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Selection on moral hazard in the Swiss market for mandatory health insurance: Empirical evidence from Swiss Household Panel data

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Abstract

Selection on moral hazard represents the tendency to select a specific health insurance coverage depending on the heterogeneity in utilization "slopes". I explore the extent of selection on moral hazard in the Swiss managed competition system. I use data from the Swiss Household Panel and from publicly available regulatory data. I estimate a Roy-type model to obtain responses in (log) doctor visits at lowest and highest deductible levels. I also explore an instrumental variable approach comparing responses of individuals switching deductible to those maintaining the same level of coverage. Individuals with high propensity to select the highest deductible respond to coverage between two and three times more compared to the average difference in utilisation at highest vs. any lower deductible. This is consistent with individuals who are more likely to select a more comprehensive coverage using substantially more healthcare compared to what is implied by simple adverse selection.

Keywords – health insurance; moral hazard; adverse selection; cost sharing; Switzerland

JEL codes - I13

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1. Introduction

Ever since the seminal contribution of Arrow (1963), moral hazard in health insurance has been a lively area of research in health economics. In a nutshell, moral hazard emerges as higher insurance coverage generates an increased use of healthcare, regardless of actual needs (Zweifel and Manning 2000). This phenomenon has been studied widely across different high-income settings, for example the U.S. (Einav and Finkelstein 2018; Pauly 2004), the Netherlands (Alessie et al. 2020), France (Sevilla-Dedieu, Billaudeau, and Paraponaris 2020) and Germany (Thönnes 2019). A related concept is that of adverse selection, i.e. the idea that individuals with higher expected health expenditures self-select into plans with higher insurance coverage. Adverse selection implicitly suggests that individuals with high and low health insurance coverage may be intrinsically different, complicating any trivial assessment of the extent of moral hazard. (Cutler and Reber 1998; Chiappori and Salanie 2000; Cabral 2017; Olivella and Vera-Hernández 2013). A common feature of health insurance plans regarded as a signal of adverse selection is the endogenous choice of cost-sharing models (Becker and Zweifel 2005). An interesting notion bridging adverse selection and moral hazard is the idea of selection on moral hazard (Einav et al. 2013), namely individuals selecting a specific coverage (including the level of cost-sharing) as a result of their anticipated behavioural responses to health insurance, rather than merely intrinsic differences in risk profiles. Einav et al. (2013) suggest that selection on moral hazard is driven by the slope of spending: the incremental healthcare use due to a more comprehensive coverage. This component of adverse selection is distinct from the traditional idea of selection on levels of expected health risk, mentioned above. In the case of the mandatory health insurance in Switzerland, results from previous studies seem to favour the hypothesis that higher deductibles reduce healthcare consumption due to a reduction in moral hazard (Boes and Gerfin 2016; Gerfin and Schellhorn 2006). On the other hand, Schellhorn (2001) suggested that reductions in healthcare utilization associated with higher deductible may simply reflect self-selection rather than behavioural responses related to moral hazard. The extent of selection on moral hazard in different health insurance markets, including Switzerland, remains an open empirical question. This paper speaks to this latter strand of literature, trying to measure selection on moral hazard in the market for Swiss statutory health insurance.

The study uses a mix of survey data from the Swiss Household Panel and publicly available information from the health insurance markets regulator. The main empirical approach employs Roy-type models to allow for selection on unobservable gains from coverage. I estimate the effect of coverage on the (log) number of doctor visits, modelling the selection of the lowest and respectively the highest deductible levels. I report the marginal response to coverage along the distribution of the unobserved propensity (not to) select the specific coverage level, which can be interpreted as the inverse of the multiplicative effect consistent with moral hazard. My findings suggest that individual with lowest propensity not to select high deductible (i.e. high propensity to select the high deductible) have a substantially and significantly lower healthcare utilization response. The magnitude of this amplified response is between two and three times the average difference in utilisation at highest deductible compared to any other lower deductible. Analogously, individuals with lower propensity not to select the lowest deductible have a substantially higher healthcare utilization level.

I triangulate these results with an alternative empirical approach to account for unobserved individual characteristics and overcome the inherent endogeneity between coverage choice and risk "types" related to adverse selection. Specifically, I propose an instrumental variable approach which exploits the average premiums as instruments for coverage choice. I assess heterogeneity in responses across different levels of co-payment, contrasting individuals switching deductible from year to year to those maintaining the same level of coverage. These IV estimates suggest that – on average - individuals switching from highest to lowest deductible levels have stronger responses to the health shock, compared to individuals who had already selected the same lowest deductible level. Analogously, I find a lower response in terms of doctor visits among individuals switching from lower to higher

deductible, compared to "high-risk" individuals who had already selected the lowest coverage possible. Overall, my findings seem to confirm the predictions simple models allowing for selection on moral hazard in health insurance, suggesting some scope for improvement in the regulation of the Swiss mandatory health insurance market.

The rest of the paper is structured as follows: Section 2 describes the Swiss health insurance market and institutional setting, Section 3 outlines a model which provides the main testable hypotheses. Section 4 discusses the empirical approach and the main sources of data. Finally, Section 5 presents the main results, which I discuss in Section 6.

2. Setting

2.1 Statutory health insurance in Switzerland

With about 8.5 million people located in the heart of Europe, Switzerland is a confederation of 26 independent Cantons responsible for steering their health systems. Switzerland ranks fourth among OECD countries in terms of GDP per capita, with 71 thousand USD for 2019 (OECD 2020a), whilst total life expectancy at birth was 83.8 in 2018 (OECD 2020c). Switzerland also reports consistently high levels of health spending per capita, reaching 7'732 USD ppp[1] in 2019 (OECD 2020b). Since 1996, Switzerland has organized healthcare financing with a managed competition system (Crivelli 2020). All Swiss residents are required to obtain health insurance coverage from a number of insurers offering standardized plans in a strictly regulated marketplace, akin to the one set up in the U.S. with the Affordable Care Act (Courtemanche, Marton, and Yelowitz 2016). Insurers on the market offer a set of plans which vary along two main dimensions: yearly deductible level and managed care option. Options for yearly deductible are 300, 500, 1'000, 1'500, 2'000 and 2'500 Swiss francs. Higher deductibles are associated to premium reductions up to 70 percent. Managed care plans (e.g. family doctor, gatekeeper through phone consultation with a medical consultant or HMO) also offer premiums up to 20 percent cheaper compared to the basic plan featuring free provider choice. The benefit package is standard across all plans and everyone is subject to a 10 percent co-payment for all costs in excess of the deductible up to a 700 Swiss francs cap. The marketplace is further regulated with a risk-adjustment in cost differences between models with free provider choice and managed care, as well as a community-rated adjustment on a cantonal level based on age, gender, inpatient care and consumption of medicines in the previous year (Kaufmann, Schmid, and Boes 2017; Federal Office of Public Health 2020a). Premium discrimination is also allowed across three age groups: children (0-18 years), young adults (18-25) and adults (26 and older). Thus, individuals in the same Canton and age group face the same healthcare plan choice set, irrespective of income. To correct this strong element of inequity, besides broader social security mechanisms, Cantons grant earmarked means-tested subsidies to about 30 percent of residents based on taxable income in the previous years (Kaufmann, Schmid, and Boes 2017). Furthermore, healthcare costs for inpatient care are partially (55 percent) financed through general taxation by Cantons.

