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A Voluntary Deductible in Social Health Insurance with Risk Equalization: "Community-Rated or Risk-Rated Premium Rebate?"

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Abstract

On January 1, 2006 a new mandatory basic health insurance will be introduced in the Netherlands. One aspect of the new scheme is that the insured can choose to have a deductible. This option should increase the individual responsibility and reduce moral hazard. In the new scheme, a risk equalization system is aimed at avoiding preferred risk selection and insolvency of insurance companies with a relatively high-risk pool. A crucial issue with respect to a voluntary deductible in this type of social health insurance is whether the premium rebate should be *community rated* or *risk rated*. The Dutch government has chosen the former, which means that the premium rebate will be independent of health status and risk. Our analysis shows that, in a situation with "accurate" risk equalization, a community-rated premium rebate could lead to an adverse selection spiral. Over time, this spiral results in none of the insured taking a deductible and thus no reduction in moral hazard.

Introduction

On January 1, 2006 a new mandatory basic health insurance will be introduced in the Netherlands for the whole population. One aspect of the new scheme is that the insured can choose to have a deductible.[1] One of the issues related to the practical implementation of a voluntary deductible is whether the premium rebate should be community rated or risk rated. The Dutch government has chosen the former, implying that the premium rebate will be independent of health status and risk.

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[1] With a maximum of 500 euro per individual.

In this article we analyze the consequences of a community-rated premium rebate in combination with the risk equalization system that will be functioning in new basic health insurance. Risk equalization is aimed at avoiding subtle forms of preferred risk selection and upward premium spirals for insurers with a relatively high-risk pool. The need for risk equalization comes from the ban on premium differentiation and the obligation for insurers to accept every new applicant. As part of risk equalization, the insurers receive a compensation for the relatively high-risk individuals in their insurance pool and pay a contribution for the relatively low risks. On the one hand risk equalization among insurers can reduce incentives for cream skimming. On the other hand it could be problematic with regard to the introduction of a voluntary deductible.

Without risk equalization, the premium rebate for a deductible does not only reflect cost sharing, a reduction in moral hazard, and a reduction in administration costs, but also the effect of adverse selection by insured. Adverse selection is the phenomenon that within each risk group of insured who pay the same premium for full coverage, the relatively healthy will opt for a deductible whereas the relatively unhealthy opt for full insurance. Adverse selection thus results in market segmentation, which allows the insurer to ask different premiums from the two groups of insured. Competition will force the insurers to ask costs-based premiums. This implies that they increase the premium for the (relatively unhealthy) insured choosing full coverage and decrease the premium (i.e., further increase the premium rebate) for the insured taking the deductible. So, without a risk equalization system the difference in expected expenditures between the two groups of insured, which results from their different health status, can be reflected in the premium rebate for the deductible.

However, with an accurate risk equalization system the insurer receives a compensation for the unhealthy insured and has to pay a contribution for the healthy insured. So the difference in expected expenditures between the two groups, which is the result of their different health status, is then fully reflected in these compensations and contributions. This holds true both in the case without a voluntary deductible and in the case with a voluntary deductible. So the differences in health status between the two groups cannot be reflected in the premium rebate for a deductible.

The purpose of this study is to analyze the expected implications of a community-rated premium rebate in combination with an accurate risk equalization system. For example, will the cost reduction for the insurer recover the community-rated premium rebate? If it does not, the insurer will be forced to decrease the premium rebate, resulting in less of the insured taking a deductible, an even lower cost reduction and so on. Over time, this could lead to none of the insured taking a deductible and no reduction in moral hazard. Additionally, our study examines whether this so-called adverse selection spiral can be avoided by a risk-rated premium rebate.

In the "Implications of Risk Equalization" section we briefly describe the expected implications of risk equalization by considering the components of the cost reduction resulting from a deductible. In the "Choice of Taking a Deductible" section we present a set of determinants, which we hypothesize will affect the individual choice of taking a deductible for a given premium rebate. In the "Method" and "Results" sections we report a simulation analysis in which we examined whether the insurer's total cost reduction can be large enough to recover the offered premium rebate. In this analysis we took into account different assumptions with respect to the level of risk rating.

Finally, in the "Conclusion, Implications, and Discussion" section we conclude and discuss this study.

It is important to keep in mind that the main purpose of this study is to indicate the implications of a community-rated premium rebate in a situation where risk equalization accurately compensates for differences in health. Considering the large number of assumptions underlying the choice of taking a deductible, the importance of this study lies in the overall conclusions rather than specific tables and figures. Although the new Dutch basic health insurance is taken as the context of our study, the main results and conclusions are expected to be representative of all mandatory social health insurance schemes with risk equalization.

IMPLICATIONS OF RISK EQUALIZATION

Prospective Risk Equalization

The new Dutch basic health insurance is aimed at guaranteeing equal access to a package of health-care benefits required by law. In this new scheme the insured pay an income-dependent premium to a Central Fund and a nominal premium of about 1,100 euro directly to their insurer (Figure 1). Insurers are obliged to accept every eligible applicant, while it is forbidden to differentiate the nominal premium. In order to avoid subtle forms of preferred risk selection and insolvency of insurance companies, the Central Fund determines compensations and contributions, which the insurers receive and pay for the individuals insured in their insurance pool (Pupp, 1981; van Vliet, 2000). The compensations are funded by the income-dependent premium revenues as well as the contributions by insurers. The compensations and contributions are prospectively calculated, based on age, gender, diagnostic cost groups (DCG), pharmacy cost groups (PCG), degree of urbanization, and eligibility status (van de Ven, van Vliet, and Lamers, 2004). Ideally, the compensation or contribution for insured i equals the expected costs of i minus the "standard" nominal premium (van Vliet, 1992). The insurers are competing on the level of the nominal premium. For more details of the (developments) in the Dutch social health insurance, we refer to Schut and van de Ven (2005).

Whereas risk equalization reduces incentives for cream skimming and avoids problems for the insurer's solvency, it will also lead to a lower premium rebate that the insurer can offer to those insured opting for a deductible (see section "Selection Effect").

