Is adverse selection effectively mitigated by consumer inertia? Empirical evidence from the Dutch health insurance market

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ABSTRACT

This paper examines whether consumer inertia can effectively reduce adverse selection in health insurance markets. To this end, we investigate consumer choice of deductible in the Dutch health insurance market, using panel data on all insured individuals in the Netherlands over period 2010-2013. The Dutch health insurance market offers a unique setting to study adverse selection, because during annual open enrollment periods all adults are free to choose an extra deductible up to 500 euros per year. By focusing on deductible choices of those who do not switch health plans, we are able to examine the 'pure' adverse selection effect (i.e. not distorted by other health plan attributes). We estimate a logit model to determine how previous and future costs are related to individuals' deductible choice. We find that almost 70% of the individuals with the highest deductible level are likely to stick with this choice even after incurring very high costs during the previous year. Furthermore, only 3.5% of those having no deductible and very low costs are likely to choose a 500 euro deductible next year. These findings suggest that consumer inertia can act as a powerful brake on adverse selection.

1. INTRODUCTION

The presence of adverse selection is a well-known impediment to an efficient health insurance market (Einav and Finkelstein 2011). Adverse selection occurs when enrollees choose health plans with more coverage because they have private information about being likely to incur high costs. Rothschild and Stiglitz (1976) show that adverse selection can result in the under-insurance of low-risk enrollees or even a market with no equilibrium. As shown by Handel (2013) and Handel et al. (2015), however, adverse selection may in practice be counteracted by individuals' suboptimal decision making. There is ample empirical evidence that optimal consumer choice in health insurance markets is hampered by "frictions" like inertia, search and switching cost, and a lack of knowledge (˜health insurance literacy"); see for example Samuelson and Zeckhauser (1988), Abaluck and Gruber (2011), Bhargava et al. (2015), Handel (2013), Handel and Kolstad (2015), Handel et al. (2015), Heiss et al. (2016), Ho et al. (2015), and Marzilli Ericson (2014).

Beforehand, it is not clear whether adverse selection or friction is more important to market outcomes and how these two factors interact which each other. As Pauly (1984) noticed already more than three decades ago: "One of the things that theory does say here is that only a little bit of adverse election may cause market equilibrium to unravel. But then only a little bit of consumer inertia is needed to reinstate it."

The interaction of adverse selection and consumer inertia has recently been studied in the context of US markets for health insurance (Handel 2013, Handel and Kolstad 2015, Handel et al. 2015, Polyakova 2016). Handel and Kolstad (2015) measure inertia as the implied monetary costs of switching plans when a default option is present. They identify inertia by comparing health plan choice of the same consumers over time in both clearly active and clearly passive choice environments. In the context of an employment-based insurance setting of a large US firm, they show that both adverse selection and inertia are important. Furthermore, they show that reducing frictions is welfare decreasing (increasing) when the mean and variance of surplus from risk protection compared to its costs are relatively low (high).

In this paper, we aim to determine to what extent adverse selection is mitigated by consumer inertia. In our setting – the Dutch market for mandatory basic health insurance – the choice environment is stable, since we focus on individuals staying with the same health plan during the study period. These individuals, however, can freely adapt their choice of deductible (i.e. coverage level) resulting in a lower or higher premium. Hence, no health plan attributes other than the deductible level and its corresponding premium difference play a role in the consumer choices examined here. Given that only monetary trade-offs are involved in this choice setting, we are able to truly identify inertia as defined by Handel (2013); i.e. the implied monetary costs of choice

persistence. Using detailed data for the total Dutch adult insured population who were enrolled in the same health plan during the entire study period 2010-2013 (about 9.5 million individuals), we first constructed 16 possible deductible choice paths to examine the relationship between health care costs and deductible choice. In a second step we used the same dataset for estimating a logit model. The model estimates reveal to what extent individuals' choice of deductible in 2013 can be explained by their previous and future health care cost. Although we find clear evidence of adverse selection, we also find that the extent of adverse selection is strongly mitigated by the presence of substantial consumer inertia.

The remainder of this paper is organized as follows. In the next section, we briefly describe the context of the Dutch health insurance market in which people annually have free choice of deductible. Section 3 informs about the data and descriptive statistics. In section 4, deductible choice paths are defined and analyzed. The empirical model is formulated in section 5, after which the estimation results are presented in section 6. Section 7 concludes.

2. CONTEXT

In the Netherlands, universal mandatory health insurance is offered by competing private health insurers.[77] During our study period (2010-2013), the number of insurers decreased from 11 to 9 due to two mergers, whereas the number of basic health plans (or health insurance policies) offered by these insurers increased from 57 to 67. All Dutch citizens are required to buy a basic health plan and health insurers have to accept all individuals applying for enrollment in such a plan. The basic benefit package is comprehensive and standardized by law. Hence, each basic health plan covers the same benefits. In addition, health plan premiums have to be community-rated. That is, all people enrolling in the same health plan face the same premium (except that in case of a group contract insurers are allowed to offer a premium discount up to 10%).[78] For all adult enrollees (18 years and older) there is a mandatory deductible. Its level is

77 For a more detailed description of the Dutch health insurance market and the system of regulated (or managed) competition, see Van de Ven and Schut (2008), and Douven et al. (2017).

78 For each enrollee insurers receive a risk-adjusted premium subsidy from a risk-equalization fund that is filled with income-related contributions. This risk-adjusted premium subsidy is equal to the enrollee's predicted costs minus a fixed amount that is annually determined by the government (about 1,000 euro per year). Hence, to break even health insurers must at least charge a community-rated premium equal to this fixed amount (McGuire and Van Kleef, 2018).

annually set by the government.[79] On top of this mandatory deductible, adults can opt for a (voluntary) deductible in return for a premium discount. The deductible levels are restricted by the government to 0, 100, 200, 300, 400 or 500 euro per year. For each deductible level, health insurers are free to determine a community-rated premium discount. During our study period the cost of maternity care and family care (provided by GPs) were exempted from the deductible.

Each year, individuals can switch health plans during the annual open enrollment period (December/January). Health plans differ from each other in terms of premium, (preferred) provider networks and premium discounts for the various deductible levels. Enrollees can adjust the deductible level every year by notifying their health insurer during the open enrollment period. This typically requires only one phone call or ticking another box at the insurer's website. Changing deductible levels does not require changing health plans. Hence, after having increased the deductible level people can easily lower it again during the next open enrollment season if they have acquired a chronic disease or otherwise expect higher medical costs in the year(s) to come.

As mentioned in Section 1, depending on the fundamentals of the market, having substantial consumer inertia in the health insurance market could be welfare increasing or decreasing (Handel et al. 2015). In the Netherlands, there is a sophisticated system of risk equalization, which reduces the potential negative welfare effects of adverse selection (Van Kleef et al. 2017). Further, as described above, the premium discount in return for a deductible is community rated, thereby reducing the opportunities for insurers to attract favorable risks (relative to the risk adjusted capitation payments) by higher discounts. Nevertheless, even after sophisitcated risk equalization those opting for the highest deductible level appear to be profitable to insurers at the prevailing discount levels (Croes et al. 2017). Increasing the uptake of voluntary deductibles by reducing consumer inertia may reduce profitability for insurers if people with a higher risk profile opt for it, or if it results in higher premium discounts because of enhanced competition. However, the welfare implications of stimulating the uptake of voluntary deductibles require further empirical research.