Assuming rational responses to price differences for equivalent plans, competition among insurers should lead to efficient premiums and high quality of service. However, switching rates have been historically quite low (Laske-Aldershof et al. 2004), likely reflecting behavioural biases (Krieger and Felder 2013; Frank and Lamiraud 2009) and bundling with supplementary (voluntary) health insurance (Dormont, Geoffard, and Lamiraud 2009). Heterogeneity in the scale of insurers and other market inefficiencies generate wide differences in premiums and – mostly due to inertia - citizens often forgo savings up to 40 percent for a virtually identical coverage (Crivelli 2020). Switching rates have slightly increased in the last years, possibly in response to the steady growth of premiums

[1] OECD used the purchasing power adjustment based on most recent Actual Individual Consumption, or AIC (OECD 2019).

parallel to the rise in health expenditures (Crivelli 2020) and to increased ease of access to online tools to compare premiums and facilitate switching (Lako, Rosenau, and Daw 2011). Additionally, the strict regulation of standardized health insurance plans entails – by design – a set of dominated (non-optimal) plans offered on the market, which result in further welfare losses (Biener and Zou 2021).

2.2 Deductible choice and potential role of selection on moral hazard

Every year, by the end of November, Swiss residents can notify to insurance companies their decision to change insurer and/or coverage for the subsequent year in relation to mandatory health insurance. Insurers cannot refuse coverage to any individual in relation to mandatory health insurance, whilst they are free to refuse coverage and conduct risk assessments for voluntary health insurance plans, which are subject to private insurance laws. In the regulated setting outlined above, consumers decide to change insurer or coverage in response to premium levels or shocks to individual characteristics, considering both private (socioeconomic status, risk factors, risk preferences, healthcare consumption patterns, health status, etc.) and public information (i.e. new premiums announced every September for the coming year).

On the one hand, the traditional concept of "ex post" moral hazard in health insurance suggests that individuals with higher coverage – facing milder incentives to limit their healthcare consumption – tend to have higher levels of healthcare utilization. This effect has typically been looked in terms of an average tendency to use more medical care, mostly overlooking the heterogeneity in this responsiveness to coverage. On the other hand, adverse selection suggests that individuals with high expected healthcare costs have already sorted themselves into plans with high coverage, i.e. low deductible. Therefore, without underlying changes in risk type and assuming constant preferences (at least in the short run, from one year to the other), sharp changes in the level of deductible (high to low, or low to high) are consistent with optimal responses to changes in:

- Premiums (i.e. relative prices of different plans);
- Household's budget constraint (e.g. income reductions that lead families to choose higher deductibles, in order to pay lower premiums);
- Anticipated healthcare consumption intentions;
- Anticipated behavioural responses to different coverage levels.

The notion of "selection on moral hazard" is consistent with this last point. In the spirit of Einav et al. (2013), when deciding their coverage for year $t+1$, consumers incorporate their expected and heterogeneous responses to health insurance coverage in $t+1$. Intuitively moral hazard materializes as a tendency to switch to higher coverage (i.e. lower deductible) – from a previous lower coverage level - for individuals expecting to react more strongly to higher future healthcare needs. The opposite should also be true, namely that switching to lower from a previously higher coverage should be associated with a milder response to the health shock.

3. A simple model of selection on moral hazard

To build the intuition of my main research hypothesis, this section outlines a simple two-period model that draws heavily from Einav et al. (2013).

In the first period, the utility-maximising risk-averse agent makes a financial decision, selecting her optimal coverage level for the second period, anticipating her optimal response in terms of healthcare utilization to her future healthcare needs. In the second period, given a coverage level and a realized healthcare need, she decides her optimal level of healthcare utilization, trading off health and money.

This stylized decision process is fully consistent with the Swiss institutional background and health insurance choices described above.

Echoing the original contribution (Einav et al. 2013), I assume the period 2 utility to be additively separable in health and money. The quadratic (monetized) health utility component is given by

$$H[m - \lambda^t; \omega] = (m - \lambda^t) - \frac{1}{2\omega_i}(m - \lambda^t)^2 \qquad (1)$$

That is, the agent has concave preferences in the net benefit of treatment m given her healthcare need type $\lambda^{t\in(High,Low)}$. Utility increases with $(m - \lambda^t)$ until a switching point where cost of treatment outweighs the benefits, and utility starts to decrease. The switching point is higher for high healthcare need types, i.e. sicker individuals with higher need for (monetized) healthcare ($\lambda^{High} > \lambda^{Low}$). In this parameterization, ω shapes the curvature of the relationship and will be interpreted as a coefficient of moral hazard, shifts the level of optimal spending.

The monetary component of utility simply given by

$$Y[m; c_i, \pi(c_i)] = y - c_i m - \pi(1 - c_i) \qquad (2)$$

The agent's period income y is given. To simplify matters, I characterize the insurance contract as a combination of a co-payment rate $c_i \in [0,1]$ and corresponding premium defined by a tariff $\pi(1 - c_i)$, which is a monotonic decreasing function ($\pi'(1 - c_i) < 0$) of the share of healthcare costs covered by the insurer $(1 - c_i)$. At the time of the utilization decision, λ^t, ω, c_i, and $\pi(1 - c_i)$ are known. Hence, the agent maximises her period utility choosing

$$\max_m u[m; \lambda^t, c_i, \pi(1 - c_i)] = (m - \lambda^t) - \frac{1}{2\omega}(m - \lambda^t)^2 + y - c_i m - \pi(1 - c_i) \qquad (3)$$

The optimal utilization level is given by

$$m^* = \omega(1 - c_i) + \lambda^t \qquad (4)$$

Equation (4) suggests that the optimal utilization level increases with moral hazard, the share of costs covered by the insurer, and the realized healthcare need. Moving from a lower to a higher level of coverage (from high to low c_i) should result in a higher discretionary healthcare utilization for the same level of non-discretionary healthcare need.

In period 1, the agent anticipates her optimal period 2 utilization response m^*, conditional on her realized healthcare need and her coverage choice. I assume that the agent assigns a probability p to a realization λ^{High}, and probability $(1 - p)$ to realization λ^{Low}. Given the (*ex-ante*) financial nature of health insurance contracts, I model her period 1 choice as a decision over future financial outcomes (i.e. the monetary component of the period utility). Assuming a simple logarithmic utility function to capture risk-averse preferences, the agent chooses c_i in order to maximise her expected utility, as follows

$$\max_c E\{u(c, \pi(1 - c_i); y, \omega, \lambda^t)\} =$$
$$p \ln[y - c_i\big(\omega(1 - c_i) + \lambda^{High}\big) - \pi(1 - c_i)] + (1 - p)\ln[y - c_i(\omega(1 - c_i) + \lambda^{Low}) - \pi(1 - c_i)]$$

After rearranging terms, the optimal level of co-payment can be expressed as

$$c^* = \frac{1}{2} + \frac{1}{2\omega}[E[\lambda] - \pi'(1 - c)] \qquad (5)$$

Appendix A provides full details regarding the model solution. The central result in expression (5) is that higher value of moral hazard ω are associated with higher coverage (i.e. lower values of co-

payment). The model also suggests that a higher expected healthcare need is associated with higher coverage, consistently with a classic adverse selection argument. The effect of $\pi'(1-c)$ (which is negative) captures the influence of tariff function steepness on coverage choice c^*.