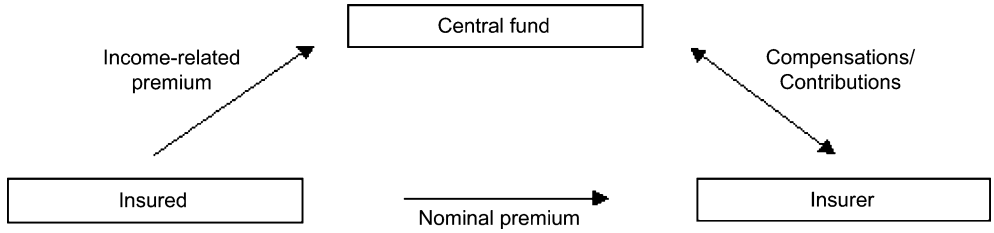
Cost Reduction Resulting from Deductibles

According to Bakker, van Vliet, and van de Ven (2000), the cost reduction resulting from a deductible compared to full insurance consists of three components: cost sharing, a cost reduction because of decreased moral hazard, and a reduction in administration costs. These components are briefly described within the context of the new Dutch mandatory basic health insurance.

Cost Sharing. Insured having a deductible have to pay the costs up to the deductible amount out-of-pocket, resulting in a shift of costs from the insurer to the insured (compared to full coverage). Within a competitive health insurance market, insurers will be forced to reflect this cost reduction in the premium rebate.

Cost Reduction Because of Decreased Moral Hazard. A second component of the cost reduction resulting from a deductible is a reduction in moral hazard. Moral hazard

FIGURE 1
The New Dutch Mandatory Basic Health Insurance Scheme



can be defined as the increase of (more expensive) health-care consumption because of insurance. One of the most authoritative investigations in estimating the effect of coverage on health consumption is the RAND-experiment (Manning et al., 1987; Newhouse, 1993). On the basis of this experiment Keeler et al. (1988) conclude that full coverage leads to about 70 percent higher health costs compared to a situation without insurance. Whereas broad coverage could lead to an *increase* of health-care consumption, less coverage (e.g., deductibles) could lead to a *decrease* of health-care consumption. Keeler et al. (1988) report that in the RAND-experiment, deductibles between $50 and $1,000 led to a cost reduction of between 15 and 39 percent of the average health costs ($842). Since the RAND-setting is U.S.-specific and already more than twenty years old, one may not directly conclude that a deductible will lead to a similar reduction in moral hazard in the new Dutch mandatory health insurance. Gardiol, Geoffard, and Grandchamp (2005) have studied the effects of deductibles on health-care expenditures in the context of the Swiss mandatory health insurance. They report 33.6 percent lower expenditures for insured with a high deductible compared to insured with a low deductible. They found that this difference can be attributed to a selection effect (17.1 percent) and to a reduction in moral hazard (16.5 percent). van Vliet (2001, 2004) has investigated the reduction in moral hazard resulting from deductibles among the privately insured in the Netherlands. He reports that deductibles between 50 and 800 euro result in a reduction in health expenditures in the range of 8 to 14 percent relative to the average total health costs of 1,072 euro. Other Dutch studies[2] about the effect of insurance on medical expenses among privately insured report similar results (Rutten, 1978; Starmans and Verkooijen, 1990; van der Gaag and van de Ven, 1978; van Vliet and van de Ven, 1986).[3]

Reduction in Administration Costs. In a reimbursement scheme, a third component of the cost reduction resulting from a deductible could be a reduction in administration costs. Since the costs under the deductible amount have to be paid out-of-pocket, most of the insured will not send their bills to the insurer before the total amount

[2] For a broad overview of other studies, see Bakker (1997).

[3] It should be noted that there are some crucial differences between the private health insurance market and the new Dutch mandatory health insurance, such as the higher average income of the privately insured, the way in which health consumption is financed (reimbursement in the private market vs reimbursement and "delivery in kind" in the new mandatory health insurance) and the absence of an open enrollment in the private market.

exceeds the deductible. Consequently, the insurer does not have to handle the bills of those with health costs below the deductible amount (in the period for which the deductible holds). In the new Dutch scheme, part of the health-care interventions are delivered in kind. In such a situation, bills are settled between the insurer and providers, presumably resulting in hardly any reduction in administration costs due to deductibles.

Selection Effect

Within a competitive health insurance market without risk equalization, the premium rebate is not only a reflection of this cost reduction, but also of the effect of adverse selection. Adverse selection can be defined as the selection that occurs because high risks have a greater incentive to buy (more) insurance coverage than low risks within the same premium risk group. Many studies have found evidence of adverse selection within the health insurance market (Browne, 1992; Gardiol, Geoffard, and Grandchamp, 2005). In the context of this study, adverse selection occurs because the healthy insured have a greater incentive to opt for a deductible than the unhealthy insured. In a heterogeneous risk pool, adverse selection will result in average health costs that are lower for the (relatively healthy) insured having a deductible than the (relatively unhealthy) insured without a deductible. Competition will force the insurer to increase the premium for the latter and decrease the premium (i.e., increase the premium rebate) for the former. If risk pools are more heterogeneous, this effect of adverse selection will be larger.

As considered in the "Introduction" section, this adverse-selection component will be smaller in case of risk equalization among insurers. If risk equalization fully compensates for the differences in health risks between the insured with a deductible and the insured with full coverage then the adverse-selection component of the premium rebate is zero (although there might be substantial adverse selection).

Research Question

In this article we assume that the consumer's direct premium to the insurer is community rated. The better the risk equalization system compensates for differences in costs due to differences in health status, the smaller will be the premium rebate for the insured opting for a voluntary deductible. If risk equalization completely compensates for differences in health, then the premium rebate exclusively consists of cost sharing, a reduction in moral hazard, and a reduction of administration costs. This will be the case if the level of deductible is used as a risk adjuster in calculating the compensations and contributions for risk equalization. In such a situation, the effect of adverse selection is fully reflected in these compensations and contributions and cannot be reflected in the premium rebate.

The central question of this article is whether, in a situation of accurate risk equalization, the cost reduction resulting from a deductible will recover the community-rated premium rebate. The importance of this question lies in the implications of community rating in a situation where the actual cost reduction resulting from a deductible does not exceed the offered premium rebate. Such a "loss" will force the insurers to decrease the premium rebate, resulting in less of the insured taking a deductible, an even lower cost reduction for the insurer, a further decrease of the premium rebate,

and so on. Over time, this so-called adverse selection spiral could lead to none of the insured taking a deductible and no reduction in moral hazard.

If the cost reduction arising from a deductible does not recover the offered *community-rated* premium rebate, it may be wise to allow the insurers to *risk rate* the premium rebate. In the "Results" section we report an analysis in which we calculated the actual cost reduction. This was done for a community-rated premium rebate, an "age/gender"-related premium rebate and a "completely" risk-rated premium rebate. In this analysis we had to make several assumptions with respect to the insured's choice.