3. DATA AND DESCRIPTIVES

We use individual level panel data on the total Dutch population over the period 2010-2013 obtained from the Dutch Healthcare Authority (NZa). The dataset includes information on (i) individual health care expenses – including out-of-pocket costs – for

79 During our study period the mandatory deductible was gradually raised from 165 euro in 2010 to 170 euro in 2011, 220 euro in 2012, and 350 euro in 2013.

benefits covered by mandatory health insurance, (ii) individuals' choice of health plan and deductible level, and (iii) a number of individual characteristics. In our analysis, we included age (5 classes), gender and household income (3 classes) as potentially relevant individual characteristics. In addition, we obtained data from the Dutch Healthcare Authority (NZa) about the community-rated premium discount offered by each health plan in return for a higher deductible. Throughout the study period, the average discount was 222 euro for a 500 euro deductible with a standard deviation of about 40 euro. We linked the information in the dataset about each individual's health plan to the health plan specific discount.

The full dataset includes about 16.6 million individual records in 2010. After excluding individuals that were not in the dataset for all four years, the number of observations reduced to 15.9 million. We also excluded a small number of people with more than one health plan per year (for example because they enrolled in another group contract after changing jobs), and people with incomplete information on household income (both groups comprise less than 1% of the total population). Furthermore, we excluded all individuals younger than 18 years in 2010, since these individuals did not face any deductible during part or the entire study period. The remaining dataset includes about 11.8 million individual records with data for each of the four years.

For this balanced panel, Table 1 shows the distribution of individuals over the various deductible levels. The proportion of enrollees that opted for a deductible other than zero increased from 5% to 9% from 2010 to 2013. This change is almost entirely due to the increasing share of individuals choosing the deductible of 500 euro (from 2% to 5%).

Table 1. Distribution of enrollees over deductible levels, 2010-2013 (N x 1000).

	2010		2011		2012		2013	
Deductible level	N	share	N	share	N	share	N	share
000	11226	0.95	11172	0.94	11097	0.94	10816	0.91
100	174	0.01	167	0.01	166	0.01	170	0.01
200	102	0.01	101	0.01	107	0.01	136	0.01
300	77	0.01	86	0.01	92	0.01	80	0.01
400	16	0.00	17	0.00	17	0.00	24	0.00
500	227	0.02	279	0.02	344	0.03	596	0.05
Total	11822		11822		11822		11822	

As explained above, from the perspective of adverse selection we are primarily interested in the question to what extent enrollees' choice of deductible is related to their past, current and expected future health costs. Enrollees who switch health plans, are

probably also reconsidering their deductible choice during this switching process.[80] In our dataset, 46% of all enrollees who changed their deductible, also switched health plans. The decision to switch health plans depends on multiple factors (Boonen et al. 2016). Because these factors may be correlated with the choice of deductible, we restricted our analysis to those enrollees that did not switch health plans during the study period. For this subsample, it is most likely that the change of deductible level is driven by past or anticipated health care expenses. Furthermore, to keep the analysis concise we also excluded the small minority of people who chose intermediary deductible levels (100-400 euro).[81] As a result the final sample consist of about 9.4 million individuals who in the period 2010-2013 (i) did not switch health plans and (ii) each year have either a zero or a 500 euro deductible. Given the two deductible choice options (0 and 500) and 4 years (2010-2013) we can distinguished 16 possible deductible choice paths. Each individual can be assigned to one of these paths. Table 2 exhibits the distribution of individuals over the 16 possible choice paths.

As shown in Table 2 the vast majority (96%) of all enrollees included in the dataset sticks with the default option of a zero deductible during the entire period. The second largest subgroup (1%) includes the enrollees who stick with a once chosen 500 euro deductible. The remaining 3% changed their deductible at least once during the study period.

When calculating each individual's health care costs, we excluded the costs of GP and maternity care because these health care services are exempted from the deductible. The average costs per individual increased from 2,085 euro in 2010 to 2,508 euro in 2013 during the study period. As typically is the case, the distribution of individual health care costs is highly skewed. For instance, in 2013 25% of all enrollees had costs below 45 euro while 50% and 87.5% had costs below 477 euro and 4464 euro, respectively. Therefore, we transformed the cost data by taking the natural logarithm of one plus cost, i.e. $log(1+cost)$. Figure 1 shows that the resulting log transformed cost distribution has the familiar bimodal shape, with local maxima at 0-0.5 (about zero euro) and 6.5-7 (about 900 euro). The log transformed cost distribution is convenient for our application, since we want to categorize enrollees into cost classes.

For the empirical analysis, we distinguished 6 different log transformed costs categories. Table 3 displays the proportion of people with either a zero or 500 euro deductible in 2013 for each of the 6 cost categories in 2012. As expected, the share of people opting

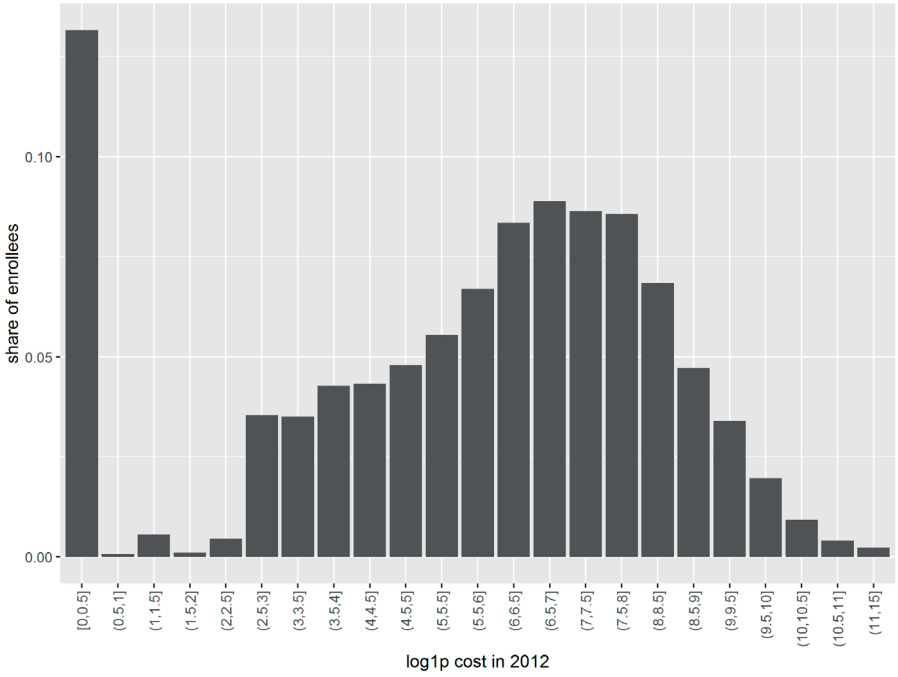
80 See Boonen et al. (2016) for a study of the factors that impact the propensity to switch health insurers in the Dutch health insurance market.