4. Data and methods

4.1 Data

The main data source for this work is the Swiss Household Panel, henceforth SHP (Tillmann et al. 2016), a nationally representative longitudinal study running since 1999. The 2017, 2018 and 2019 waves included data on health insurance coverage choices, except for insurer and premium paid. All waves also include information on healthcare utilization. Akin to previous work on the role of insurance in healthcare utilization in Switzerland (Gerfin and Schellhorn 2006), my main proxy outcome for healthcare utilization is the (log) number of doctor visits in a given calendar year (conditional on having at least 1). The survey also collects detailed information about the health status of respondents. Among these, the survey reports the occurrence of illnesses, accidents or serious health problems in the survey year. I use this variable to construct an indicator of health shock (akin to the "surprise in healthcare need" defined in Appendix A) defined as a new illness, accident or serious health problem in year *t* (i.e. with no occurrence reported in year *t-1*). From the SHP I also obtain the level of deductible in each year measured in Swiss francs, as well as the type of plan (i.e. free choice of provider, or managed care options). The SHP includes a wide range of personal and household characteristics. Besides standard socio-economic characteristics, these include the receipt of means-tested subsidies to cover part of the mandatory health insurance premium. To focus as much as possible on financially independent individuals and avoid mixing two different premium classes (see Section 2.1), I focus only on participants aged 26 or older. Furthermore, to replicate an empirical setting that is comparable to the model in Section 2, I compute an approximate share of co-payment dividing the different levels of deductible by accurate national level estimates of yearly healthcare expenditure by age group (Federal Statistical Office 2021). The data allows identifying the canton where respondents were living at the time of the survey. Albeit not perfectly, controlling for canton fixed effects in the analysis allows to account for differences in costs of healthcare and differences in supply-side availability.

To complement SHP data, I use publicly available data on premiums published by the oversight authority of the Swiss mandatory health insurance market (Federal Office of Public Health 2020b). These data offer a complete overview of the supply of mandatory health insurance plans across Switzerland. Matching the coverage choices reported by survey respondents and based on their age group and canton, I generated average market price for the type of coverage selected. Since individual level data on exact insurance company choices are not available in the public domain, this corresponds the best possible information that I could retrieve in terms of premium paid by individuals. Given the variables used for matching (age range, canton, type of plan and deductible level), these local and age specific market average premiums appear precise enough to encapsulate the average information on price variation available to individual consumers, and hence appropriate address our main research questions. Appendix B supports this claim with an overview of the distribution of these locally defined premiums. Whilst I acknowledge that some individuals deviate from average premiums in their choices, it is reasonable to assume that these deviations cancel each other out in the sample. A full list of data sources is also provided in Appendix B.

4.2. Empirical approach

4.2.1. Heterogeneous effects of coverage allowing for selection on unobservables

My main empirical approach is based on a Roy-type model. Linking the stylized model in Section 3 to the setting described in Brave and Walstrum (2014) and in Carneiro, Heckman, and Vytlacil (2011), one can suppose that the (log) number of doctor visits is related to the choice of deductible as follows

$$y_i = \beta\lambda_i + \delta C_i + \mu(C_i \times \omega_i) + \epsilon_i \qquad (6)$$

Equation (6) implies that the differences in (log) number of doctor visits associated with choosing a given deductible (i.e. co-payment rate) depend upon an unobserved component ω_i, just like in equation (4). As long as $\mu \neq 0$, the equation is consistent with the phenomenon that Einav et al. (2013) termed selection on moral hazard. Since any variable that is correlated with the decision to choose a given deductible is also correlated with the unobserved interaction between that decision and moral hazard, I model the selection process explicitly.

The underlying Roy model can be represented in terms of potential outcomes. Without loss of generality, let $D = (0,1)$ indicate whether the individual chose a specific deductible level instead of all other. To simplify matters, let us focus on the case of $D = 1$ indicating the choice of the lowest (highest) possible deductible, so that $D = 0$ indicates the choice of any other higher (lower) deductible. The potential outcomes y^1 (doctor visits with the lowest/highest deductible) and y^0 (doctor visits for with any other higher/lower deductible) are linearly related to observables (λ, X) and unobservables (ω^1, ω^0), so that

$$\begin{aligned} y^D &= (1-D)y^0 + Dy^1 \\ y^1 &= \alpha^1 + \beta^1\lambda + \gamma^1 X + \omega^1 \\ y^0 &= \alpha^0 + \beta^0\lambda + \gamma^0 X + \omega^0 \end{aligned} \qquad (7)$$

The deductible choice process is modelled as a latent variable function of observable instruments Z and unobservables V

$$\begin{aligned} I &= Z\psi - V \\ D &= \begin{cases} 1 & \text{if } I > 0 \\ 0 & \text{if } I < 0 \end{cases} \end{aligned} \qquad (8)$$

Following Heckman, Urzua, and Vytlacil (2006), I use average local group-level premiums and a lagged indicator of health insurance subsidy receipt as excluded instruments Z for the selection equation.

The average local group-level premium is very likely to satisfy the exclusion restriction condition, as (a) they are exogenous from the perspective of households (Hadley et al. 2006; Pan, Lei, and Liu 2016), and (b) there is no clear way why the premium should affect the healthcare utilization response to the health shock directly. Two main arguments support this assumption. Firstly, in the Swiss setting with mandatory health insurance and given a household budget, the most obvious effect of premiums is indirect. Namely, premiums affect utilization through deductible choices happening at the end of the year before the realization of the health shock, in response to lower prices for lower coverage levels. Secondly, any residual influence of monthly premiums on the budget of low-income households, which may prevent them from accessing care to avoid incurring in co-payments - should be contrasted by the redistribution policy based on means-tested subsidies.

For this reason, alongside average premiums, I also include the lagged subsidy state. The validity of this variable as excluded instrument is motivated by the Swiss health insurance market setting. Specifically, I argue that the lagged subsidy status can be seen as an additional valid instrument

because being granted a subsidy in year t (and conditional on knowledge of the current and past income) is strongly informative of the likelihood of obtaining the subsidy in year $t+1$, which can easily favour choice of more expensive coverage with lower co-payment rates. Crucially, the coverage decision for year $t+1$ also happens in year t and there is no obvious reason why being granted an earmarked health insurance subsidy could be related to healthcare consumption through channels other than health insurance coverage.

Assuming that the two instruments are uncorrelated with moral hazard, imposing joint normality of the unobserved component with an arbitrary correlation structure $(\omega^0, \omega^1, V) \sim N(0, \Sigma)$, and conditioning on a comprehensive set of explanatory variables (λ, X), Brave and Walstrum (2014) and Carneiro, Heckman, and Vyltalcil (2011) show that it is possible to obtain consistent estimates of the marginal treatment effects (MTEs) along the distribution of an unobserved component representing the propensity not to self-select into treatment (in our case, not to choose a given deductible level). The propensity score $P(Z) \in (0,1)$ is estimated with a simple Probit model. Then, the parametric estimator proposed Brave and Walstrum (2014) is used to correct for selection into deductible and estimate the response to the given deductible choice (either the lowest or the highest) on (log) number of doctor visits. The relationship between MTEs at different values of propensity to not select the deductible and the average treatment effect for the same deductible (which we use as a benchmark) is relatively straightforward. The function recovering MTEs can then be integrated through the estimated propensity score to obtain the average treatment effect (Heckman and Vytlacil 2001).

The utilization model includes a comprehensive set of control variables. Firstly, I account for habit formation in healthcare utilization patterns controlling for the lagged value of the dependent variable. Secondly, I control for differences in initial health conditions controlling for the lagged self-assessed health status. The combination of initial health status and lagged value of doctor visits provides a reasonable proxy for the expected healthcare need of equation (5). Thirdly, I focus on responses to an unexpected health shocks, which we measure as a new illness, accident or serious health problem in year. I argue that this health shock is plausibly exogenous (conditional on initial health conditions), and should therefore further reduce concerns related to anticipated healthcare procedures determining health insurance coverage choice, and hence contribute to tempering the extent of adverse selection. Finally, I also include a larger set of socioeconomic controls and pre-determined health conditions and behaviours (e.g. chronic conditions, consumption of medicines, physical activity, smoking status; the full list is in Table 2).

To estimate the model described above, I rely on the *margte* Stata command (Brave and Walstrum 2014) to obtain parametric estimates for the marginal treatment effects for the choice of the lowest (300 Swiss francs) and highest (2'500 Swiss francs), separately for years 2018 and 2019. The unobserved propensity not to select a given deductible can be interpreted as the inverse of the unobserved level of moral hazard ω, as in equation (4). Standard errors for the marginal treatment effects are bootstrapped, considering Cantons as strata.

