



The effect of reinsuring a deductible on pharmaceutical spending: A Dutch case study on low-income people

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ARTICLE INFO

Article history:

Received 9 January 2019

Received in revised form 1 July 2019

Accepted 7 July 2019

JEL classification:

I12

I13

C23

D12

Keywords:

Health insurance

Deductible

Reinsurance of consumer cost sharing

Pharmaceutical spending

Low-income people

ABSTRACT

Many countries have cost sharing schemes in health insurance to control health care expenditures. The Dutch basic health insurance includes a mandatory deductible of currently 385 euros per adult per year. To avoid affordability problems, several municipalities offer a group contract for low-income people in which the mandatory deductible is 'reinsured'. More specifically, this means that out-of-pocket spending under the deductible is covered by supplementary insurance.

By comparing groups with and without the reinsurance option, this study examines whether low-income people are price-sensitive when it comes to pharmaceutical spending. We use a unique dataset from a Dutch health insurer with anonymized individual insurance claims for the period 2014–2017. The data allows for a clean difference-in-difference analysis as it contains both municipalities without reinsurance and municipalities that introduced reinsurance on January 1st 2017.

We find that the introduction of reinsurance led to a statistically significant increase in pharmaceutical spending of 16% in the first quarter of 2017 and 7% in the second quarter. For the second half of 2017 the effect is small and not statistically significant. This study adds to the evidence that low-income people are indeed price-sensitive when it comes to pharmaceutical spending.

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1. Introduction

In response to rising health care spending, many countries have increased the level of consumer cost sharing in their regulated health insurance schemes [1]. The Netherlands is no exception to this trend: the annual mandatory deductible in the basic health insurance for curative care has gradually increased from 150 euros per adult per year in 2008 to 385 euros in 2017. The current deductible level has led to concerns about the affordability of health care and the potential avoidance of necessary care, especially among people with low income. In response to these concerns, several municipalities in the Netherlands offer a group contract for low-income people in which the deductible is reinsured. More specifically, this reinsurance option implies the mandatory deductible is waived in return for a higher monthly premium.

By comparing group contracts for low-income people with and without the reinsurance option, this study examines whether low-income people are price-sensitive. More specifically, we analyze the effects of reinsuring the deductible on pharmaceutical spending, using a unique anonymized dataset from a Dutch insurance company with individual-level spending and characteristics for the period 2014–2017. The data includes three group contracts in which reinsurance was introduced (on January 1, 2017) and three group contracts in which reinsurance was not introduced. This data allows a clean difference-in-difference study to estimate the effects of reinsurance on health care spending.

A vast amount of literature shows that cost sharing reduces health care spending. Two of the most prominent studies on the effect of cost sharing are the RAND health insurance experiment and the Oregon health insurance experiment. The RAND experiment found that people with a deductible spent less on health care compared to people with full insurance coverage [2,3]. In the Oregon experiment the likelihood of having a hospital admission, outpatient care or taking prescription drugs increased for low-income people after obtaining insurance coverage [4].

Next to these randomized studies, a vast amount of quasi-experimental research shows that cost sharing reduces healthcare

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spending. Bundorf [5] reviewed the effects of consumer directed health plans (CDHPs) and finds that CDHPs reduce health care spending by approximately 5–15 percent relative to similar plans with lower deductibles and without spending accounts. Other studies looked specifically at vulnerable populations. For example, Chandra et al. [6] use exogenous variation in the copayments faced by low-income enrollees in the Massachusetts' Commonwealth Care program. Overall, they find price elasticities of about -0.16 for this low-income population. Blais et al. [7] studied the impact of introducing consumer cost sharing among people receiving social assistance who had previously free access to medications. For all three classes of medications analyzed they find a decrease in use, of which one was statistically significant.