81 Note that – in contrast to intermediairy deductible levels – the share of enrollees who have chosen the highest (500 euro) deductible level has grown significantly from 2010 to 2013. Furthermore, this growth continued after 2013 (Vektis 2017).

Table 2. Distribution of individual enrollees in the final sample over the possible deductible choice paths (2010-2013)

Path Nr.	Deductible level 2010-2011-2012-2013	N	share
1	500_500_500_500	134977	0.01
2	500_500_500_000	5471	0.00
3	500_500_000_500	1279	0.00
4	500_500_000_000	5969	0.00
5	500_000_500_500	1325	0.00
6	500_000_500_000	220	0.00
7	500_000_000_500	4524	0.00
8	500_000_000_000	8359	0.00
9	000_500_500_500	20838	0.00
10	000_500_500_000	1546	0.00
11	000_500_000_500	589	0.00
12	000_500_000_000	2130	0.00
13	000_000_500_500	26329	0.00
14	000_000_500_000	2245	0.00
15	000_000_000_500	121941	0.01
16	000_000_000_000	9025461	0.96
Total sample		9363203	1.00

Figure 1. Distribution of log transformed individual health care expenses in 2012



for the highest deductible in 2013 is negatively related to their health care expenses in the previous year. In the lowest cost category 7.8% of the individuals opted for a 500 euro deductible, whereas this holds for only 0.3% of the individuals in the highest cost category. However, note that even among those in the lowest cost category more than 90% of the individuals preferred not to have an extra deductible.

Table 3. Number and percentage of individuals with a zero and a 500 euro deductible in 2013 for each 2012 log transformed cost class

	Number of individuals		Percentage individuals
log(1+*cost*2012)	deductible 000	deductible 500	with deductible 500
[0,2]	1200177	101563	7.8%
(2,4]	1033134	70097	6.4%
(4,6]	1921228	79647	4.0%
(6,8]	3174945	49024	1.5%
(8,10]	1575631	11017	0.7%
(10,15]	146286	454	0.3%
Total	9051401	311802	3.3%

The high percentage of people with low costs choosing a zero deductible indicates that many people may not make a (financially) optimal deductible choice. Indeed, as shown by Van Winssen et al. (2015) an uptake of a 500 euro deductible would have been retrospectively financially profitable for 48% of the Dutch insured population in 2014, whereas only about 11% actually acted in this way.[82] We calculated the share of people that with hindsight made the most profitable deductible choice. We find that, given their actual health care expenses, about 50% of the people with a zero deductible made the best choice during the study period (varying between 47 and 54%).[83] By contrast, 82 to 85% of the people with a 500 euro deductible with hindsight made the financially optimal decision. These findings are similar to those of an earlier study by Douven and Remmerswaal (2016). Of course, an ex-post non-profitable deductible choice does not necessarily mean this choice is also non-profitable ex-ante, since the ex-ante profitability depends on the distribution of risk as well as the existing risk preferences.[84] Therefore the key question is: do people, from a financial perspective, make the optimal deduct-

82 Handel et al. (2015) find similar differences in a US employment-based insurance context, where, based on ex post spending 60% of employees are better off financially in a high deductible health plan, though only 15% of employees actually choose that plan.

83 Individuals with a zero deductibles who retrospectively made a suboptimal choice, could have gained on average about 200 euros if they had opted for a 500 euro deductible.

84 Note that the rationale of insurance is that ex-post the majority of the insured make a loss because their premiums are used to pay the claims of an unlucky minority.

ible choice given their expected health care expenses? Before exploring this question in-depth, we first examine enrollees' annual deductible choices in relation to their previous and future health care expenses.

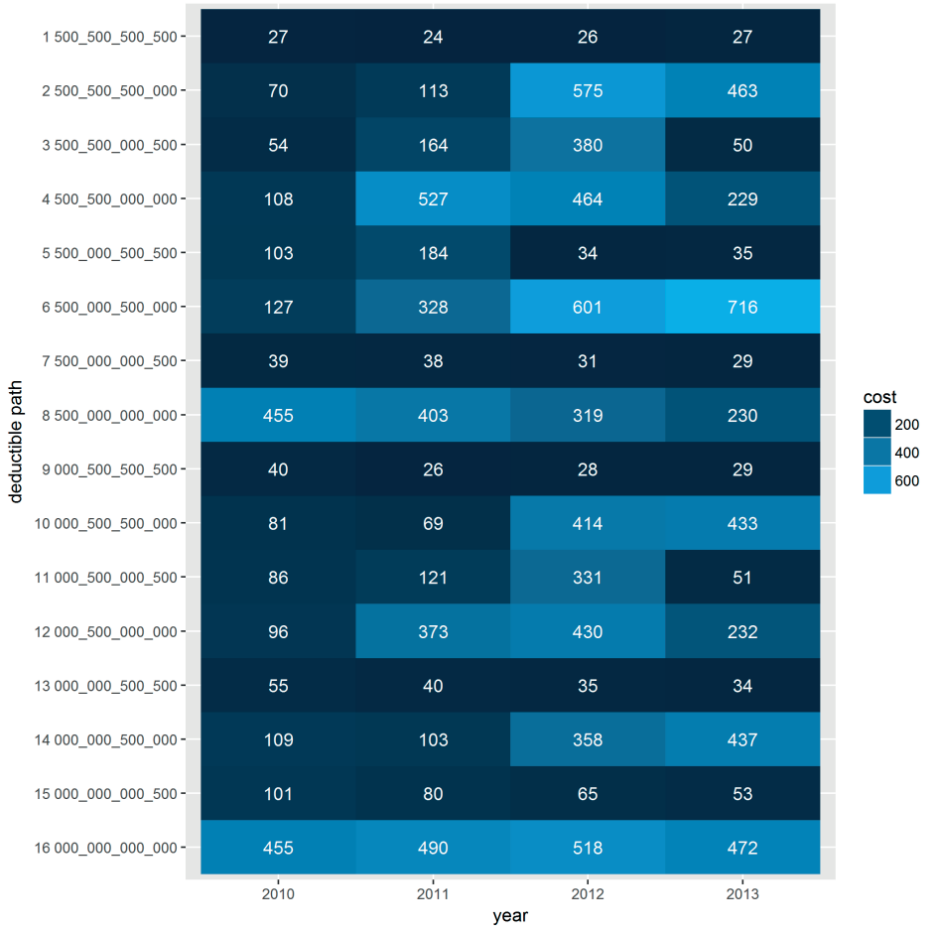
4. DEDUCTIBLE CHOICE PATHS

To examine the relation between enrollees' deductible choices and their health care costs, we have distinguished all possible deductible choice paths over the period 2010-2013. For each of these paths, the aggregate annual median cost are then calculated. The resulting median cost patterns for each of the 16 deductible choice paths are presented in a heatmap (Figure 2). The first eight paths include all enrollees with a 500 euro deductible in 2010, while the last eight paths include all enrollees with a zero deductible in 2010. The heatmap confirms our initial expectation. Enrollees in path 1 () consistently have the lowest annual median costs. In contrast, enrollees in path 16 () in each year have among the highest median costs compared to the other deductible paths. These median cost patterns are consistent with the presence of adverse selection: high (low) risks sorting themselves into the low (high) deductible plans.

