.009.

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