CHOICE OF TAKING A DEDUCTIBLE

With the choice of taking a deductible the insured can choose between full coverage and paying the cost up to a certain amount out-of-pocket. Choosing the latter would mean that an insured receive a rebate on the premium paid for full coverage. Presumably, a rationally behaving insured only takes a deductible if the offered premium rebate exceeds his "demanded" premium rebate. Within the competitive new scheme the *offered* premium rebate will probably be a reflection of the (expected) cost reduction from a deductible, as described in the previous section. This section describes the main components that we expect to affect the *demanded* premium rebate.

Demanded Premium Rebate

Presumably, the demanded premium rebate consists of the expected health costs that have to be paid out-of-pocket plus an expected compensation for increased uncertainty, transaction costs, and perhaps other efforts.

Expected Out-of-Pocket Expenditure. A rational, income-optimizing insured will not take a deductible if the offered premium rebate is lower than his expected out-of-pocket expenditure. The latter depends on the individual's health status and his perception of the probability and cost of health-care consumption.

Risk Aversion. A risk averse individual will not spend part of his income on a lottery to win the same expected amount (Lapré and Rutten, 1999). Similarly, a risk averse insured will not take a deductible if the premium rebate "just" equals his expected out-of-pocket expenditure. The demanded premium rebate for a risk averse utility-optimizing insured will be higher than (just) his expected out-of-pocket expenditure since a higher deductible increases the uncertainty of incurring high health-care expenditure. A higher level of risk aversion leads to a higher demanded premium rebate.

Transaction Costs. Although the benefit package in the Dutch basic health insurance is to be determined by law, it will take the insured some (mostly immaterial[4]) costs to switch between different deductible plans (Pauly and Kunreuther, 2004). The higher these costs are, the less attractive it will be for the insured to switch between these plans. However, these costs are expected to be low since there will be only five deductible amounts.

[4] In terms of time or other efforts.

Conclusion

Concluding this section, we assume the insured to take a deductible if the offered premium rebate exceeds the demanded premium rebate. In the simulation, the offered premium rebate is assumed to be a reflection of the (expected) cost reduction resulting from a deductible and the demanded premium rebate is assumed to consist of the expected out-of-pocket expenditure and a compensation for uncertainty.

METHOD

Answering the research question would have been easy if any country[5] in the world had mandatory health insurance with both "accurate" risk equalization and voluntary deductibles at the time this study was executed. Since this was not the case, we had to conduct a simulation analysis.

By means of the simulation analysis we examined whether a community-rated premium rebate leads to an adverse selection spiral in a situation of accurate risk equalization. We simulated the extent of the cost reduction resulting from a deductible under several assumptions with respect to the level of risk aversion and the reduction in moral hazard. Additionally, we simulated two other scenarios in order to examine whether a risk-rated premium rebate can avoid an adverse selection spiral.

These simulations are based on a data set[6] of 38,631 insured who were enrolled in the same Dutch sickness fund[7] during the whole year 1995. In the analysis we assumed this data set to constitute a single insurance pool. For reasons of transparency we only took into account a deductible of 500 euro, although the insured in the new Dutch basic health insurance are offered five levels of deductible.

Three Scenarios

As depicted in Table 1, each scenario is characterized by a different level of risk rating, varying from a community-rated premium rebate to a completely risk-rated premium rebate. Since our data set includes only age, gender, "DCG" (Lamers, 1998, 1999b), "PCG"[8] (Lamers, 1999a), degree of urbanization, and eligibility status as explanatory variables, we assumed that the choice of taking a deductible can be fully explained by these variables. Consequently, risk rating according to these variables results in no consumer information surplus. These variables are nearly the same as included in the calculation of the compensations and contributions for risk equalization in the new Dutch mandatory health insurance scheme.

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[5] Although Switzerland has a sickness fund scheme with voluntary deductibles, adverse selection spirals do not occur there since risk equalization is far from accurate.

[6] This data set is constructed by Leida Lamers. For detailed information of the data set we refer to her dissertation, Capitation Payments to Competing Dutch Sickness Funds Based on Diagnostic Information from Prior Hospitalisations (Lamers, 1997).

[7] Until 2006, the sickness fund insurance has been the mandatory basic health insurance for about 65 percent of the Dutch population. The other 35 percent of the population had private health insurance. With the introduction of the new scheme on January 1, 2006 there comes an end to the co-existence of these schemes.

[8] In the new Dutch mandatory health insurance, DCGs and PCGs will be used for calculating the risk adjusted compensations and contributions for risk equalization. DCGs are based on inpatient hospital information and PCGs are based on outpatient pharmacy information.

TABLE 1
Scenarios

	Premium Rebate Differentiated According to . . .
Scenario I	–
Scenario II	Age and gender
Scenario III	Age, gender, DCG, PCG, degree of urbanization, and eligibility status

For each scenario we aimed to examine the annual number of insured taking a deductible in order to find out whether an adverse selection spiral will occur over time.

Thus, in our insurance pool, there is just 1 premium risk group in scenario I (community-rating), there are 18 premium risk groups (based on age and gender) in scenario II and there are in theory 16,200 premium risk groups (based on all six variables) in scenario III. For practical reasons, it is not likely that insurers will indeed differentiate the premium rebate according to all these risk factors. If government would allow insurers to differentiate the premium rebate, then the level of risk rating would likely resemble scenario II. Moreover, there would probably always be some consumer information surplus. This implies that even if the premium rebate is risk-rated according to all these variables, reality will have more in common with scenario II than with scenario III.

Data

The data set includes individual level data from *one* sickness fund on health care costs of inpatient room and board, both inpatient and outpatient specialist care, dental care, obstetrics and maternity care, paramedical services (physiotherapy and speech therapy), and sick-transport. Costs of medical care provided by a general practitioner are not included in the data set. This is because of the uniform annual fee that the general practitioner receives for each sickness fund member in his practice regardless of medical consumption. Next to the costs of health care, the data set includes variables such as age, gender, type of supplementary insurance, number of hospital admissions, and zip code. Since PCG and degree of urbanization[9] in 1995 had already been composed and supplemented to the data set, the only variable to be derived was DCG. This variable was approximated by the number of days of hospitalization.

The average health costs in the 1995 data set are 780 euro. As a result of both inflation and the aging of the population, the average costs of the same benefit package were about 1,560 euro in 2004. The data set is corrected for this cost expansion. In order to simulate the premium rebate and the number of insured taking a deductible over a period longer than just one year, we created a multiyear data set by using the 1995 data set repeatedly.