Of particular interest are the choice paths of enrollees who experience a substantial increase in health care expenses over the years. In Figure 2, this involves the paths with a profound change of color. As the heatmap shows, for all the choice paths in which enrollees experience a strong increase in costs – i.e. choice paths 2, 4, 6, 10, 12, and 14 – we observe that the cost jump is followed by a change in deductible from 500 to zero in the next year. This is also consistent with the presence of an adverse selection effect. Enrollees following choice paths 3, 5 and 11 exchanged a zero for a 500 euro deductible in the only year they had higher health care cost (and changed back in the subsequent year). This is both consistent with adverse selection (choosing a zero deductible in anticipation of health care expenses) and moral hazard (a zero deductible resulting in higher health care expenses). Choice paths 7, 9, 13, and 15 show that enrollees with a zero deductible who are experiencing low health costs over the entire period eventually opt for a 500 euro deductible. This demonstrates that adverse selection may not take place immediately because consumers may learn more over time about their health risk – as well as the corresponding health care expenses – and the available deductible choice options.

In sum, all the possible choice paths seem to have cost patterns that are consistent with the presence of adverse selection. The patterns also suggest that (i) adverse selection may take time to arise and (ii) some healthy people are able to effectively anticipate an increase in next year's health care costs.

Figure 2. Heatmap of annual median cost (in euros) per deductible choice pattern over the period 2010-2013



5. EMPIRICAL MODEL

We estimate a logit model to examine the determinants of individual choice of deductible (0 or 500) for the year 2013 based on individual level data over the period 2010-2013. The logit model specifies the probability that individual *i* chooses a 500 euro deductible in 2013 as:

$$\pi_i = \frac{exp(\mu_i)}{1 + exp(\mu_i)}$$

where μ_i denotes the set of relevant characteristics for individual *i*, which can be specified as follows:

$$\mu_i = c + \beta\, deductible2012_i + \sum_{k=1}^{5} \rho_k cost2012_{ki} + \sum_{k=1}^{5} \sigma_k cost2013_{ki} + \sum_{k=1}^{5} \omega_k cost2012_{ki} deductible2012_i + \sum_{k=1}^{5} \varphi_k cost2013_{ki} deductible2012_i + \delta\, stablelowcost_i + \sum_{k=1}^{2} \gamma_k income_{ki} + \sum_{k=1}^{4} \theta_k age_{ki} + \vartheta\, gender_i + \tau\, discount_i$$

The main variables of interest are *deductible2012, cost2012*, *cost2013* and *stablelowcost* because these four variables may provide evidence of adverse selection. The dummy variable *deductible2012* is equal to one if the individual had a 500 euro deductible in 2012. If there is choice persistence, we expect that having a 500 euro deductible in 2012 has an positive impact on the probability of choosing a 500 euro deductible in 2013. *Cost2012* and *cost2013* represent an individual's health care cost in 2012 and 2013, categorized in 6 categories (k=1,..6), which are included as dummy variables in the regression (excluding the lowest cost class as reference dummy). If adverse selection is present, we expect to find a negative relationship between the uptake of a 500 euro deductible in 2013 and the individual health care expenses in 2012. Since people may not only base their expectations on last year's health care costs but also on expected future expenses, we also included *cost2013* as an indicator of adverse selection. It should be noted, however, that this *cost2013* variable may be endogenous, since these costs may depend on the choice of deductible because of moral hazard. Hence, the effect of *cost2013* on the choice of deductible may be overestimated. For this reason, we estimated the model with and without the *cost2013* variable. We also interacted both cost variables with the dummy variable *deductible2012*. This is because we expect that among individuals having a 500 euro deductible in 2012 those who experience (or expect) high costs are less likely to opt again for a 500 euro deductible in 2013. Hence, if these interaction effects are negative for higher cost categories, this will provide further evidence of adverse selection. For individuals who have chosen zero deductible in 2010, 2011 and 2012, we included the variable *stablelowcost* to investigate the possibility of a delayed adverse selection effect due to learning. We have defined *stablelowcost* as a dummy variable taking the value of 1 if (*i*) the individual's health care expenses did not exceed the mandatory deductible for three consecutive years (165 euro in 2010, 170 euro in 2011 and 220 euro in 2012) and (*ii*) if the individual has chosen zero deducible in 2010, 2011 and 2012. If there is a delayed adverse selection effect because for some individuals learning takes time, we expect to find a positive coefficient for this variable. Note that this variable also provides an indication of consumer inertia, as a positive coefficient implies that people are incurring monetary costs of choice persistence.

To control for risk preferences, we include for each individual his/her household income (*income*) (three categories, with the lowest income category as reference dummy), *age* (5 dummies, with the youngest age category as reference dummy), and *gender* (male=1). Furthermore, to control for health plan specific differences in the monetary

value of a 500 euro deductible, for each enrollee we include his specific health plan's community rated premium *discount* for a 500 euro deductible in 2013.

6. ESTIMATION RESULTS

Table 4 presents the estimation results for two models, one excluding and one including 2013 cost variables.[85] First, the results provide evidence of a high degree of choice persistence. Individuals already having a 500 euro deductible in 2012 are very likely to opt for the same deductible in 2013. The weighted average probability of choosing a 500 euro deductible in 2013 is 85 percentage points higher for individuals already having a 500 euro deductible in 2012 than for individuals having a zero deductible in 2012.[86]

Next, there is a significant negative relation between the propensity of choosing a deductible in 2013 and the costs in the previous and current year. This result provides evidence of adverse selection.[87] Moreover, the interaction effects between cost and deductible choice show that this relationship is particularly strong for people with a 500 euro deductible in 2012.[88] Below, we provide a detailed discussion and illustration of the marginal effects of prior and current year's health care cost on deductible choice.

In model 1, having stable low costs during the 2010-2012 period is positively related to the propensity of having a 500 euro deductible in 2013. However, the marginal effect of *stablelowcost* in this model is close to zero. Furthermore, in model 2 where we include the cost of the current year, this effect disappears. This suggest that the learning effect that is measured by the *stablelowcost* variable is captured by the *cost2012* and *cost2013*

85 We determined the accuracy rate of both models based on a down-sampled dataset, including all people choosing a 500 euro deductible and an equally sized randomly selected subsample of people choosing a zero deductible. Assigning a 500 euro deductible to individuals when the predicted probability of choosing this deductible exceeds 0.5, both models predict 29 percentage point better than a 50/50 random prediction (79% vs. 50%).

86 For each possible combination of covariates, we calculated the difference in probability of choosing a 500 euro deductible in 2013 with and without having a 500 euro deductible in 2012. The weighted average of these differences in probability is then calculated by weighing each covariate combination with the number of individuals. The marginal effects of the other variables are calculated in the same way.