There are two recent studies on cost sharing in the Netherlands. Ravesteijn et al. [8] study mental health services. They find that an increase in the out-of-pocket price for adults (by up to €200 per year for outpatient treatment and €150 per month for inpatient treatment) reduced the number of regular mental health care records opened abruptly and persistently by 13.4% per day. Remmerswaal et al. [9] find that deductibles have an impact on hospital expenditure for persons with a low income and that liquidity constraints play a role here.

In line with the conclusions of previous studies, we find that with reinsurance people tend to have higher pharmaceutical spending than without reinsurance. The effect is most prominent in the first quarter following the introduction of reinsurance, and is no longer statistically significant in the third and fourth quarter. These findings suggest that low-income people are indeed price-sensitive and that reinsurance increases health care consumption.

2. Institutional setting

The Dutch basic health insurance is based on regulated competition [10]. In this system consumers have a choice of health plan (leading to competition among insurers) and insurers have flexibility in provider contracting (resulting in competition among providers of care). The regulator has set certain rules to protect public objectives such as the affordability and accessibility of care. For example, insurance companies are obliged to accept every applicant and are not allowed to price discriminate between sick and healthy persons. The benefits package is set by the government, and includes GP care, medication and hospital care, among other services. Consumers are obliged to purchase basic coverage. At the end of each year, they can switch health plans. On top of the basic insurance package, insurers offer supplementary insurance, e.g. covering dental care, physiotherapy and glasses. Contrary to the basic health insurance, no specific regulation applies to the market for supplementary insurance (apart from the standard insurance regulation, e.g. in terms of solvency requirements). This implies that insurance companies are completely free to decide which benefits to include. Moreover, consumers are not obliged to enroll in supplementary insurance.

The basic health insurance includes a mandatory deductible of 385 euros per adult per year (in 2017). This means that each year the first 385 euros of health care costs have to be paid out-of-pocket before insurance kicks in. Once the 385 euros threshold has been reached all costs are covered by the insurance (except for copayments for some specific treatments). The level of the mandatory deductible is set by the government. Visits to the general practitioner are exempted from the mandatory deductible, a feature we return to in the discussion of the paper.

Within the Dutch health care system, group arrangements are allowed. In 2017, over 50,000 group arrangements exist and about two-thirds of the population opted for such an arrangement. People joining a group arrangement usually get a premium discount

(which by law is limited to 10% of the premium for non-group contracts). In addition, group arrangements also offer tailor-made supplementary health insurance that is relevant for the group (e.g. additional physiotherapy in a group contract for workers in a construction company).

Almost all of the 388 Dutch municipalities offer a special group arrangement for residents with low income; we will refer to this arrangement as 'municipality contracts'. The definition of low income differs slightly between municipalities; the cutoff varies between 110% and 130% of the social minimum income, which in 2018 was 992 euros net of taxes per month for a single person and 1417 euros for a couple. The arrangements themselves also differ somewhat across municipalities, but generally include supplementary health insurance with extensive coverage. Almost all insurance companies offer a modest premium discount to people joining a municipality contract, and most municipalities give an additional premium subsidy. Though low-income people are not obliged to enroll in a municipality contract, the subsidy usually makes the contract more attractive than competing plans.

Approximately half of the municipality contracts include reinsurance of out-of-pocket spending due to the mandatory deductible. More specifically, this means that insured pay an additional monthly fee, usually subsidized by the municipalities, and in return do not have to pay the deductible. In some municipality contracts insured are obliged to take up reinsurance while in other municipality contracts reinsurance is optional. Municipality contracts are the only type of group arrangements aimed at Dutch residents that sometimes include reinsurance. Although reinsurance of the deductible is not strictly forbidden, none of the health insurers offers it to the general public.