4.2.2. Instrumental variable approach contrasting switchers to non-switchers

I also triangulate the results of the model introduced in section 4.2.1 with an alternative IV strategy. It is worth repeating that the study aims to measure the extent of selection on moral hazard, isolating heterogeneity in the healthcare utilization response to given coverage levels in an attempt to estimate the parameter ω in equation 4 above. The main challenge in estimating this model lies in the traditional mechanisms of adverse selection: an intrinsic difference between the individuals self-selected in high and low deductible plans respectively, which drives healthcare utilization patterns. The econometrician is faced with the problem of endogeneity due to unobserved characteristics affecting both the coverage level and healthcare utilization. To address this empirical challenge, similarly to Section 4.2.1, I exploit the fact that changes in health insurance premiums (i.e. price of

coverage) from year to year are exogenous from the perspective of individuals. Crucially, changes in prices influence coverage choices as more generous plans may become more or less expensive.

Ultimately, I aim to explore the heterogeneity in co-payment slope, with the assumption that higher responsiveness to co-payment leads to selection of higher coverage. To achieve this, I contrast the utilization patterns of individuals who switched the deductible level compared to the previous year to that of individuals who maintained the same deductible level. Specifically, I divide individuals in 5 mutually exclusive groups based on their deductible switching behaviour, as reported in Table 1.

Table 1: Deductible switching groups

Groups	**Switching behaviour**
No switch	Individuals reporting the same deductible level in years t and $t-1$
Strong drop	Large reductions of 1'000 – 2'200 Swiss francs, moving highest deductible levels in $t-1$ to the lowest in t, likely to reflect conscious changes to coverage
Mild drop	Small reductions (200-700 Swiss francs) in deductible levels, likely to reflect small adjustments to accommodate premium differences from year to year and budget constraints
Mild increase	Small increases (200-700 Swiss francs) in deductible levels, likely to reflect small adjustments to accommodate premium differences from year to year and budget constraints
Strong increase	Large increases of 1'000 – 2'200 Swiss francs, moving from lowest deductible levels in $t-1$ to the highest in t, likely to reflect conscious changes to coverage

The underlying assumption is that, conditional on the comprehensive set of covariates introduced in Section 4.2.1., non-switchers (who are already self-selected at a given deductible level) represent a natural comparison group for switchers, so that the difference between the two will unpick the extent of selection on moral hazard. Accordingly, the IV approach has 5 distinct first-stage regressions (one per each level of the switching group) given by

$$(\mathrm{S}\times\mathrm{C})_{i,t} = \beta(S\times\pi)_{i,t} + \mathrm{e}_{\mathrm{i,t}} \quad (9)$$

where $(S\times C)_{i,t}$ is the interaction between co-payment rate dummy $C_{i,t}$ and switching group and $S_{i,t}$, a categorical variable indicating whether and how the individual switched the deductible level compared to the previous year (see Table 1). The instrument is represented by $(S\times\pi)_{i,t}$ is the interaction between switching group and premium level for year t. The corresponding linear specification for the second stage regression reads as follows:

$$\ln(y_{i,t}) = \rho\ln(y_{i,t-1}) + \omega(\widehat{\mathrm{S}\times\mathrm{C}})_{i,t-1} + \psi\mathrm{UHS}_{\mathrm{i,t}} + \delta\mathrm{HS}_{\mathrm{i,t-1}} + \beta X_{i,t} + \epsilon_{i,t} \quad (10)$$

where y_{it} is the number of doctor visits, for individual i in year t, $(\widehat{S\times C})_{i,t}$ is the switching group and co-payment rate interaction predicted using the first-stage regression in (9). $\mathrm{UHS}_{\mathrm{i,t}}$ is a dummy indicating the health shock in year t, $\mathrm{HS}_{i,t-1}$ model the initial health conditions using the lagged value of the self-reported health status, whilst $X_{i,t}$ includes a set of individual health and socio-economic characteristics. In this full specification, the vector of coefficients of interest is represented by ω, which measures our IV estimate of the slopes of the co-payment for different switching behaviours. The simple model in Section 2 implies that switchers to high coverage levels (i.e. smaller deductibles) have intrinsically higher values value of ω, compared to switchers to lower coverage levels. I estimate 4 different coefficients, using non-switchers as reference group.

I discuss tests for the validity of this IV approach later. The models are estimated with a linear two-stage least squares estimator pooling the two usable waves of data available (2018 and 2019), clustering standard errors by individual, and including year and canton fixed effects to account for time-invariant common trends and different healthcare supply and epidemiological characteristics across cantons.

4.3. Heterogeneity and robustness checks

To explore the heterogeneity in the patterns of selection on moral hazard and ensure that my empirical approach is valid, I conduct a series of stratified analyses and robustness checks.

Firstly, albeit the focus on individuals aged 26 and more excludes the behaviour of young adults likely to depend upon their parents, the coverage decisions may nevertheless reflect household decisions and composition (e.g. children) rather than independent individual choices. This would invalidate the empirical approach as it wouldn't allow to directly link heterogeneous responses to a same coverage to a mechanism of selection on an unobserved moral hazard. To check whether household composition confounds the estimates, I propose a set of stratified analyses by household composition (1 member, 2 members, 3 or more members) estimating the Roy model on the full sample pooling the 2018 and 2019 survey waves.

Secondly, risk preferences and health insurance preferences may vary by gender. Hence, similarly to the household composition stratification, I estimate my main empirical approach separately for females and males.

Thirdly, one major concern is that individuals' choices may be driven by socioeconomic status rather than explicit or implicit selection based on utilization responses to health insurance coverage. This pattern would not be fully captured by simply controlling for socioeconomic status in the regression. This is important to consider for two reasons. From a positive perspective, premiums are disjoint from income and subsidies to correct for equity are generally decided ex post, which leaves scope for households to select insurance plans to optimise budget rather than optimal insurance coverage for medical care. From a normative perspective, if low-income households optimise budget rather than coverage, potential changes to policies devised to control the growth in healthcare expenditures in relation to a mechanisms of selection on moral hazard may be flawed by unintended distributional consequences. To explore whether estimates of the extent of selection of moral hazard vary across socioeconomic status, I estimate stratified models by quintile of disposable household income (poorest and richest quintiles), and by receipt of health insurance subsidy in year *t*.

Fourth, in my main model I proxy the intensive margin of healthcare utilisation with the number of doctor visits (i.e. number of doctor visits conditional on having at least one). However, extensive margin, i.e. the propensity of individuals to visit a doctor in the first place, is often very persistent. This could introduce an intrinsic sample selection bias in my main analysis. To address this concern, I model the decision to visit a doctor with a binary variable (0 if no visit to doctors, 1 if at least one visit). Although admittedly sub-optimal, I re-estimate the Roy-type model using this binary dependent variable.

Finally, despite the parametric estimator proposed by Brave and Walstrum (2014) does not strictly require the propensity score to have common support between treated and untreated groups (compared to alternative semiparametric approaches), I explore the validity of these conditions to further assess the robustness of the estimation procedure.

5. Results

5.1. Descriptive statistics

Table 2 describes the characteristics of the core 2019 sample of individuals used for my main analysis. Conditional on having at least one visit to doctors, individuals reported 8.72 visits to doctors in 2019, on average. Unsurprisingly, individuals who chose the lowest level of deductible reported more doctor visits, overall and conditional on a "health shock". The choice of excluding individuals who did not have any doctor visits has clear consequences in terms of representativeness for the overall population. However, given that my focus is on the identification of selection on moral hazard and the data available, the number of doctor visits appeared to be the best possible proxy for healthcare utilization. Nevertheless, as mentioned in Section 4.3, in the sensitivity checks I also explore response on the extensive margin.