87 As discussed earlier, the effect of people's health care cost in 2013 on deductible choice may be overestimated, because these costs are likely to be influenced to some extent by the choice of deductible as a result of moral hazard. Given the broad cost categories we distinguished, however, the moral hazard effect is most likely not large enough to have a substantial impact on the classification of individuals into the various cost classes. Therefore the potiential endogeneity problem seems small.

88 Notice that the interaction effects for the highest cost category are not signficant (2012) or only at 10% level (2013), which is probably due to the very small subgroup (only 454 individuals, see Table 3).

Table 4. Regression results

	Dependent variable: 500 euro deductible in 2013 (Y/N)	
	(1)	(2)
deductible2012	7.460 (0.028)	7.638 (0.033)
cost2012(2,4]	-0.004 (0.008)	0.051 (0.009)
cost2012(4,6]	-0.217 (0.009)	-0.060 (0.009)
cost2012(6,8]	-1.074 (0.010)	-0.655 (0.010)
cost2012(8,10]	-1.851 (0.016)	-1.150 (0.017)
cost2012(10,15]	-3.339 (0.097)	-2.312 (0.098)
income2	0.190 (0.008)	0.191 (0.008)
income3	0.525 (0.008)	0.519 (0.008)
age[30,40)	0.085 (0.010)	0.095 (0.010)
age[40,50)	0.090 (0.009)	0.126 (0.009)
age[50,60)	0.069 (0.009)	0.152 (0.009)
age[60,60+)	-0.467 (0.010)	-0.283 (0.010)
gender	0.092 (0.006)	0.071 (0.006)
discount	0.008 (0.0001)	0.008 (0.0001)
stablelowcost	0.079 (0.008)	-0.004 (0.008)
cost2013(2,4]		-0.048 (0.008)
cost2013(4,6]		-0.259 (0.008)
cost2013(6,8]		-0.882 (0.010)
cost2013(8,10]		-1.444 (0.018)
cost2013(10,15]		-1.579 (0.055)
deductible2012:cost2012(2,4]	-0.215 (0.041)	-0.119 (0.043)
deductible2012:cost2012(4,6]	-0.531 (0.037)	-0.363 (0.039)
deductible2012:cost2012(6,8]	-0.725 (0.034)	-0.637 (0.037)
deductible2012:cost2012(8,10]	-0.598 (0.043)	-0.600 (0.046)
deductible2012:cost2012(10,15]	-0.028 (0.133)	0.019 (0.137)
deductible2012:cost2013(2,4]		-0.160 (0.043)
deductible2012:cost2013(4,6]		-0.375 (0.039)
deductible2012:cost2013(6,8]		-0.488 (0.038)
deductible2012:cost2013(8,10]		-0.261 (0.049)
deductible2012:cost2013(10,15]		-0.114 (0.111)
constant	-5.770 (0.019)	-5.637 (0.020)
Observations	9,363,203	9,363,203
Log Likelihood	−667,808.6	-659,057.7
Akaike Inf. Crit.	1,335,659.0	1,318,177.0

Note: * = p<0.01, standard errors in brackets

variable, which is plausible since for most of the individuals having low costs in 2010 and 2011 the cost in 2012 and 2013 are expected to be low as well. All other explanatory variables are significant and have the expected signs (e.g. Borghans et al. 2009). The propensity of choosing a 500 euro deductible is positively related to *income* and *gender* (being male). For *income,* however, the weighted average marginal effect of a change in income category is only 1 percentage point for individuals with zero deductible in 2012, and 3 percentage points for individuals with 500 euro deductible in 2012. For *gender*, the weighted average marginal effects are less than 1 percentage point.

The propensity of choosing a 500 euro deductible is also positively related to being enrolled in a health plan offering a higher premium *discount* in return for a 500 euro deductible. When comparing the probability of choosing a 500 euro deductible in 2013 between having the maximum (311) and minimum (150) *discount* in our sample, the weighted average marginal effect is 2 percentage points for individuals with zero deductible in 2012 and 6 percentage points for individuals with 500 euro deductible in 2012. Furthermore, the propensity of choosing a 500 euro deductible increases with *age* up to an age of 40-50, and then decreases, particularly among those older than 60. When comparing the probability of choosing a 500 euro deductible in 2013 between age 40-50 and age older than 60, the weighted average marginal effect is -1 percentage point for individuals with zero deductible in 2012 and -3 percentage points for individuals with 500 euro deductible in 2012.

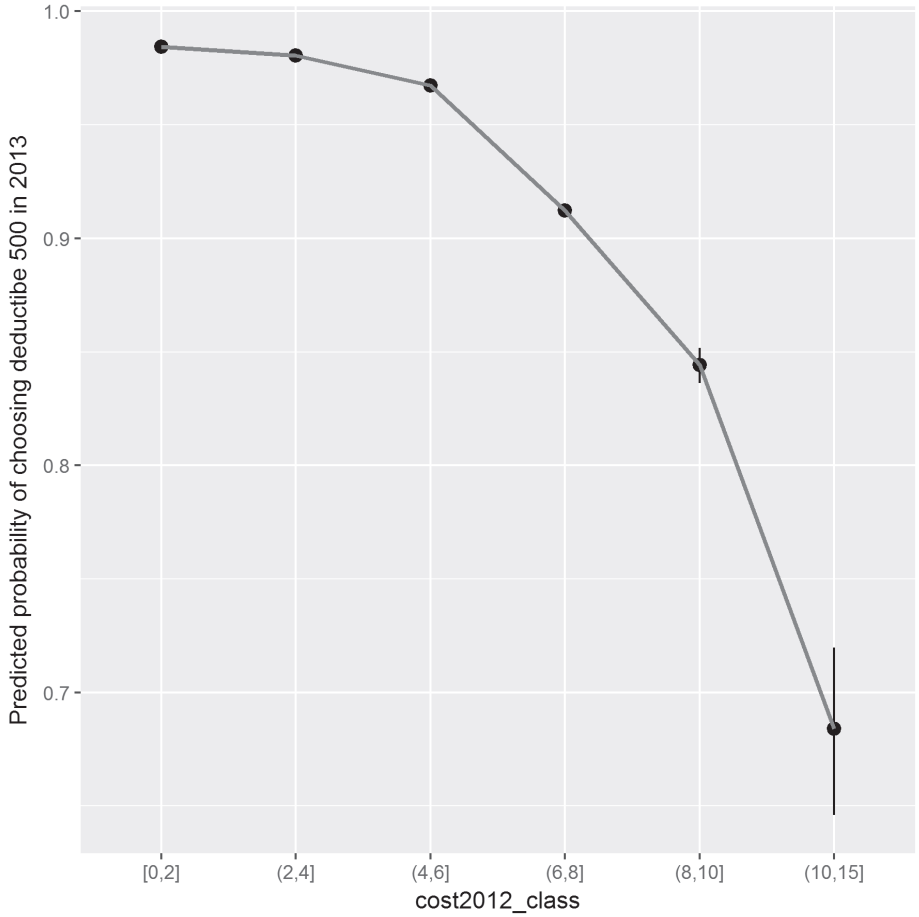
We illustrate the marginal effects of changes in 2012 cost classes on deductible choice in model 1 by Figures 3 and 4. Both figures refer to a 'median individual', i.e. the median of each covariate of a 500 euro deductible chooser (as specified below the figures).[89] Figure 3 shows for each 2012 cost category the probability that people with a 500 euro deductible in 2012 choose the same deductible in 2013.