3. Data and method

We compare enrollees from three municipalities that introduced reinsurance of the deductible on January 1st 2017 (the treatment group) with enrollees from three municipalities that never offered such reinsurance (the control group). All six municipality contracts have identical coverage. Before 2017, all six municipalities offered a group arrangement for low-income people with a regular deductible (i.e. without reinsurance). In 2017, the municipalities in the treatment group introduced a mandatory reinsurance and subsidized almost all premium costs of this reinsurance. The municipalities decided on the reinsurance in the fall of 2016. This might have created some scope for anticipation effects for people who use medication for chronic conditions (e.g. statins). Without reinsurance, they might collect their medication at the end of the year, when they already used their full deductible, to avoid immediate out-of-pocket costs in January. With the announcement of reinsurance in the fall of 2016, these people might postpone collecting their medication till January.

The health insurer that offers the group arrangement in the six municipalities provided us with anonymized individual-level claims data for the period January 2014 to December 2017. The data include all enrollees (of the insurer) who were in the municipality contract at some point during those four years. In addition to the insurance claims, the data also includes information on the age and gender of the insured.

Our empirical analysis focusses on pharmaceutical spending per quarter as covered by the basic health insurance. Our motive for focusing on pharmaceutical spending is threefold. First, in our sample of low-income people with municipality contract pharmaceuticals form the major spending category under the deductible; approximately 55% of out-of-pocket spending under the deductible is on pharmaceuticals. Second, the variation in pharmaceutical spending is relatively small, compared to hospital spending for

instance, which makes our estimations more robust. Third, when picking up medication, consumers often can make a reasonable guess of the price. For most types of care, including medication and hospital care, bills are usually sent to the insurer first who – in a second step – sends a bill for out-of-pocket spending to the consumer. For medication, this process usually takes about one to two months. Therefore, the consumer is quickly aware of the price and can take this into account when picking up repeat medication. Also, if asked, the pharmacist can immediately state the cost of medication. For hospital spending it usually takes several months more before the bill is sent to the consumer and moreover most specialists are not able to directly state the price of treatment. It can therefore be expected that insured behave more rational and price-sensitive with respect to pharmaceuticals than to hospital care.

From the data, we select individuals that are 18 years or older on January 1st 2014 and have been in the same municipality contract for all four years. The resulting data is a balanced panel with 16 quarters of claims data for 5.868 individuals. Table 1, columns 2 and 3, provide some descriptive results for the treatment and control group respectively. The groups are fairly similar. The sample includes more women than men, possibly because 20% of the receivers of income support in the Netherlands are single parent, which are mostly women [11]. Because municipality contracts include extensive supplementary coverage the population has high health spending and is relatively old.

In the next section, we estimate the following fixed effects difference-in-difference equation.

$$Y_{it} = \alpha_i + \gamma_t + \sum_{t=2017,1}^{2017,4} \beta_t I_{treatment,t} + \varepsilon_{it}$$

Here Y_{it} denotes the (log) pharmaceutical spending of person i in year-quarter t , α_i and γ_t denote individual and year-quarter fixed effects and $I_{treatment,t}$ is a dummy denoting persons in the treatment group in quarter t . β_t are our difference-in-difference estimates of the effect that reinsurance has on the (log) pharmaceutical spending.

Note that the effect estimates are a measurement of how much the (log) spending in the treatment group differs from the (log) spending in the control group in 2017, given pre-existing differences between the populations (the α_i) and given the quarterly development in the control group (the γ_t). The quarterly development includes any changes over time in e.g. medical developments and the level of the deductible. In the four years considered for this study the change in the deductible has been moderate and roughly in line with general inflation; in 2014, the deductible was 360 euros, in 2015 it was 375 euros and in 2016 and 2017 it was 385 euros. Moreover, there have been no major changes in the pharmaceuticals covered by the basic health insurance.