The vast majority of people (82 percent) reported being well or very well in the year prior to the interview date. Somewhat accordingly, the share of people reporting weekly physical activity is high (84 percent) and there seems to be a generally limited dependency on drugs in everyday life (3.18 out of 10). Nevertheless, 46 percent of people reported some chronic condition and 17 reported smoking in the previous year.

Overall, individuals selecting the highest deductible are younger, healthier, less likely to smoke, less dependent upon medications, and more likely to be women. Individuals selecting the highest deductible level are also more educated, more likely to be actively employed, and report a higher income compared to those selecting the lowest level of deductible. The share of individuals indicating having a new illness, accident or disease in 2019 - which I interpret as measure of health shock – is around 12 percent and constant across groups based on deductible choices.

In my 2019 sample, about 44 percent reported having the lowest level of deductible, whilst 26 percent opted for the highest. Between 2018 and 2019, only 18 percent of the individuals in the sample switched deductible: switching patterns are roughly equally distributed across the groups defined in Table 1.

Figure 1 illustrates the distribution of changes in deductibles from 2018 to 2019, split among the corresponding switching groups reported in Table 1. The two spikes at +/- 2'200 correspond to individuals switching from highest to lowest deductible, and vice versa. The average health insurance premium is 392. This supports the approach proposed in section 4.2.1, which focuses only on the selection of lowest and highest levels of deductible.

Figure 2 represents the distribution of estimated co-payment rates in 2018 and 2019. These rates are estimated as the ratio of the deductible choice reported (in Swiss francs) to the health expenditure per capita based on detailed national-level data stratified by 5-year age groups and gender. For individuals who chose a deductible level that exceeds the average health expenditure for a same gender and age group we imputed full co-payment. Figure 2 shows a substantial stability in time for the shape of underlying distribution of co-payment rates in the sample.

Table 2: Descriptive statistics for the panel sample, for year 2019, overall and for low and high deductibles

	2019		Low subsidy 300 Swiss francs		High subsidy 2,500 Swiss francs	
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Doctor visits	5.46	8.98	6.96	12.08	3.57	4.09
Doctor visits in previous year	5.82	8.83	7.23	10.60	3.59	4.74
New illness, accident, disease (Yes/No)	0.12		0.11		0.12	
Doctor visits conditional on Health Shock	8.72	16.33	10.30	23.74	6.13	4.98
Health status in previous year						
Very well	0.17		0.12		0.25	
Well	0.64		0.62		0.67	
Average	0.16		0.22		0.07	
Not very well	0.02		0.03		0.01	
Not very well at all	0.00		0.00		0.00	
Smoking in previous year (Yes/No)	0.17		0.17		0.14	
Chronic condition in previous year (Yes/No)	0.46		0.59		0.28	
Weekly physical activity in prev. year (Yes/No)	0.84		0.82		0.89	
Index of medication need (0-10) in prev. year	3.18	3.59	4.34	3.72	1.28	2.38
Woman (Yes/No)	0.44		0.40		0.50	
Age in year of interview	57.81	15.45	61.65	14.73	50.00	13.85
Years of education based	14.40	3.39	13.85	3.32	15.56	3.25
Working status						
Actively occupied	0.62		0.50		0.82	
Unemployed	0.01		0.01		0.01	
Not in the labour force	0.37		0.49		0.17	
Income per household member	59,914	48,409	55,067	33,837	65,186	42,874
Subsidy for mandatory health insurance (Yes/No)	0.15		0.17		0.15	
Average premium for coverage [a)]	387.85	78.86	431.70	57.38	307.41	53.82
Estimated co-payment rate [b)]	0.64	0.34	0.34	0.18	1.00	0.02
Deductible level selected						
300	0.44		1.00			
500	0.14					
1000	0.05					
1500	0.08					
2000	0.03					
2500	0.26				1.00	
Deductible switching group						
No	0.82		0.87		0.84	
Strong reduction	0.04		0.06			
Mild reduction	0.05		0.07			
Mild increase	0.05				0.05	
Strong increase	0.04				0.11	
Type of health insurance model selected						
Standard model	0.33		0.35		0.21	
HMO	0.05		0.04		0.08	
Family doctor	0.54		0.55		0.57	
Telmed and similar	0.08		0.06		0.13	
Observations	4,964		2,035		1,205	

Note: [a)] The average market premium is defined based on the universe of market prices for the combination of canton, age group, managed care model and deductible level. See Appendix B for further details. [b)] Estimated as the ratio of the deductible choice reported (in Swiss francs) to the health expenditure per capita based on detailed national-level data stratified by 5-year age groups and gender. See Appendix B for a full list of data sources.

Figure 1: Changes in deductible from 2018 to 2019 (conditional on switching).

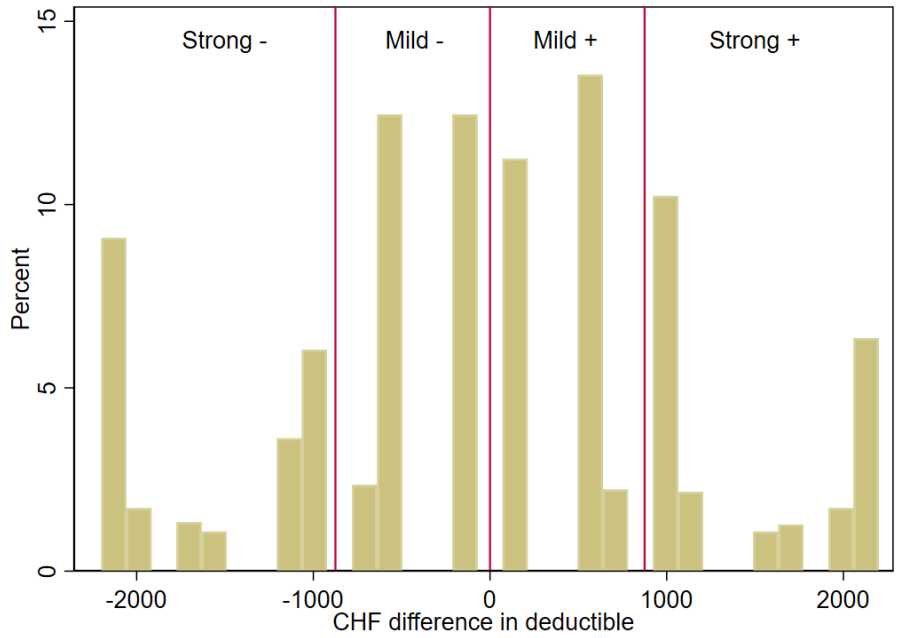
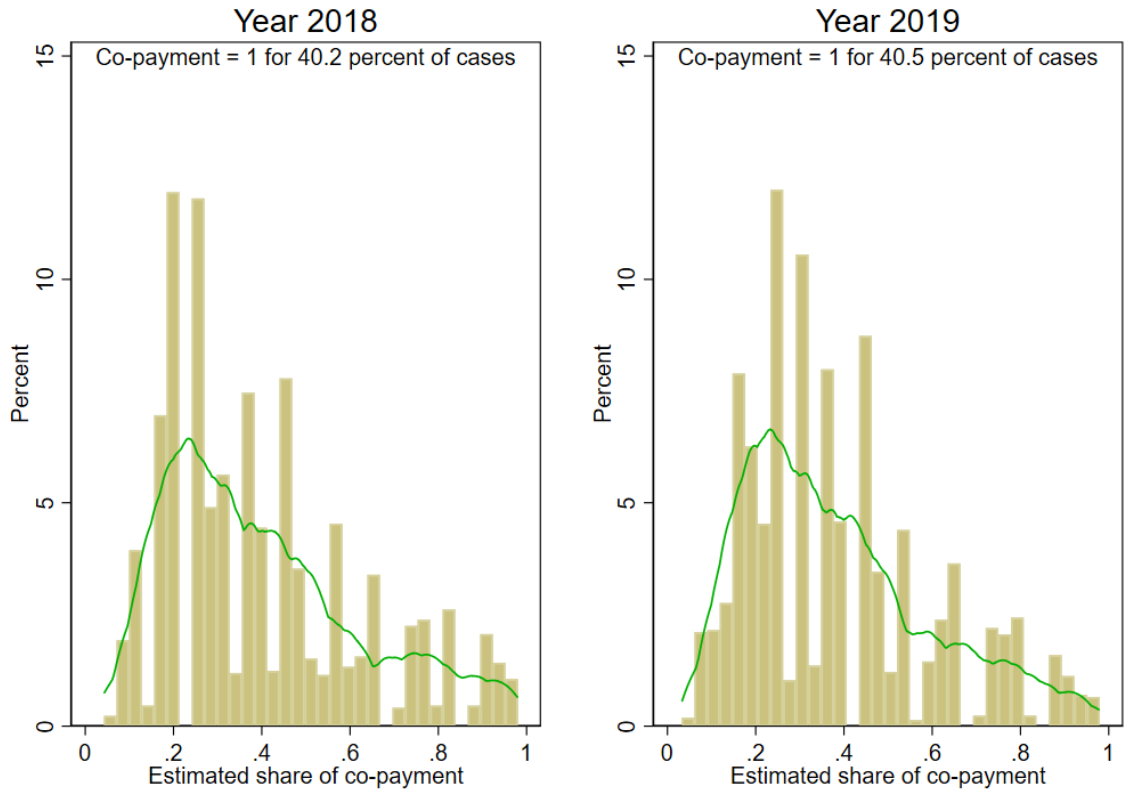