As illustrated, individuals within the lowest cost category in 2012 have a 98% probability of continuing their 500 euro deductible choice in 2013, whereas this probability drops to 68% for individuals in the highest cost category. The 30 percentage point reduction in probability provides evidence of a substantial adverse selection effect. Despite extremely high costs (exceeding 20,000 euro) in 2012, 68% of the individuals do not lower their 500 euro deductible in 2013. This provides evidence of substantial consumer inertia, because it is unlikely that these costs were just incidental for most individuals. For the whole population, the weighted average reduction in the probability of choosing a 500 euro deductible for people moving from the lowest to the highest cost category is 37 percentage points.

Figure 4 shows for each 2012 cost class the probability that people with a zero deductible in 2012 choose a 500 euro deductible in 2013. Clearly, the probability that people

89 Using alternative values for *income*, *stablelowcost age*, *gender* and *discount* show similar patterns.

Figure 3. Probability of choosing a 500 euro deductible in 2013, for individuals with a 500 euro deductible in 2012 in six different 2012 cost classes

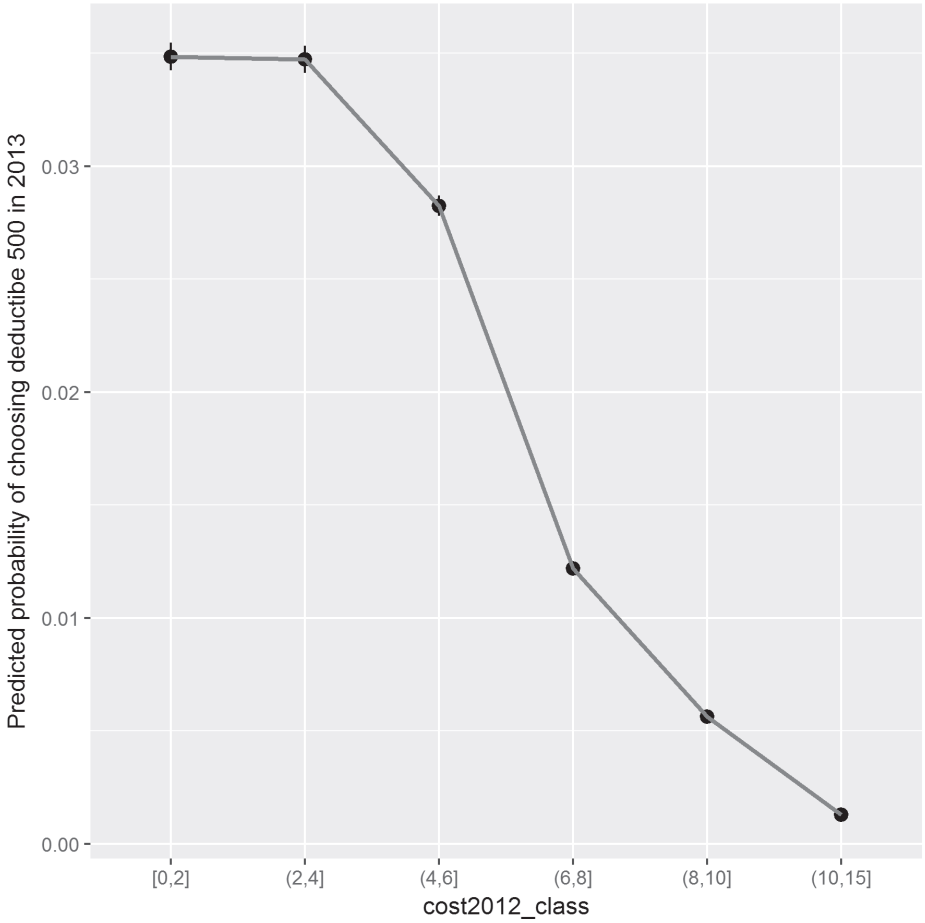


Based on model 1 for individuals with the following characteristics: income=category 3, stablelowcost=0, age=[40-50], gender=male, discount=222 euro.

switch from a zero to a 500 euro deductible is very small. Even for people having the lowest costs in 2012, the chance of taking up a 500 euro deductible in 2013 is only 3.5%. As expected, this percentage drops to close to zero percent for people experiencing very high health care expenses in 2012. The small share of low-cost individuals likely to take up a 500 euro deductible indicates a high degree of choice persistence with substantial implied monetary costs. For the whole population, the weighted average reduction in the probability of choosing a 500 euro deductible for people moving from the lowest to the highest cost category is 2 percentage points.

For each individual, we can retrospectively determine whether they made the most financially optimal deductible choice in 2013. Individuals who chose a zero deductible

Figure 4. Probability of choosing a 500 euro deductible in 2013, for individuals with a zero euro deductible in 2012 in six different 2012 cost classes



Based on model 1 for individuals with the following characteristics: income=category 3, stablelowcost=0, age=[40-50], gender=male, discount=222 euro.

in 2013 did not make an optimal choice if their costs are lower than the mandatory deductible (350 euro) plus the premium discount offered by their health plan for a 500 euro deductible. Similarly, individuals who chose 500 euro deductible in 2013 and have costs on top of the mandatory deductible (350 euro) that are higher than the discount, did not make an optimal choice. In 2013, 53% of the individuals who have chosen zero deductible would be financially better off with a 500 euro deductible. And for individuals who have chosen a 500 euro deductible, 14% would be better off with a zero euro deductible. We approximated the implied monetary costs by determining the gain that those individuals would attain if they would have chosen optimally in retrospect. The

average implied monetary costs is 229 euro for individuals who have chosen a suboptimal zero deductible, and 187 euro for individuals who have chosen a suboptimal 500 euro deductible.

As discussed above, previous cost experience does not necessarily mean that people can predict future health expenses. To get an indication of the extent to which people foresee future health expenses and act upon it, we used the estimation results of model 2 to examine for each 2012 cost category the relationship between people's choice of deductible and their (at that time future) health care cost in 2013. Figure 5 illustrates this relationship.

