The Impact of Subsidies on Deductible Choice in Health Insurance

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Abstract

Premium subsidies affect insurance coverage via income effects (higher disposable income leads to increased coverage) and substitution effects (lower relative prices make generous plans attractive). Previous literature assumes a small income effect. Using administrative data from Switzerland and regression kink discontinuity analysis, I demonstrate a substantial income effect: a CHF 100 subsidy raises generous-plan uptake by 5.4 percentage points, accounting for 29% of coverage increases. Marginal enrollees' medical spending rises from CHF 1,109 (1255 USD) to CHF 5,687 (6436 USD). Income effects reshape subsidy policy evaluation, highlighting that the direction of price changes (subsidies vs. penalties) matters for policy-making.

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1 Introduction

Governments allocate substantial resources to subsidize health insurance (Gruber (2017); Gruber (2022)). In the United States, federal spending on premium subsidies in the ACA marketplace surpassed $111 billion in 2023 (Kaiser Family Foundation (2025)). Similarly, in Switzerland, more than a quarter of households receive premium subsidies to maintain universal health coverage (WHO Europe (2024)). Subsidies typically influence insurance decisions through two channels. The first is the "income effect": larger subsidies increase disposable income, which can lead people to purchase more generous coverage (e.g., lower deductibles). If coverage prices remain fixed, individuals receiving bigger subsidies might opt for plans with greater coverage. The second channel is the "substitution effect": subsidies alter the relative prices of insurance options. In many cases, higher subsidies reduce price differentials between plans (Einav and Finkelstein (2018)), potentially driving consumers to switch to more comprehensive coverage. Economic theory and insurance models suggest that subsidies lower prices and boost insurance uptake, but at the cost of possible distortions (Powell (2016); Einav and Finkelstein (2011); Gruber et al. (2024)). However, if consumers treat a subsidy more like an income transfer, the resulting behavior could actually reflect a welfare gain.

The existing literature often assumes that the income effect on insurance demand is negligible, and thus many insurance models employ quasi-linear utility (Cohen and Einav (2007); Handel (2013)). These studies reach this assumption for two main reasons. First, subsidies are generally small relative to overall income, so any subsidy-driven income effect should be spread across all consumption choices (over the life cycle) rather than concentrated on insurance. Second, subsidies are typically tied to income, which complicates the isolation of their pure income effect. Empirical studies often estimate price elasticities following Einav et al. (2010) by using subsidies as instruments to shift demand and trace out the demand curve across income groups. These estimates assume a minimal income effect, effectively treating willingness to pay (WTP) as independent of income. For example, Finkelstein et al. (2019) use price discontinuities to estimate WTP for health insurance.

This paper challenges the assumption that income has a negligible effect on health insurance demand. I exploit a unique setting in the Swiss basic insurance market. First, individuals are mandated to hold a basic coverage plan, known as the high-deductible (HD) plan, which functions as a uniform tax for all residents. The primary choice consumers face is whether to pay for a lower-deductible (LD) plan instead of the HD plan; I refer to switching from the HD plan to the LD plan as buying top-up insurance. Most importantly, the price of the top-up option is fixed by law as the premium difference between the HD and LD plans. Second, the subsidy is independent of the insurance contract and is determined solely by income. The subsidy is applied first to reduce the HD plan's premium, and once the HD premium hits the price floor, any additional subsidy is used to reduce the top-up premium.