Figure 2: Distribution of estimated co-payment rates in 2018 and 2019



5.2. Roy selection model results

The main result obtained with the approach described in Section 4.2.1 are summarized in Table 3. The difference in (log) number of doctor visits between individuals selecting the highest deductible compared to those selecting any lower deductible (reported as ATE) is negative. Depending on the year, the ATE for coverage with the lowest deductible level is positive or null. These differences reflect a mix of standard adverse selection based on level of healthcare need and ex post moral hazard.

Table 3: Results of parametric MTE estimates for coverage with lowest and highest deductibles in 2018 and 2019

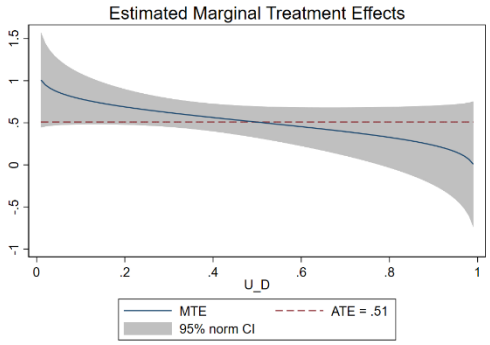
	(1) 2018 Lowest deductible	(2) 2018 Highest deductible	(3) 2019 Lowest deductible	(4) 2019 Highest deductible
Average difference between individuals selecting the deductible of interest compared to all other deductible levels (ATE)				
ATE	0.508***	-0.393***	0.172	-0.340***
	[0.320,0.695]	[-0.535,-0.252]	[-0.0677,0.412]	[-0.515,-0.164]
MTE across the distribution of unobserved propensity not to select a given deductible				
1st Percentile	1.008***	-1.212***	1.082***	-0.935***
	[0.445,1.572]	[-1.751,-0.674]	[0.440,1.723]	[-1.377,-0.493]
25th Percentile	0.653***	-0.631***	0.436***	-0.512***
	[0.468,0.838]	[-0.771,-0.491]	[0.208,0.663]	[-0.642,-0.382]
50th Percentile	0.508***	-0.393***	0.172	-0.340***
	[0.320,0.695]	[-0.535,-0.252]	[-0.0677,0.412]	[-0.515,-0.164]
75th Percentile	0.363*	-0.156	-0.0918	-0.167
	[0.0413,0.685]	[-0.447,0.135]	[-0.481,0.298]	[-0.475,0.141]
99th Percentile	0.00773	0.426	-0.738	0.255
	[-0.738,0.753]	[-0.291,1.142]	[-1.608,0.132]	[-0.426,0.937]
N	5156	5156	4964	4964

Notes: Models estimated separately for 2018 and 2019 and for the effect of lowest and highest deductible levels using the parametric estimator for marginal treatment effects in a Roy selection model proposed by Brave and Walstrum (2014). The MTE are reported at different points in the distribution of U_D, which represents the likelihood not to select a given deductible. In relation to the theoretical framework introduced in Section 3, U_D can be interpreted it as $1 - \omega$ with ω normalized to 1. The selection models use average premium and lagged health insurance subsidy status as excluded instruments. The utilization models control for: lagged self-assessed health status, lagged smoking status, lagged chronic conditions, lagged indicator of good physical status, gender, age, age squared, income per person in the household, years of educations, working status, and cantonal fixed effect. Full regression results included in Appendix C. Standard errors for the utilization model are bootstrapped, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

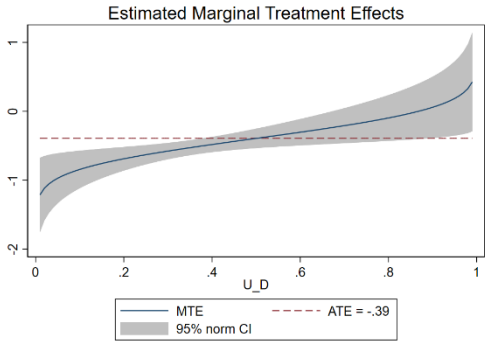
Most importantly, the pattern of MTEs across the distribution of the unobserved propensity not to select the corresponding deductible – which I interpret as the inverse of the multiplicative moral hazard coefficient in Equation (5) - is fully aligned with the predictions of the model of selection on moral hazard inspired by Einav et al. (2013). Individuals with lower propensity not to select the higher deductible have a sensibly lower estimated response to coverage compared to the average effect. Although slightly weaker, the pattern is analogous but inverted in relation to the coverage with the lowest deductible: whilst individuals with lowest propensity not to select the lowest deductible tend to have a sensibly higher response to coverage compared to the average. The response of individuals with higher propensity to select the most/least comprehensive coverage is about 2-3 times stronger than the average treatment effect. This difference in marginal treatment effects are symmetric in magnitude between low and high deductible (i.e. high and low coverage), and roughly similar across the two years analysed. These same results are visually summarised by Figure 3.

Figure 3: Estimated marginal treatment effects of choosing the lowest and highest deductible levels on the (log) number of doctor visits across the inverse distribution of the unobserved level of moral hazard.