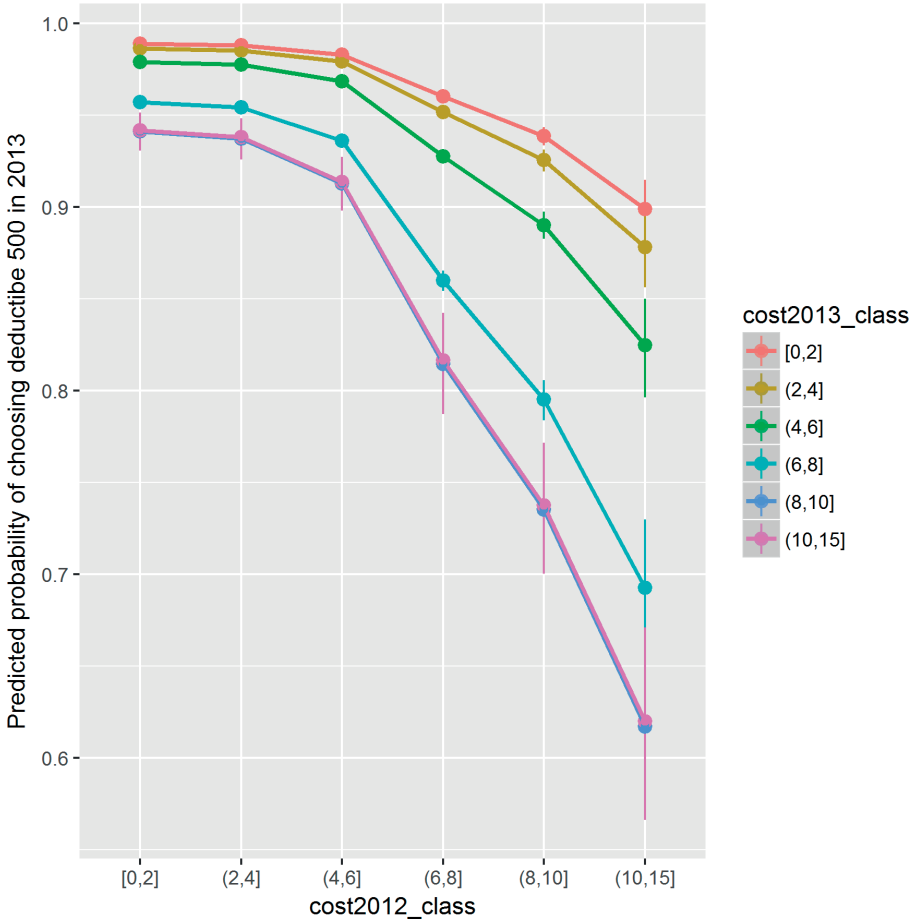
For each 2012 cost category, Figure 5 shows that the probability of people keeping a 500 euro deductible decreases if their health care expenses in 2013 increase. For instance, for people within the lowest cost category in 2012 the probability of keeping a 500 euro deductible in 2013 reduces from 99 to 94% if they shift to the highest cost category in 2013. Hence, only a small minority of about 5% of people having low cost in 2012 and high cost in 2013 seem to have anticipated a substantial cost increase in 2013 by reducing their deductible to zero. Much more pronounced is the anticipatory behavior of those who experienced high cost in 2012 followed by – on hindsight – low cost in 2013. As shown in Figure 5, for people having the highest cost in 2012 the propensity of keeping a 500 euro deductible is 62% if they have high costs in 2013, whereas this propensity increases to 90% if they have low costs in 2013. Hence, a substantial share of high cost individuals effectively anticipates future expected health care cost by (not) adjusting their choice of deductible. However, the fact that 62% of people within the highest cost groups in both years nevertheless keeps their 500 euro deductible further supports the evidence of high consumer inertia.

For individuals who had a zero deductible in 2012, Figure 6 shows a similar pattern as Figure 5. Although the probability that people switch from a zero to a 500 euro deductible is very small, we again find that at least some people effectively anticipate a change in future health care costs. For instance, the probability that people within the lowest cost class in 2012 will uptake a 500 euro deductible in 2013 reduces from 4% to less than 1% if they move from the lowest to the highest cost class in 2013. Still, the fact that 96% of those in the lowest cost class in both years sticks with a zero deductible indicates also here that consumer inertia and choice persistence are high.

7. CONCLUSION AND DISCUSSION

In the context of the Dutch health insurance market where people can annually choose a deductible level, varying from 0 to 500 euro, we find evidence of both adverse selection and consumer inertia. Using data for about 9.5 million individuals who do not

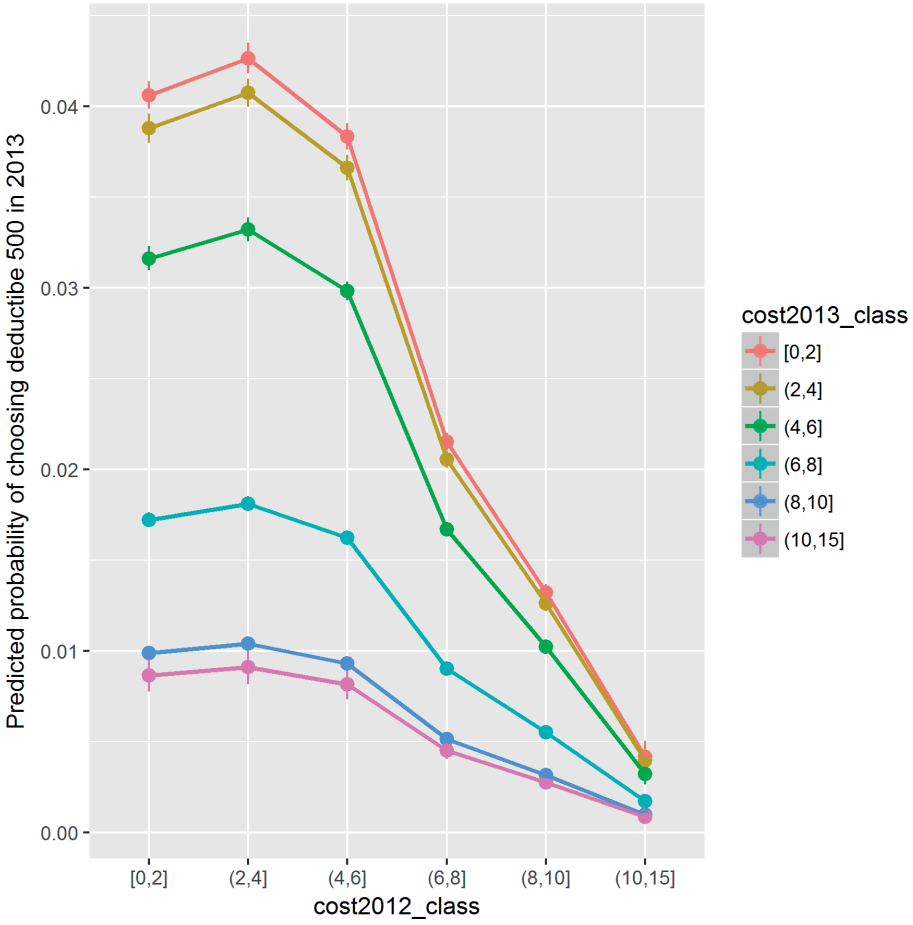
Figure 5. Relationship between the probability of sticking with a 500 euro deductible in 2013 and people's health care cost class in 2013, for individuals with a 500 euro deductible in 2012 in six different 2012 cost classes



Based on model 1 for individuals with the following characteristics: income=category 3, stablelowcost=0, age=[40-50], gender=male, discount=222 euro.