There are two selection issues that can potentially bias the difference-in-difference estimates. First, the introduction of reinsurance might attract new and relatively unhealthy persons to the municipality contract. Indeed, we find that in 2017 the number of adults insured in the treated municipality contracts grew by 57%, compared to 13% in the non-treated municipality contracts. To avoid this potential selection bias, we select only those persons who are in the same contract for all four years and hence leave out any persons who might be newly attracted to the contract because of the reinsurance feature. Second, as reinsurance is less attractive for healthy persons, the introduction of reinsurance might lead to selection in the persons who leave the contract and therefore are not in our data. However, we note that the subsidy provided by municipalities covers almost all premium costs of reinsurance, making reinsurance financially attractive even for persons with low

expected medical costs. Moreover, we find that the dropout rate at the end of 2016 is 7% for the treatment group and 8% for the control group, and that the average medical costs in 2016 of both groups of dropouts are comparable. Therefore, we expect that the second selection issue does not lead to bias in our analysis.

The effect of reinsurance might be different for people with a low probability of exceeding the deductible than for those with a high probability of exceeding the deductible. Theoretically, a rational consumer with a regular deductible and a high probability of exceeding this deductible will hardly reduce spending. Therefore, the effect of reinsurance might be limited for this group. To test this hypothesis we repeat our difference-in-difference analysis separately for two subgroups. One subgroup consists of persons whose medical spending (including hospital care etc.) in 2014 until 2016 never exceeded the yearly deductible. The complementary group – i.e. those who in at least one of the years 2014–2016 exceeded the deductible – forms the other subgroup. For the first group the probability of exceeding the deductible in 2017 indeed is substantially lower than for the latter: 20% versus 76%. Table 1 presents some descriptive results conditional on these groups.

4. Results

Fig. 1 displays the average log quarterly spending on pharmaceuticals for both the treatment and the control group. The spending is somewhat lower in the treatment group than in the control group, which corresponds with the lower average age in the treatment group. In the model we correct for individual level differences with the individual fixed effects α_i .

Over the four-year period, there is a slight upward trend in spending. Since we follow the same group of persons over time, this upward trend can be the effect of ageing. In addition, there might be small fluctuations in prices of medication, also contributing to the upward trend. In both the treatment and control group there is a prominent seasonal pattern. In quarters 1 and 3 spending is relatively low, in quarter 2 spending is somewhat higher, and in quarter 4 spending peaks. A possible explanation for the peak in quarter 4 and the dip in quarter 1 might be that some people who have already exceeded their deductible in a year pick up larger amounts of pharmaceuticals at the end of that year to avoid out-of-pocket spending in the (first quarter of the) new year. The dip in quarter 3 might be caused by the summer holidays. The parameter γ_t in the model corrects for the general upward trend in the data and the seasonal effects.

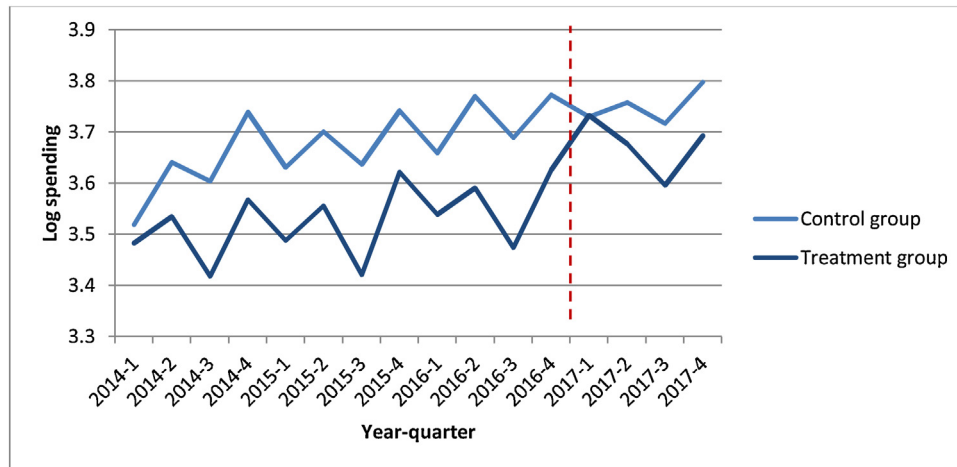
Starting on January 1st 2017, the deductible is reinsured in the treatment group. In the first quarter following the policy change there is a striking increase in spending in the treatment group, compared to a decrease in spending in the control group. However, in the following quarters the spending seems to return to normal or slightly above normal values.