Offered and Demanded Premium Rebate

We assume the insured to take a deductible if the offered premium rebate (OPR) exceeds the demanded premium rebate (DPR). As mentioned before, the demanded

[9] Derived from zip code.

premium rebate of individual i is assumed to be the sum of his expected out-of-pocket expenditure $E(\text{OOPE}(d))_i$ plus a compensation for uncertainty C_i:

$$\text{DPR}_i = E(\text{OOPE}(d))_i + C_i. \tag{1}$$

Because of a lack of experience with regard to the new scheme, it will be difficult for the insurers to determine the premium rebate for the first year after the introduction. We assume the insurer to equate the premium rebate of risk group j (for year 1) with the average expected health cost up to the deductible amount $\overline{E(\text{OOPE}(d))}_j$ plus the average expected reduction in moral hazard $\overline{E(\text{RMH})}_j$:

$$\text{OPR}_{j,\text{year1}} = \overline{E(\text{OOPE}(d))}_{j,\text{year1}} + \overline{E(\text{RMH})}_{j,\text{year1}}. \tag{2}$$

After year 1, the insurer has experienced the actual cost reduction resulting from insured having a deductible in risk group j. For the following years, we assume the insurer to equate the premium rebate for a deductible in risk group j for year t with the actual average cost reduction from the insured having a deductible in risk group j in year $t-1$:

$$\text{OPR}_{j,\text{year}t} = \overline{(\text{OOPE}(d))}_{j,\text{year}t-1} + \overline{\text{RMH}}_{j,\text{year}t-1}. \tag{3}$$

Expected Out-of-Pocket Expenditure

We estimated the *total* individual health costs Y by Equation (4) with age, gender, PCGs, DCGs, degree of urbanization, and eligibility status as explanatory variables:

$$E(Y)_i = e^{\beta 0+\beta 1*X1+\beta 2*X2.....+\beta z*Xz}. \tag{4}$$

Then, we estimated the individual expected out-of-pocket expenditure by formula (5), in which we assume individual total health costs to have a gamma distribution with parameters c and k. For a deductible amount of d euro, the expected out-of-pocket expenditure equals (van Vliet, 1995):

$$E(\text{OOPE}(d))_i = E(Y)_i * \Gamma(c, k+1) + d * (1 - \Gamma(c, k)) \tag{5}$$

with

$$c = d * \lambda, \text{and } \lambda = k/E(Y)_i \tag{6}$$

and with $\Gamma(.)$ the cumulative density function of the gamma distribution with parameters c and k. Equation (5) can be seen as the weighted sum of the expected out-of-pocket expenditure if health costs are below d and the expected out-of-pocket expenditure if health costs exceed d. Respectively, the weighting factors are $\Gamma(c, k)$ and $1 - \Gamma(c, k)$, i.e., the probability of $(Y < d)$ and the probability of $(Y > d)$. From Table 2 it can be

TABLE 2
Actual Costs, Actual Costs < 500, and $E(\text{OOPE}(d))$ in the Data Set

	Mean	Minimum	Maximum
Actual costs	1,560	0	184,096
Actual costs < 500	334	0	500
$E(\text{OOPE}(d))$	322	214	490

concluded that the prediction with Equation (5) closely agrees with the actual average costs below d.

Compensation for Increased Uncertainty

The compensation C for (increased) uncertainty resulting from having a deductible can be defined as a monetary compensation demanded by the insured for facing more uncertainty about the occurrence of health costs compared to full coverage. We calculated this compensation by Equation (7).

$$C_i = 0.5 * S^2(E(\text{OOPE}(d)))_i * r \tag{7}$$

with r the measure of risk aversion developed by Pratt (1964) and $S^2(E(\text{OOPE}(d)))_i$ the variance in the costs up to the deductible amount. We calculated $S^2(E(\text{OOPE}(d)))_i$ by Equation (8) (Bakker, 1997):

$$S^2(E(\text{OOPE}(d)))_i = E(Y)_i^2 * (1 + (1/k)) * \Gamma(c, k+2) + d^2(1 - \Gamma(c,k)) - E(\text{OOPE}(d))_i^2. \tag{8}$$

The higher the variance in $E(\text{OOPE}(d))_i$, the higher will be the uncertainty about the out-of-pocket expenditure and the higher will be the compensation for uncertainty demanded by a risk averse insured. van de Ven and van Praag (1981) found an uncertainty compensation of 80 percent relative to the average expected out-of-pocket expenditure, corresponding to $r = 0.0067$. Another rare study on this subject reports r-values of $r = 0.00094$ and $r = 0.00113$ (Marquis and Holmer, 1986). In order to compensate for the variety in these results, our simulation incorporated three different values of r, which are $r = 0$, $r = 0.003$, and $r = 0.005$. Notice that for a risk-seeking individual the uncertainty compensation would be negative. In our simulation we only took into account situations in which the insured are risk neutral ($r = 0$) or risk averse ($r = 0.003$ or $r = 0.005$).

Cost Reduction Because of Decreased Moral Hazard

The study results mentioned in the "Cost Reduction Because of Decreased Moral Hazard" section can be influenced by the context in which deductibles are arranged. Therefore, we should not overestimate the reduction in moral hazard. To avoid

overestimations, we assumed the total reduction in moral hazard relative to the average total health costs to equal m, with $0 < m < 0.1$. In the analyses we took into account $m = 0$, $m = 0.05$, and $m = 0.1$, i.e., a reduction in moral hazard of 0, 0.05, and 0.1 relative to the average total health costs, respectively.

The insured only have an incentive for *efficient* health consumption until their health costs exceed the deductible amount. We calculated the individual reduction in moral hazard by Equation (9).

$$\tilde{m} * E(\text{OOPE}(d))_i, \tag{9}$$

with $\tilde{m}$ chosen such that the average reduction in moral hazard of the insured having a deductible relative to the average health costs of these insured equals m.