switch health plans during a four years study period (2010-2013), we first constructed 16 possible choice paths for people choosing a zero or 500 euro deductible. We find that all possible choice paths have cost patterns that are consistent with the presence of adverse selection. The patterns also suggest that adverse selection may take time to arise since it can take several years before people with low health care cost substitute a 500 euro for a zero deductible. In addition, the choice paths show that on average healthy people are able to anticipate effectively next year's health care costs. Next, using the same dataset over the period 2010-2013 (including about 37.5 million observations) we estimated a logit model to examine to what extent the individual choice of deductible

Figure 6. Relationship between the probability of changing from a zero to a 500 euro deductible in 2013 and people's health care cost class in 2013 , for individuals with a 500 euro deductible in 2012 in six different 2012 cost classes



Based on model 1 for individuals with the following characteristics: income=category 3, stablelowcost=0, age=[40-50], gender=male, discount=222 euro.

in 2013 can be explained by previous and future health care cost. We find clear evidence of adverse selection, as people with higher previous and future health care cost are substantially less likely to take up or keep a 500 euro deductible. Furthermore, our results also indicate that people do anticipate future health care cost as these cost can explain part of the variation in deductible choice given their cost in the previous year.

However, we also find clear evidence of high consumer inertia as the propensity of taking up a 500 euro deductible among low-cost individuals is only 3.5%, while the propensity of keeping a 500 euro deductible among high-cost individuals is 68%. For both low-cost individuals sticking with a zero deductible and high-cost individuals

sticking with a 500 euro deductible, the implied monetary costs of choice persistence are approximately 200 euros per year. The substantial degree of consumer inertia is remarkable, given the very low transaction costs for enrollees involved in adjusting their deductible level.

By counteracting adverse selection, a certain degree of consumer inertia may be welfare increasing (Handel 2013, Handel and Kolstad 2015). Within the context of the Dutch health insurance market with regulated (or managed) competition, however, the presence of substantial consumer inertia may well be welfare decreasing. This is because the potential negative welfare effects of adverse selection are possibly substantially mitigated by a sophisticated system of risk equalization. Despite the presence of risk equalization, however, those opting for the highest deductible level appear to be profitable to insurers at the prevailing premium discount levels (Croes et al. 2017). Hence, an active policy to reduce consumer inertia may enhance adverse selection and increase insurers' profits. Nevertheless, the associated negative welfare effects are likely to be much smaller than the positive welfare effects of enhancing active consumer choice because of the large share of the population currently incurring a substantial implied monetary loss (about 200 euro per person). This suggests that within the Dutch context, activities aimed at reducing consumer inertia with regard to deductible choice are likely to be welfare improving.

REFERENCES

Abaluck, J., Gruber, J. (2011). Choice inconsistencies among the elderly: evidence from plan choice in the medicare part d program. American Economic Review, 101 (4), 1180–1210.

Bhargava, S., Loewenstein, G., Sydnor, J. (2015). Do individuals make sensible health insurance decisions? Evidence from a menu with dominated options. National Bureau of Economic Research (NBER), Cambridge (Mass.)

Boonen, L. H., Laske-Aldershof, T., Schut, F. T. (2016). Switching health insurers: the role of price, quality and consumer information search. European Journal of Health Economics, 17 (3), 339–353.

Borghans, L., Golsteyn B.H.H., Heckman, J.J., Meijers, H. (2009). Gender differences in risk aversion and ambiguity. Journal of the European Economic Association, 7(2-3), 649-658.

Croes, R., Katona, K, Mikkers, M., Shestalova, V. (2017). Evidence of selection in a mandatory health insurance market with risk adjustment. Working paper, Dutch Healthcare Authority (NZa), Utrecht.

Douven, R., Remmerswaal, M. (2016). Keuzegedrag verzekerden en risicosolidariteit bij vrijwillig eigen risico, CPB Netherlands Bureau for Economic Policy Analysis, The Hague.

Douven, R., Katona, K., Schut, F.T., Shestalova, V. (2017), Switching gains and health plan price elasticities: 20 years of managed competition reforms in the Netherlands, European Journal of Health Economics, 18 (8), 1047-1064.

Einav, L., Finkelstein A. (2011), Selection in insurance markets: Theory and empirics in pictures, Journal of Economic Perspectives, 25 (1), 115-138.

Handel, B. R. (2013). Adverse selection and inertia in health insurance markets: When nudging hurts. American Economic Review, 103 (7), 2643–2682.

Handel, B. R., Kolstad, J. T. (2015). Health insurance for humans: Information frictions, plan choice, and consumer welfare. American Economic Review, 105 (8), 2449–2500.

Handel, B. R., Kolstad, J. T., Spinnewijn, J. (2015). Information frictions and adverse selection: policy interventions in health insurance markets. Working Paper 21759, National Bureau of Economic Research (NBER), Cambridge (Mass.).

Heiss, F., McFadden, D., Winter, J., Wuppermann, A., Zhou, B. (2016). Inattention and switching costs as sources of inertia in Medicare Part D. Working Paper 22765, National Bureau of Economic Research (NBER), Cambridge (Mass.).

Ho, K., Hogan, J., Morton, F. S. (2015). The impact of consumer inattention on insurer pricing in the medicare part d program. Working Paper 21028, National Bureau of Economic Research (NBER), Cambridge (Mass.)

Marzilli Ericson, K. M. (2014). Consumer inertia and firm pricing in the medicare part d prescription drug insurance exchange. American Economic Journal: Economic Policy, 6 (1), 38–64.

McGuire, T.G., Van Kleef, R. (eds) (2018), Risk Adjustment, risk sharing and premium regulation in health insurance markets. Elsevier Publishing. forthcoming.

NZa (2013). Marktscan en beleidsbrief Zorgverzekeringsmarkt 2013, Nederlandse Zorgautoriteit, Utrecht.
Pauly, M. V. (1984). Is cream-skimming a problem for the competitive medical market? Journal of Health Economics, 3 (1), 87–95.

Polyakova, M., (2016). Regulation of insurance with adverse selection and switching costs: Evidence from Medicare Part D. American Economic Journal: Applied Economics, 8 (3), 165–95.

Rothschild, M., Stiglitz, J. (1976). Equilibrium in competitive insurance markets: An essay on the economics of imperfect information. Quarterly Journal of Economics, 90 (4), 629–649.

Samuelson, W., Zeckhauser, R. (1988). Status quo bias in decision making. Journal of Risk and Uncertainty, 1(1), 7-59.

Van Kleef, R, McGuire, T., van Vliet, R., van de Ven, W. (2017). Improving risk equalization with constrained regression. European Journal of Health Economics, 18 (9), 1137-1156.

Van de Ven. W.P.M.M., Schut, F.T. (2008). Universal mandatory health insurance in the Netherlands: a model for the United States? Health Affairs, 27(3), 771–781.

Van Winssen, K., van Kleef, R., van de Ven, W. (2015). How profitable is a voluntary deductible in health insurance for the consumer? Health Policy, 119 (5), 688–695.

Vektis (2017), Zorgthermometer Verzekerden in beeld 2017.Vektis. Zeist.