The regression results in Table 2 (column 2) confirm those observations. There is a statistically significant positive effect of reinsuring the deductible on pharmaceutical spending in the first quarter after introduction, and a smaller but still statistically significant effect in quarter 2. In later quarters, the effect is no longer statistically significant. The estimates for the first and second quarter imply a 16% and 7% increase in spending respectively. In Appendix A in Supplementary material we present several additional statistics and show that the results are robust to a range of alternative specifications. Notably, using a model with lagged treatment dummies, we find no evidence for an anticipation effect in quarter 4 of 2016.

Fig. 2 shows the average quarterly spending for people who didn't exceed the deductible in each of three prior years. Note that the figure plots spending in euros, as the quarterly spending is rela-

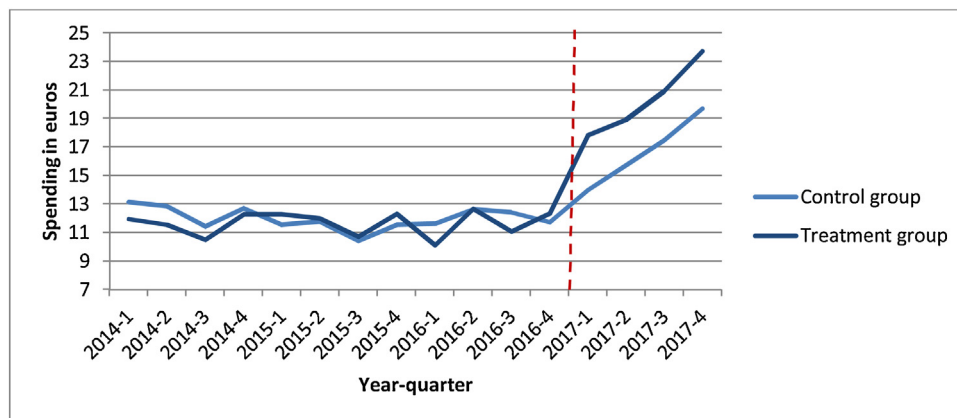
Table 1
Descriptive statistics.

	Total population		Never exceeded deductible in 2014–2016		Exceeded deductible in at least one of the years 2014–2016	
	Treatment	Control	Treatment	Control	Treatment	Control
n	2,219	3,649	356	543	1,863	3,106
% female	71.5%	68.8%	60.1%	59.3%	73.6%	70.4%
Mean age on 31-12-2014	56.0	58.7	49.5	51.5	57.2	60.0
Mean quarterly spending on pharmaceuticals (s.e.)	€ 187 (802)	€ 205 (786)	€ 14 (29)	€ 13 (28)	€ 221 (871)	€ 239 (848)

**Fig. 1.** Average log quarterly spending of treatment and control group (total population).**Table 2**
Difference-in-differences estimates of changes in quarterly spending in 2017.

	Total population Log(spending)	Exceeded deductible in at least one of the years 2014–2016 Log(spending)	Never exceeded deductible in 2014–2016 Spending in euros
$\beta_{2017,1}$	0.150*** (0.032)	0.135*** (0.035)	4.173** (1.661)
$\beta_{2017,2}$	0.065** (0.032)	0.046 (0.035)	3.561** (1.661)
$\beta_{2017,3}$	0.026 (0.032)	0.012 (0.035)	3.787** (1.661)
$\beta_{2017,4}$	0.042 (0.032)	0.019 (0.035)	4.372*** (1.661)

Models include individual level fixed effects and year-quarter dummies ***p < 0.01, **p < 0.05, *p < 0.1.