RESULTS

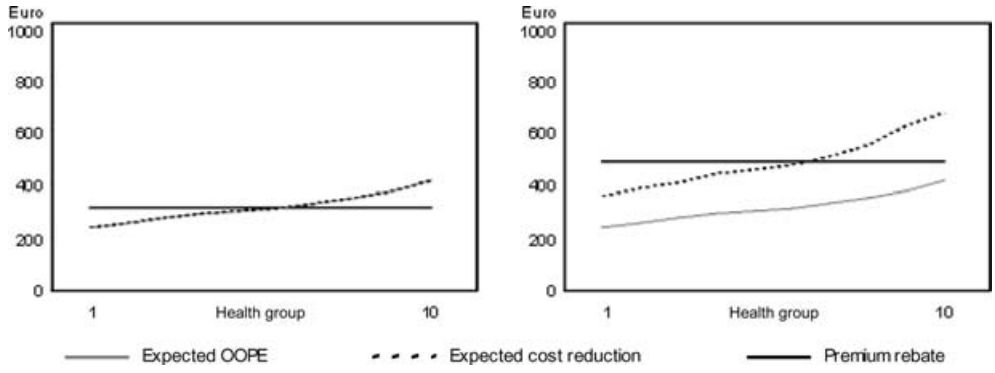
If the expected individual health costs $E(Y)_i$ and the expected out-of-pocket expenditure $E(\text{OOPE}(d))_i$ are calculated by formulas (4)–(6), the $E(\text{OOPE}(d))_i$ appears to vary between €214 and €490. Based on $E(\text{OOPE}(d))_i$, the insured can be categorized in "health" groups such that each "health" group represents about one-tenth of the entire population. Following this categorization, "health" group one contains the healthiest insured and "health" group ten contains the unhealthiest insured. A change in either health status or probability to consume medical care is reflected in $E(\text{OOPE}(d))_i$, possibly resulting in a switch between "health" groups. Table 3 presents the average, minimum, and maximum expected out-of-pocket expenditures in these ten health groups.

In subsequent graphs these ten health groups define the x-axis. It is important to keep in mind that these health groups are just a reflection of $E(\text{OOPE}(d))_i$, taking into account age, gender, PCGs, DCGs, degree of urbanization, and eligibility status.

TABLE 3
"Health" Groups (N = 38,631)

"Health" Group	Percent of N (%)	Average $E(\text{OOPE}(d))$	Minimum $E(\text{OOPE}(d))$	Maximum $E(\text{OOPE}(d))$
1	10	242	214	254
2	10	260	254	270
3	10	280	270	294
4	10	300	294	304
5	10	308	304	312
6	10	318	312	332
7	10	338	332	350
8	10	356	350	368
9	10	384	368	398
10	10	420	398	490

FIGURE 2
Expected Out-of-Pocket Expenditure, Expected Cost Reduction, and (Community Rated) Premium Rebate for Year 1 with m = 0 (Left) and m = 0.1 (Right)



Scenario I "Community-Rated Premium Rebate"

In this scenario the premium rebate is community rated, which means that all insured receive the same premium rebate for a deductible of 500 euro. The expected financial benefit from taking a deductible equals the offered premium rebate minus the expected out-of-pocket expenditure. In this scenario the expected financial benefit is higher for the healthy insured than for the unhealthy insured, as is shown in Figure 2.

Figure 2 depicts the situation for year 1 in which the insurer bases the premium rebate on the average expected cost reduction under the assumption that all of the insured will take a deductible. The gray line stands for the average expected out-of-pocket expenditure per health group. If the expected cost reduction (dashed line) for the insurer only consists of the expected out-of-pocket expenditure (left graph) then the expected financial benefit is positive for the healthy insured and negative for the unhealthy insured. A "substantial" reduction in moral hazard (right graph) increases the average expected cost reduction to such an extent that the premium rebate could exceed the deductible amount. In such a situation, the unhealthiest insured have an expected financial benefit from taking a deductible too.

In this scenario, taking a deductible is more attractive for the healthy insured than for the unhealthy insured. Figure 3 shows the percentage of insured taking a deductible per health group. As is shown, the unhealthiest insured are the last to be inclined to take a deductible if the premium rebate does not exceed the deductible amount.

We assumed that the insured do only take a deductible if the premium rebate exceeds the expected out-of-pocket expenditure plus the compensation for increased uncertainty. As can be seen from the left graph in Figure 2, the expected cost reduction from the insured taking a deductible is on average lower than the offered premium rebate. This means that the offered (community-rated) premium rebate is expected to result in a loss for the insurer, which will force the insurer to decrease the premium rebate for year 2. In year 2 the community-rated premium rebate will still lead to adverse selection, which will again result in a financial loss. Over time, this so-called adverse

FIGURE 3
Percentage of Insured Taking a Deductible in Exchange for a Community-Rated Premium Rebate in Year 1 per "Health" Group

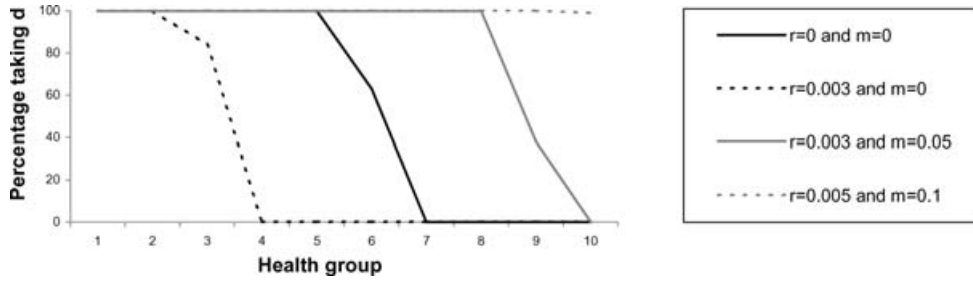


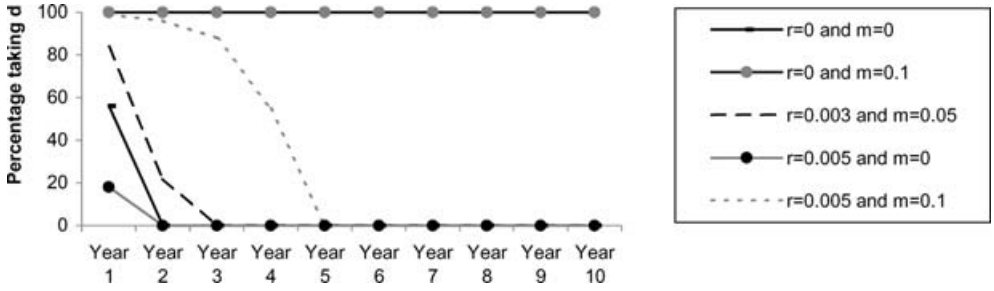
TABLE 4
Percentage of Insured Taking a Deductible in Exchange for a Community-Rated Premium Rebate (100 = N = 38,631 Insured)

		Reduction in Moral Hazard		
Year	Level of Risk Aversion	m = 0	m = 0.05	m = 0.1
1	r = 0.000	56	93	100
	r = 0.003	28	84	99
	r = 0.005	18	76	99
2	r = 0.000	0	79	100
	r = 0.003	0	22	98
	r = 0.005	0	0	96
3	r = 0.000	0	23	100
	r = 0.003	0	0	97
	r = 0.005	0	0	88
4	r = 0.000	0	0	100
	r = 0.003	0	0	95
	r = 0.005	0	0	55

selection spiral leads to very low premium rebates resulting in none of the insured taking a deductible.