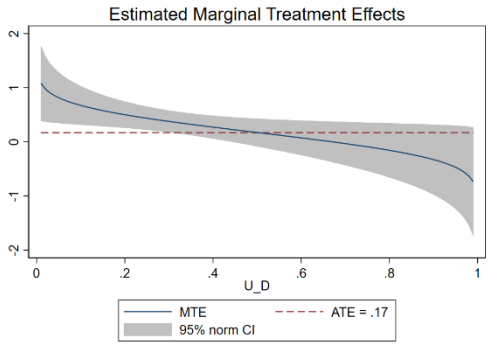
(a) Choosing lowest deductible, 2018



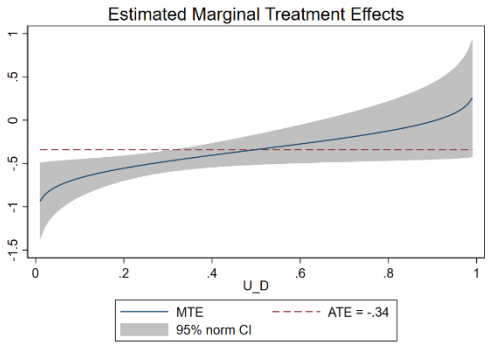
(b) Choosing highest deductible, 2018



(c) Choosing lowest deductible, 2019



(d) Choosing highest deductible, 2019



Note: Models estimated separately for 2018 and 2019 and for the effect of lowest and highest deductible levels using the parametric estimator for marginal treatment effects in a Roy selection model proposed by Brave and Walstrum (2014). The horizontal axis represents the likelihood not to select a given deductible. In relation to the theoretical framework in Section 3, U_D can be interpreted it as $1 - \omega$ with ω normalized to 1. The selection models use average premium and lagged health insurance subsidy status as excluded instruments. The utilization models control for: lagged self-assessed health status, lagged smoking status, lagged chronic conditions, lagged indicator of good physical status, gender, age, age squared, income per person in the household, years of educations, working status, and cantonal fixed effect. Full regression results included in Appendix C. Standard errors for the utilization model are bootstrapped, 95% confidence interval reported in grey.

5.3. Results for the IV approach

The IV estimates for model (10) are included in Table 4. I find substantial heterogeneity in the slope of utilization with respect to co-payment across our deductible switching behaviour groups. Consistently with the influence of endogeneity due to adverse selection and on the focus on compliers implicit in the IV approach, the OLS results are biased towards zero (i.e. show a milder selection effect). The results are also stable to the inclusion of a full set of controls. In Table 4 I also report results of various tests to support the IV identification strategy. The F statistics for the first-stage appear sufficiently high and support the validity of our instrument, albeit the validity of the exclusion restriction remains difficult to test formally. Further details on first-stage regressions are included in Appendix C, which also includes full regressions results: all other covariates behave as expected.

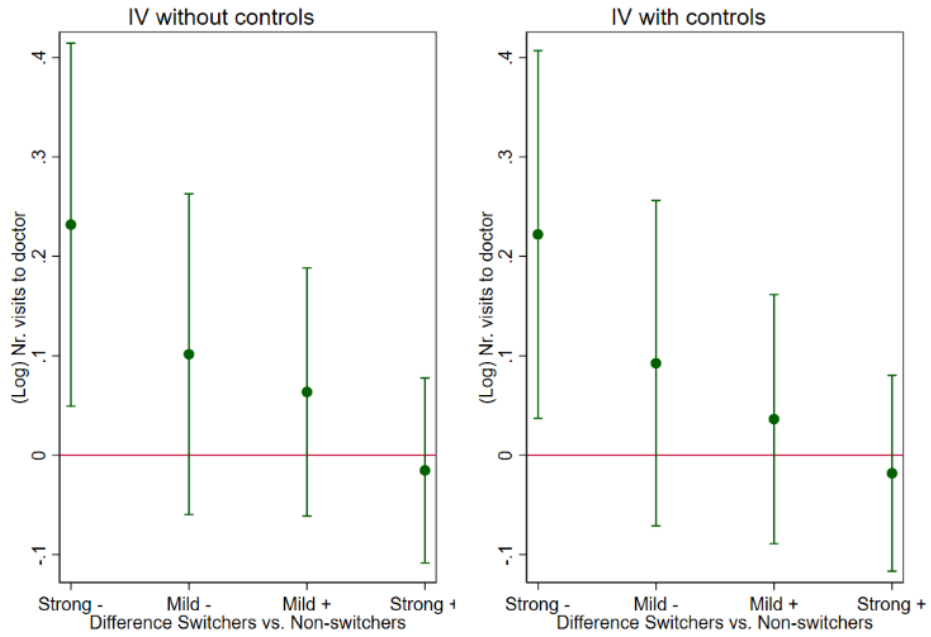
Building on the IV estimates, I compute the difference in predicted responses to a positive health shock, given observed values of other covariates. My main focus is on differences between deductible switching groups, namely in terms of contrasts between switchers and non-switchers. This should ultimately allow to avoid the traditional adverse selection and moral hazard effects, focusing on the mechanisms of selection on moral hazard (Einav and Finkelstein 2018; Einav et al. 2013). Overall, the IV models suggest that high moral hazard individuals who strongly reduced their deductible visit the doctors about 20-25 percent more. Figure 4 summarizes visually the results in Table 4.

Table 4: Main results with alternative IV approach

VARIABLES	(1) OLS	(2) OLS	(3) IV	(4) IV
Marginal effect conditional on health shock=1 (at observed levels of other covariates) on				
Unit for nr. of doctor visits in *t*	Natural log	Natural log	Natural log	Natural log
No switching * Co-payment	-0.236***	-0.248***	-0.393***	-0.385***
	[-0.291,-0.181]	[-0.323,-0.172]	[-0.473,-0.313]	[-0.500,-0.270]
Strong + * Co-payment	-0.0828	-0.0964	-0.161	-0.163
	[-0.242,0.0763]	[-0.265,0.0719]	[-0.358,0.0350]	[-0.388,0.0618]
Mild + * Co-payment	-0.152*	-0.169*	-0.292**	-0.293**
	[-0.285,-0.0184]	[-0.317,-0.0221]	[-0.469,-0.115]	[-0.493,-0.0926]
Mild - * Co-payment	-0.267***	-0.299***	-0.330***	-0.349***
	[-0.376,-0.159]	[-0.418,-0.179]	[-0.464,-0.195]	[-0.501,-0.197]
Strong - * Co-payment	-0.334***	-0.325***	-0.409***	-0.403***
	[-0.422,-0.245]	[-0.428,-0.223]	[-0.507,-0.310]	[-0.525,-0.281]
New illness = 1	0.615***	0.599***	0.618***	0.606***
	[0.555,0.675]	[0.538,0.661]	[0.556,0.679]	[0.543,0.668]
Testing for difference in slope vs. "No switching" group				
Strong + * Co-payment vs. No Switching	0.15 [0.00, 0.31]	0.15 [0.00,0.30]	0.23 [0.05,0.41]	0.22 [0.04,0.40]
Mild + * Co-payment vs. No Switching	0.08 [-0.04, 0.21]	0.08 [-0.05,0.21]	0.10 [-0.06,0.26]	0.09 [-0.07,0.25]
Mild - * Co-payment vs. No Switching	-0.03 [-0.13,0.07]	-0.05 [-0.16,0.05]	0.06 [-0.06,0.19]	0.04 [-0.09,0.16]
Strong - * Co-payment vs. No Switching	-0.10 [-0.18,-0.01]	-0.08 [-0.17,0.01]	-0.01 [-0.11,0.08]	-0.02 [-0.11,0.08]
Other controls	No	Yes	No	Yes
Canton Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	6488	6009	6232	5775
Number of clusters (individuals)	4598	4332	4464	4201
R-squared	0.35	0.36	0.34	0.36
Underidentification test: Kleibergen-Paap Wald F	-	-	1409.30	1086.49
Weak identification test: Kleibergen-Paap rk LM test	-	-	1630.72	998.82
Weak-instrument-robust inference tests:				
Anderson-Rubin Wald test	-	-	23.39	12.46
Stock-Wright LM S statistic	-	-	115.00	61.88

Notes: Detailed sources of data are reported in Appendix B. Details about first stage-regressions are included in Appendix C. Test for difference in slopes conducted with the *lincom* command in Stata. Standard errors obtained using the Delta method, 95% confidence intervals in brackets. Stars indicate significance as follows: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 4: Predicted (log) changes in number of doctor visits conditional on the health shock for different deductible switching groups based on IV estimates.