**Fig. 2.** Average quarterly spending of treatment and control group (people who never exceeded the deductible in 2014–2016).

tively low; Fig. B5 in Appendix B in Supplementary material shows log spending. There are two remarkable differences with spending of the total population as shown in Fig. 1. First, the spending for both the treatment and control group increases linearly in 2017. The persons in the subsample in Fig. 2 are selected based on the fact that their spending is low in 2014–2016. Someone who e.g. is in good

health in 2014 and 2015, but falls ill in 2016 (resulting in spending above the deductible) is excluded from this subsample. This results in almost constant average spending in 2014–2016 in Fig. 2. However, persons in good health in 2017 are included in this subsample, leading to the increase in average spending. In Appendix B in Supplementary material we show

that the group of people who never exceeded the deductible in 2014 and 2015, but might have a health shock in 2016, has a similar increase in average spending in 2016. Second, until 2017 the spending in the treatment and control group is very similar, but in all quarters of 2017 the treatment group spends approximately four euros more than the control group.

The regression results in Table 2 (last column) again confirm this observation. In the group of persons who didn't exceed the deductible in each of three prior years the introduction of reinsurance leads to an increase of approximately 4 euros in quarterly pharmaceutical spending, and this effect is statistically significant in all quarters. Appendix B in Supplementary material provides additional statistics and shows that the results are robust to alternative specifications.

For completeness, we also analyzed the complementary group, that is, the group of people who exceeded the deductible in at least one of three prior years. Appendix C in Supplementary material contains descriptive statistics on this group. These statistics closely resemble the statistics on the total population. The difference-in-difference model (Table 2, column 3) shows there only is a statistically significant increase in the first quarter (+14%, roughly 26 euros). We did split this group further in persons who exceeded their deductible in only one or two years, and persons who exceeded the deductible three years in a row. The results of those groups did not significantly differ from each other. We also investigated a subgroup of persons who three years in a row exceeded their deductible in the first quarter of the year. The results on this group again do not differ from the group in the main analysis.

5. Discussion

We find that the introduction of reinsurance for out-of-pocket spending under the mandatory deductible in the Dutch basic health insurance increased pharmaceutical spending. Nevertheless, the effects are relatively small compared to those found in other studies on consumer cost sharing, such as the RAND experiment [2] and the Oregon experiment [4]. This does not necessarily mean that low-income people in the Netherlands are less price sensitive than comparable populations in other settings. There are at least three alternative explanations for the relatively small effects found in this study. First, the mandatory deductible in the Netherlands is relatively low (i.e. 385 euros per adult per year). Moreover, low income people receive healthcare subsidies from the government of up to 88 euros per month in 2017. Although this amount is intended for paying health care premiums, it might also ease deductible payments. Second, this study focused on pharmaceutical spending while the deductible also applies to other types of care such as hospital treatments. People who undergo a hospital treatment are very likely to exceed their deductible. When this treatment takes place early in the year, they will not be price-sensitive for the rest of the year, also not with respect to pharmaceutical spending. Third, visits to the general practitioner are exempted from the mandatory deductible. In most cases, people have to visit their general practitioner in order to get a prescription. Once people have visited their general practitioner for a certain problem, they might be unlikely to refuse a prescription for treating that problem. In case of follow-up prescriptions, however, consumers might still decide to discontinue treatment.

Unfortunately, our data did not allow us to identify whether the increase in spending concerns low- or high-value care. Therefore, the welfare effects of the increase in pharmaceutical spending due to reinsurance remain unclear. The RAND experiment [2] has shown that especially low-income people have worse health outcomes under co-payment, suggesting that cost sharing leads them

to cut back on needed care. Given that we find a meaningful impact of the mandatory deductible on healthcare consumption of low-income people, further research on the impact of the deductible on low- and high-value care is advisable. If the increase in spending is mainly due to high-value care, then reinsurance might be welfare improving and therefore might be an appropriate policy. In this case, lowering or abolishing the deductibles for low income people might also be an interesting policy option. In contrast, if the increase in spending is mainly due to low-value care, reinsurance might be welfare decreasing. Although reinsurance might still be helpful in reducing problems related to liquidity constraints, other policies like a rebate may have the same financial effect while still discouraging the use of low-value care [9]. In a rebate insured pay one twelfth of the mandatory deductible of 385 euros each month to the health insurer, and (at the end of the year) the health insurer returns 385-X euros to the insured if its health expenditures of X euros remain below 385 euros.