Table 4 shows how fast the annual percentage of insured taking a deductible decreases as a result of this spiral of adverse selection. It needs to be mentioned that with a reduction in moral hazard of 10 percent ($m = 0.1$) the premium rebate is a little bit lower than the deductible amount. The spiral of adverse selection occurs in every situation, except in the situation of $m = 0.1$ *and* $r = 0$. Although the premium rebate in this situation is a little lower than the deductible amount, it does exceed the expected out-of-pocket expenditure of the unhealthiest insured (490 euro, see Table 3). Consequently, all of the insured take a deductible and no spiral of adverse selection occurs. If the demanded premium rebate also consists of a compensation for uncertainty, i.e., if ($r > 0$), then the offered premium rebate does not exceed the demanded premium rebate of the unhealthiest insured.

FIGURE 4
Percentage of Insured Taking a Deductible in Exchange for a Community-Rated Premium Rebate, Under Several Assumptions With Respect to the Level of Risk Aversion (r) and the Reduction in Moral Hazard (m) (100% = N = 38,631 Insured)



Next to the occurrence of an adverse selection spiral, the simulation results in Table 4 reveal two other issues. In the first place, a larger reduction in moral hazard leads to a higher percentage of insured taking a deductible. This is not surprising since a larger (expected) reduction in moral hazard raises the premium rebate. Second, a higher level of risk aversion leads to a lower percentage of insured taking a deductible. Since a higher level of risk aversion will be reflected in a higher demanded premium rebate, less of the insured do take a deductible in exchange for a given premium rebate.

Expanding the period of time to ten years reveals that the number of insured taking a deductible eventually drops to zero in every situation where not *all* of the insured take a deductible in year 1 (Figure 4).

From these results it can be concluded that the total cost reduction for the insurer only recovers the community-rated premium rebate if the reduction in moral hazard is "substantial." If the average (expected) cost reduction from the insured having a deductible is not large enough to offer a premium rebate that is higher than the highest demanded premium rebate, then a spiral of adverse selection occurs. This will lead to none of the insured taking a deductible over time. As is shown in Table 3, the highest demanded premium rebate without risk aversion equals 490 euro, which is very close to the deductible amount. In reality the highest demanded premium rebate is likely to equal the deductible amount.

Scenario II "Partly Risk-Rated Premium Rebate"

We simulated a second scenario in order to examine whether an adverse selection spiral is less likely to occur in a situation where insurers are allowed to differentiate the premium rebate. In this scenario the premium rebate is differentiated according to age and gender, resulting in eighteen premium risk groups, as mentioned in the "Three Scenarios" section. Under the same assumptions with respect to the choice of taking a deductible, a higher level of risk rating leads to an increasing expected financial benefit for the unhealthy insured. As is shown in Figure 5, the opposite holds for the healthy insured.

FIGURE 5
Expected Out-of-Pocket Expenditure, Expected Cost Reduction, and Premium Rebate (Differentiated According to Age and Gender) in Year 1 with m = 0 (Left) and m = 0.1 (Right)

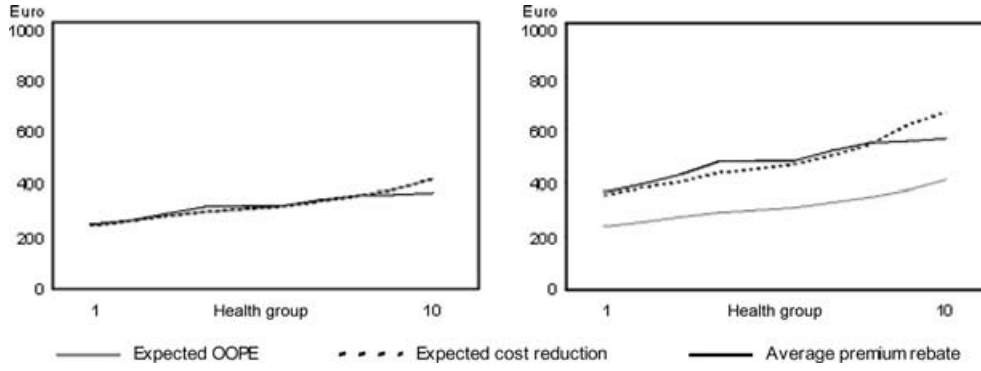
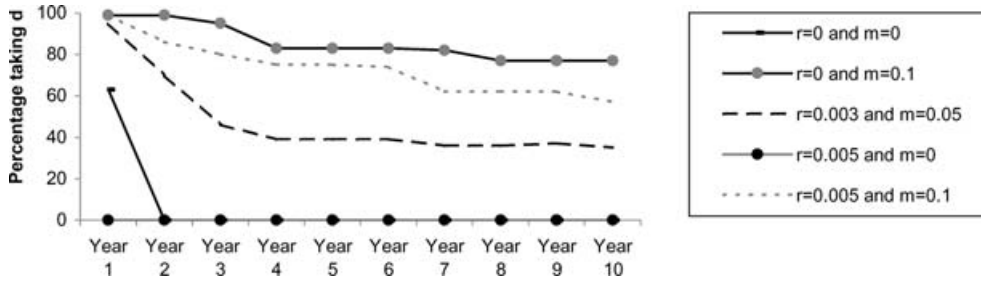


FIGURE 6
Percentage of Insured Taking a Deductible in Exchange for a Premium Rebate Differentiated According to Age and Gender, Under Several Assumptions with Respect to the Level of Risk Aversion (r) and the Reduction in Moral Hazard (m) (100 = N = 38,631)



Consequently, a (partly) risk-rated premium rebate makes it more attractive for the unhealthy insured to take a deductible. If relatively more of the unhealthy insured take a deductible then the average cost reduction for the insurer will be larger since these insured have a higher out-of-pocket expenditure. The question is whether this avoids a spiral of adverse selection. Figure 6 shows that in this scenario the number of insured taking a deductible seems to stabilize above zero if $m > 0$. A larger reduction in moral hazard increases the premium rebates for the different risk groups, resulting in more of the insured taking a deductible. A higher level of risk aversion leads to a higher demanded premium rebate, resulting in less of the insured taking a deductible for a given premium rebate.