5.4. Heterogeneity and robustness checks

Appendix D reports the results of all heterogeneity and robustness checks. The results of all stratified analyses are remarkably close to my main results. This finding suggests that the extent of selection on moral hazard is not substantially affected by the individual characteristics considered (household composition, income, gender, receipt of subsidy). The pattern of selection on moral hazard emerges also when using a binary dependent variable indicating whether individuals had any doctor visit (Appendix D5). This finding suggests that the mechanisms is likely to affect healthcare utilisation both on the extensive and on the intensive margin, calling for further research to unpack this specific aspect of healthcare utilisation decisions.

6. Discussion

This paper focuses on selection mechanisms in the intertemporal choice of health insurance deductibles for mandatory health insurance plans in Switzerland, which define the effective level of coverage limiting the amount of co-payment faced. In contrast with previous published work on Switzerland, the study addresses the notion of selection of moral hazard, that is defined as coverage selection based on heterogeneity in the behavioural response to coverage (Einav et al. 2013), rather than on the level of expected utilization (or risk). Intuitively, a mechanism of selection on moral hazard is consistent with observing a stronger reaction to high coverage (i.e. low deductible, implying low co-payment) for individuals who previously had lower levels of coverage.

To identify this heterogeneity in moral hazard and selection thereof, I measure utilization as the number of visits to doctors, conditional on a plausibly unexpected health shock. Conditioning on an unexpected shock should temper concerns about coverage choices based on anticipation of given healthcare procedures. I estimate the extent of selection on moral hazard using a structural approach which tries to estimate the difference in healthcare utilization associated to the choice of lowest or

highest deductibles, allowing for selection on unobservables. Building on the stylized model of selection on moral hazard discussed in Section 2, the unobserved selection component can be interpreted as the multiplicative heterogeneous coefficient driving selection on moral hazard. For this Roy-type model, I use average premiums and lagged receipt of health insurance subsidy as excluded instruments in the selection equation. I argue that average premiums are likely to satisfy the exclusion restriction because individuals decide on their coverage each year by the end of November of the previous year. Changes in premiums on the market are exogenous from the perspective of individuals, who may choose lower levels of coverage to benefit from reduced monthly premiums for mandatory health insurance. Hence, the influence of premiums on healthcare utilization is indirect, through deductible choices. Moreover, given a household budget, the residual effect of the burden of premiums that may push low-income households to refrain from accessing care (i.e. avoid healthcare spending) should be adequately compensated by the means-tested subsidies distributed individually by Cantons through direct reductions of premium bills.

I also triangulate the main results with an alternative IV approach which deals with the potential endogeneity in the relationship between the level of healthcare utilization and the level of coverage. I use the average market price for the health insurance coverage as instrument for the level of deductible selected. To isolate differences that are more closely related to selection on moral hazard, I compare the reaction to the health shock for different deductible switching patterns, contrasting individuals who switched deductible with individuals who did not.

The results of models measuring difference in utilization across deductible choices accounting for selection on unobservables are consistent with a multiplicative effect of unobserved moral hazard: individuals with highest unobserved moral hazard show differences in utilization 2 to 3 times stronger compared to the average effect of coverage, which can broadly be attributed to a mix of adverse selection and ex post moral hazard. The IV estimates also reveal a pattern fully consistent with selection on moral hazard. Specifically, the slope of co-payment is substantially higher for individuals switching from higher to lower levels of deductible, compared to individuals that did not switch deductible. My estimates suggest that this effect can is roughly equivalent to 1.2 to 1.5 more doctor visits, or 12-15 to 20-25 percent more utilization (depending on the reference population selected, i.e. conditional on experiencing the health shock or full sample). This magnitude is roughly consistent with the estimates obtained with the main Roy models above. Furthermore, in the robustness checks I repeated the main analysis on a binary indicator measuring whether respondents reported any doctor visits, hence modelling the extensive rather than the intensive margin. The main patterns of selection on moral hazard are found also on this secondary analysis.

My study has many relevant limitations. Firstly, it assumes rational individuals ready to change deductible and/or insurer every ear. This assumption fails to consider frictions, inertia and biases which have been highlighted by research in behavioural economics (Frank and Lamiraud 2009). Secondly, the study is based only on two effective time points: a longer longitudinal dimension in the data would better address unobserved individual characteristics or underlying healthcare use trends. One relevant timing aspect which these data are silent on is timing of claims, which could inflate observed utilisation rates due to a the form of ex-post adverse selection discussed by Cabral (Cabral 2017). Although controlling for the plausibly exogenous health shock and averaging across individuals should reduce the influence of this potential mechanism, the data at hand restrict the extent to which I can rule this specific explanation out completely. Thirdly, my study focuses on Switzerland and may have little external validity. However, the strict standardization of services covered by the mandatory health insurance in Switzerland allows us to focus on the role of the deductible as the main lever available to the insured to reduce the premium paid. Additionally, a country-wide study represents a wider focus compared to most of the published literature trying to address selection on moral hazard. Fourth, I use an arguably limited outcome measure, which is self-reported number of doctor visits. Access to more detailed claims or administrative data would allow a

much deeper understanding of these patterns, a better control for timing of claims, and a more precise assessment of the magnitude of selection on moral hazard in terms of both healthcare utilization and ultimately costs for the health system. Finally, the exclusion restriction in the selection equation of the Roy model and in the IV approach remain impossible to test formally. The sign of other covariates in the model seems to be intuitively reasonable, providing some reassurance with regards to the validity of the model specification.

Despite important differences in the study settings, my findings are broadly consistent with Einav et al. (2013). In their seminal contribution, they studied health insurance choices of US employees at Alcoa, a large multinational industrial corporation, exploiting an abrupt change in the type of plans offered. Their findings suggested that ignoring selection on moral hazard leads to substantial losses in welfare. My study exploits representative survey data to study patterns of healthcare use and endogenous health insurance plan choice across Switzerland. In a context of steady increase in healthcare expenditures and premiums, if confirmed with more precise individual-level data, my results would call for new ways to regulate the Swiss mandatory health insurance which should incorporate these known features of consumer behaviour in the design of health insurance contracts. Policy makers may want to promote policies to reduce gaming and selection on the side of consumers. Among the options discussed in the Swiss health policy arena, the marked increase in the lowest deductible level (set at 150 Swiss francs in 1996, at 230 in 1998 and unchanged at 300 since 2004)[2] or the reduction in the deductible options allowed seem the easiest to implement. To this end, it is interesting how in 2018 the CEO of a leading insurer proposed to increase the minimum deductible to 5'000 or 10'000 Swiss francs a year[3]. In 2019, the Parliament rejected an increase in the minimum deductible of 50 Swiss francs per year proposed by the Government[4]. Finding a strong role of selection on moral hazard would imply that these policy levers may turn out to be less effective, compared to what could be expected if selection is based only on different levels of expected healthcare utilization. Another alternative is to limit the opportunity to change insurer and/or deductible yearly, either extending the validity of the deductible choice (e.g. setting a multiyear deductible level) or anticipating the deadlines to require a change for the subsequent year. Finally, Einav et al. (2013) postulate the introduction of varying coinsurance rates across diagnoses or types of healthcare, tempering the scope of moral hazard for conditions or treatments with higher discretionary utilization.

Appendix

Online appendix available here: https://www.dropbox.com/s/fj0ohwbg17hvuf2/appendix.pdf?dl=0

[2]

[3] More here: https://www.swissinfo.ch/ita/lamal--css-propone-franchigia-minima-5000-o-10-000-franchi/44048366

[4] More here: https://www.parlament.ch/en/ratsbetrieb/suche-curia-vista/geschaeft?AffairId=20154157

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