In an additional analysis, we found that the effect of reinsurance differs between the groups with a low respectively high probability of exceeding the deductible. For the subgroup of people who did not exceed their deductible in each of three prior years we find a statistically significant and fairly equal increase in spending in all four quarters following the introduction of reinsurance. For the complementary group of people who exceeded their deductible in at least one of three prior years we find a statistically significant effect only in the first quarter. One possible explanation for this result might be that insured in the control group start spending more on healthcare once they exceeded their deductible. They could be more willing to pick up (possibly non-urgent) medication, but they might also stock up on necessary medication to avoid out-of-pocket spending in the first quarter of the next year. We note that in the group who exceeded the deductible in at least one of three prior years a considerable share of the control group has exceeded the deductible by quarter two; these insured might behave in quarter three and four as if they do not have a deductible, and hence the spending differences between the treatment and control group will diminish in later quarters. In a sense, our analysis measures differences between the treatment and control group in the moment of drug purchase. For this reason, the effects we find in the first quarter are much larger than the average yearly effect (see Appendices A and C in Supplementary material). In the group who did not exceed the deductible in each of three prior years, the large majority of people in the control group will remain below the deductible throughout the entire year 2017. Consequently, spending in the control group remains to be lower in all four quarters of 2017.

A rational consumer would take into account the probability of exceeding the deductible during the contract period. For example, a diabetic with annual treatment costs of 2000 euros has a probability of nearly 1.0 to pay the full deductible. For this person it hardly makes sense to reduce spending since he or she will exceed the deductible anyway. In other words, rational people would respond to the expected 'end-of-year' price, instead of the 'spot' price. For those with a probability of nearly 1.0 to exceed the deductible, the end-of-year price will be close to zero. Following this theory, it is remarkable that we still find a significant effect of reinsurance for the group with a high probability of exceeding the deductible. Apparently, not all insured behave completely rational. This is in line with the finding of Brot-Goldberg et al. [12] that insured tend to respond to the spot price even though arguably the expected end-of-year price is zero. In our context, a possible explanation for the response to spot prices might be the fact that our population has a low income and is likely to face liquidity constraints. This could make insured hesitant to use care under the deductible.

A limitation of our research is that the data only included one year after the introduction of reinsurance. Adding more years would allow us to research whether the observed pattern is persistent over time. However, although data on the use of care in 2018 is not yet available, we did observe that as of January 2018 a significant number of insured switched to a new municipal insurance plan, of another insurer. This severely limits the options for future research in this direction.

6. Conclusion

We contribute to the general literature on cost sharing by analyzing a reinsurance of a mandatory deductible of 385 euros in the Netherlands. Our analysis shows that the reinsurance leads to an increase in pharmaceutical spending, which is most prominent in the first quarter following the introduction of reinsurance and is no longer statistically significant in the third and fourth quarter. In a subgroup of persons with low probability of exceeding the deductible, the effect of reinsurance is statistically significant in all four quarters. These results suggest that, low-income people spend more on pharmaceuticals in the absence of a deductible. Whether this effect specifically applies to low-value or high-value care remains an important question for further research.

Declaration of Competing Interest

All authors declare they have no conflict of interest.

Acknowledgements

We thank Xander Koolman (VU) and colleagues from CPB for useful comments and suggestions. We thank Achmea for providing us access to the Achmea Health Database. The views presented here are those of the authors and not necessarily those of Achmea or the CPB.

Appendix A–C Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.healthpol.2019.07.004>.

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