Table 5 reveals another interesting result. This table depicts the percentage of insured taking a deductible in the nine premium risk groups for women in year 1 and year 10 under the assumption of $m = 0.05$ and $r = 0.003$. Since the probability to consume health care increases with age, the high-age groups contain relatively more high-risk individuals than the low-age groups. It shows that if not all insured in a premium

TABLE 5
Percentage of Insured Taking a Deductible in Exchange for a Premium Rebate Differentiated According to Age and Gender per Premium Risk Group for Women (m = 0.05 and r = 0.003)

	0–9	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80+
Year 1	97	97	97	96	94	94	98	100	100
Year 10	0	0	0	0	0	0	57	100	100

risk group take a deductible in year 1 then a spiral of adverse selection leads to a drop of the percentage of insured taking a deductible to zero. In other words, the spiral of adverse selection occurs in every premium risk group in which the premium rebate does not exceed the highest demanded premium rebate. This will generally be the case if the premium rebate does not exceed the deductible amount since the highest demanded premium rebate is close to 500 euro.

Thus, a spiral of adverse selection occurs in every premium risk group in which the unhealthiest insured do not take a deductible. Nonetheless, the total number of insured taking a deductible is higher than with a community-rated premium rebate since risk rating easily leads to some premium rebates exceeding the deductible amount. This will be the case for premium risk groups with relatively many high-risk individuals. Because the risk-rated premium rebate reflects the high (expected) out-of-pocket expenditure of these insured, only a small reduction in moral hazard is needed to lift the premium rebate over the deductible amount. So, in the long run, the percentage of insured taking a deductible mainly depends on the reduction in moral hazard. A larger reduction in moral hazard leads to more premium rebates exceeding the deductible amount and a higher percentage of insured taking a deductible.

Scenario III "Completely Risk-Rated Premium Rebate"

In the third scenario the premium rebate is completely risk rated, implying that the premium rebate equals the expected individual cost reduction resulting from a deductible. Figure 7 shows that without a reduction in moral hazard, the premium rebate exactly equals the individual expected out-of-pocket expenditure. If all insured are risk neutral they will be indifferent to taking a deductible. A small cost reduction because of decreased moral hazard will lead to all insured taking a deductible since the offered premium rebate then exceeds their demanded premium rebate. However, none of the insured will take a deductible if they are risk averse and there is no reduction in moral hazard.

As shown in Figure 7, the unhealthy insured benefit more from taking a deductible in exchange for a completely risk-rated premium rebate than the healthy insured. Since the expected financial advantage from taking a deductible increases with a worse health status, it will be the healthiest insured who are the first to be inclined *not* to take a deductible. This is shown in Figure 8, which presents the percentage of insured taking a deductible in year 1 per health group.

FIGURE 7
Expected Out-of-Pocket Expenditure, Expected Cost Reduction, and (Completely Risk-tRated) Premium Rebate in Year 1 with m = 0 (Left) and m = 0.1 (Right)

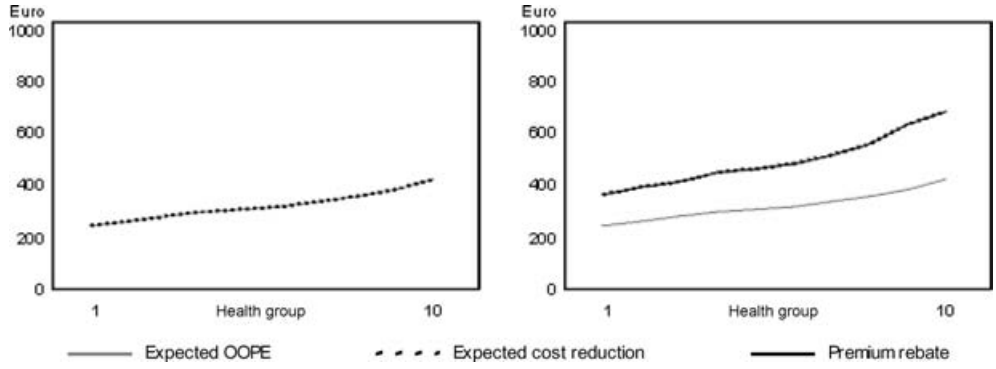
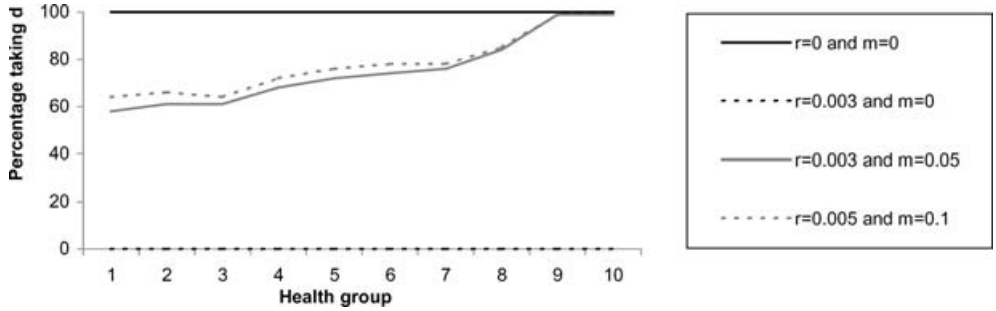


FIGURE 8
Percentage of Insured Taking a Deductible in Exchange For a Completely Risk-Rated Premium Rebate in Year 1 per "Health" Group (100 = N =38,631)



Thus, in this scenario the percentage of insured taking a deductible mainly depends on the level of risk aversion and the cost reduction because of decreased moral hazard (see Equation (1)). If there is no reduction in moral hazard, i.e., if $m = 0$, then the premium rebate equals the individual expected out-of-pocket expenditure of the insured. This implies that they do not take a deductible in a situation where they are risk averse, i.e., if $r > 0$. If the insured are risk averse they demand for a compensation for increased uncertainty resulting in a demanded premium rebate that is higher than the expected out-of-pocket expenditure. If there is a reduction in moral hazard, i.e., if $m > 0$, then the insured take a deductible if the absolute reduction in moral hazard is larger than the demanded compensation for increased uncertainty.

CONCLUSION, IMPLICATIONS, AND DISCUSSION

Conclusion

The Dutch government has proposed to introduce a voluntary deductible into the new Dutch mandatory health insurance scheme. A crucial issue with regard to the practical implementation of a voluntary deductible in this scheme is whether the premium

rebate should be community rated or risk rated. In the new scheme there is risk equalization among insurers, which is aimed to avoid preferred risk selection and insolvency of insurance companies. As part of risk equalization the insurers receive a compensation for the high-risk individuals in their insurance pool and have to pay a contribution for the low-risk individuals. A side effect of risk equalization is that it compensates for cost differences due to differences in health status between the insured choosing a deductible and the insured choosing full coverage. If risk equalization completely compensates for differences in costs between these groups due to their different health status, then the premium rebate for a deductible can only consist of cost sharing and moral hazard. The Dutch government has decided that the premium rebate for a deductible must be community rated.

In this study we aimed to examine whether, in a situation where the premium rebate can only be based on cost sharing and moral hazard, the total cost reduction from the insured having a deductible can recover a community-rated premium rebate. Four important conclusions can be drawn from this analysis.

In the first place, the number of insured taking a deductible increases as the reduction in moral hazard grows larger, whereas the opposite holds for a higher level of risk aversion. A larger reduction in moral hazard results in a higher (expected) cost reduction, a higher premium rebate, and more of the insured taking a deductible. A higher level of risk aversion makes the insured demand a higher compensation for uncertainty, resulting in less of the insured taking a deductible in exchange for a *given* premium rebate.

Second, a higher level of risk-rating goes hand in hand with a higher expected financial benefit from taking a deductible for the relatively unhealthy insured. If the premium rebate is community rated, the cost reduction from the unhealthy insured having a deductible returns in the premium rebate of all insured having a deductible. The higher the level of risk rating, the more the cost reduction from insured i will be reflected in the premium rebate for i, and the more attractive it becomes for the unhealthy insured to take a deductible. Obviously, the opposite holds true for the healthy insured, whose expected financial advantage is highest with a community-rated premium rebate.

Third, no spiral of adverse selection occurs as long as the community-rated premium rebate does exceed the highest demanded premium rebate within the insurance pool. In general terms, this will be the case if the community-rated premium rebate exceeds the deductible amount. If the reduction in moral hazard is too small for offering such a premium rebate then taking a deductible is no longer expected to be financially beneficial for *every* insured within the pool. In such a situation it will be the unhealthiest insured who are first inclined not to take a deductible, resulting in a decline of both the premium rebate and the number of insured taking a deductible. Ultimately, this will result in a spiral of adverse selection such that no insured will take a deductible in the end.

Fourth, a spiral of adverse selection may also occur in a situation where the premium rebate is related to a restricted set of relevant risk factors such as age and gender, for instance. Under the assumption that the insured behave rationally and know whether they are a low- or high-risk within their premium risk group, only premium

risk groups with a rebate exceeding the highest demanded premium rebate within that group are safe from a spiral of adverse selection. In the long run, the percentage of insured taking a deductible depends on the number of premium risk groups fulfilling this requirement.

Implications for Policy

The overall conclusion of our study is the existence of a trade-off between the effects of adverse selection and the (un)desirability of risk rating. Since the (un)desirability of risk rating is mainly a political issue, we limit ourselves to quoting some technical recommendations based upon the assumption that the introduction of a voluntary deductible is aimed to realize maximum cost reduction. From our conclusions, the implications for government policy are different for three conceivable situations.

In the first place, it could be that the community-rated premium rebate is *higher* than the highest *demanded* premium rebate in the risk pool, which will generally be the case if the premium rebate is higher than the deductible amount. In such a situation a community-rated premium rebate is not problematical since all insured take a deductible resulting in a maximum reduction in moral hazard.

In the second place, it could be that the community-rated premium rebate is much *lower* than the deductible amount. In such a situation we recommend that the government allow the insurers to risk rate the premium rebate. Risk rating could lead to premium rebates exceeding the deductible amount for the unhealthy insured, resulting in these insured taking a deductible every year. In the long run this will lead to a larger reduction in moral hazard than with a community-rated premium rebate. An adverse selection spiral could also be avoided by making the deductible compulsory.

In the third place, it could be that the community-rated premium rebate is just a little lower than the highest demanded premium rebate within the risk pool, i.e., it is a little below the deductible amount. In this situation the cost reduction could be at its largest if the government were to sponsor the gap between the premium rebate and the deductible amount. Fixing the premium rebate at the deductible amount will lead to all insured taking a deductible, resulting in a maximum reduction in moral hazard. A large reduction in moral hazard could outweigh the amount of sponsorship. *Mutatis mutandis* the same argument holds for certain risk groups in the case of a partly risk-rated premium rebate.

Limitations

This study illustrates the expected implications of a community-rated premium rebate for a deductible in combination with a risk equalization scheme. We had to make several assumptions since there has never been a mandatory health insurance scheme with both voluntary deductible and accurate risk equalization. Whether it will take two, three, or five years for a spiral of adverse selection to lead to no insured taking a deductible greatly depends on the assumptions with respect to the reduction in moral hazard and the choice of taking a deductible. Therefore, the crucial assumptions and their effects on our conclusions are briefly discussed.

We assumed the insured to behave rationally and to be able to make a reasonable estimation of their expected out-of-pocket expenditure in case of a deductible. In view

of the fact that some of them have never been faced with a choice of coverage it may be questioned whether they will indeed act in this way. Moreover, the expected out-of-pocket expenditure does not only depend on the probability of health-care consumption and prices of health care, but also on the individual perceptions of these probabilities and prices. It can even be questioned whether the insured are aware of prices and costs since the bills for a large number of health-care interventions are settled between insurers and providers. Especially in the first years after the introduction of the voluntary deductible, the insured will presumably be very careful about taking a deductible, possibly resulting in a spiral that is even faster than in our analysis.

We also assumed the reduction in moral hazard to be between 0 and 10 percent relative to total costs, which implies a reduction in moral hazard between 0 and about 50 percent relative to the costs up to the deductible amount. Since the deductible will not be higher than 500 euro (about one-fourth of average costs of the benefit package), it is doubtful whether our assumption of the upper boundary is realistic. If the insured suffering from a chronic disease know for sure that they will exceed the deductible amount, they will have no incentive for efficient health-care consumption. As can be concluded from our analysis, a low reduction in moral hazard makes it more likely that the actual cost reduction does not recover the offered premium rebate.

Further, we assumed the demanded premium rebate to consist exclusively of the individual expected out-of-pocket expenditure plus a compensation for uncertainty. However, in practice more factors may be relevant, such as income and age. In our analysis the level of risk aversion exclusively depends on the variance in expected out-of-pocket expenditure and is independent of individual characteristics.

Finally, in our analyses we assumed the insurers operating under the mandatory basic health insurance to be myopic, that is, they calculate the premium rebate in the first year under the assumption of no adverse selection. In reality, however, in particular after reading this article, they might anticipate adverse selection and prevent any losses by offering such a low community-rated premium rebate in the first year that no insured will choose a voluntary deductible.

On the basis of this article, one can be skeptical about the number of insured taking a deductible in new Dutch mandatory health insurance.

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