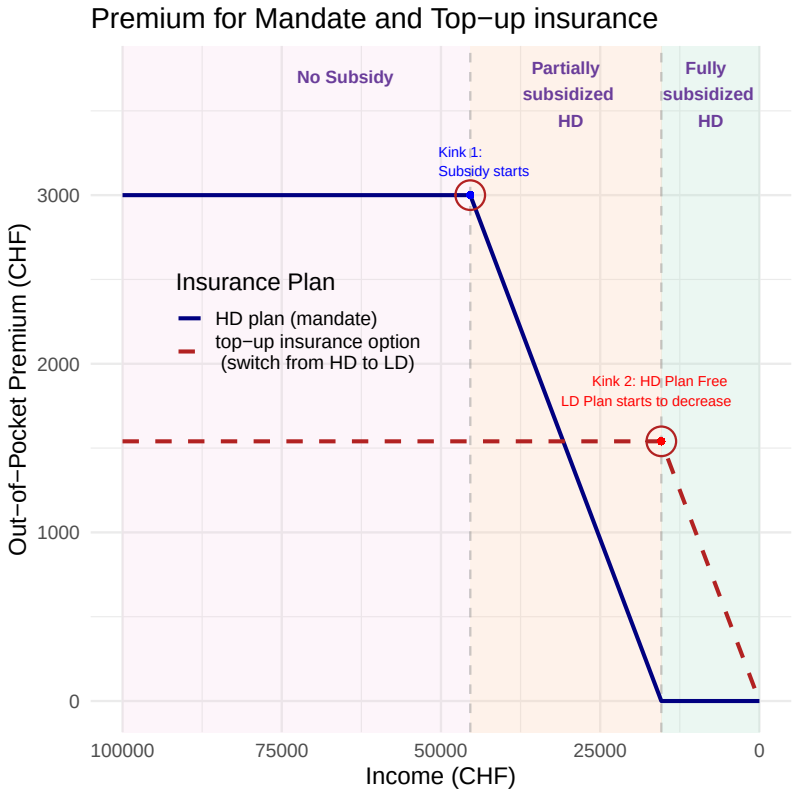


Figure 1: Net Premium and Income: Individuals first pay for the HD plan as it is mandated. They then face the option to pay CHF 1540 to upgrade from the HD plan to the LD plan. The blue line shows the price for paying the HD plan along with the income changes, and the red dash line shows the premium (price) for upgrading from the HD plan to the LD plan along with the income changes.

This market design includes two discontinuities in the subsidy schedule (see Figure 1), each addressing a distinct effect. The first discontinuity occurs when income falls below a specified threshold, thereby triggering the subsidy (indicated by the blue line at Kink 1). Imagine an individual whose income declines from 70,000 CHF to 45,000 CHF, making her eligible for the subsidy. Once the subsidy is activated, the individual's disposable income increases after the individual pays the HD premium, while the top-up insurance price remains fixed (indicated by the red dashed line in Figure 1). Essentially, any change in consumer behavior at this point can be attributed solely to the income effect. The magnitude of this income effect may depend on how narrowly individuals budget for health insurance (Hastings and Shapiro (2013)). The second discontinuity occurs when the HD plan's premium hits zero (red dashed line at Kink 2), which I refer to as the zero-price threshold. If an individual's income falls from 45,000 CHF to 15,400 CHF, she is eligible for a subsidy of CHF 3,000, which is exactly the amount of the HD premium. At this point, the HD plan's premium has reached its floor price. Any further increase in the subsidy no longer boosts disposable income, but instead progressively lowers the top-up premium. Before the zero-price threshold, consumers' responses to subsidies are driven purely by income effects. After crossing the zero-price point, consumers' responses to subsidies reflect a combination of income

and substitution effects. The shift in consumer choices around this zero-price point is therefore attributable to the substitution effect.

In this study, I use two datasets. The first is the newly available administrative health insurance data that represent the entire Swiss population. The second is a subset of this administrative dataset linked to a survey that provides household income information. Using a regression discontinuity design, I examine how insurance choices change with the subsidy discontinuities.

To begin, I document a positive income effect. Using a regression kink discontinuity approach, I find that a CHF 100 increase in subsidy raises the probability of choosing the most generous plan by 1.83 percent. Iizuka and Shigeoka (2023) offer similar evidence, showing that, in Japan's child healthcare program, increasing coinsurance from 0% to 30% produces a demand drop more than twice the gain from reducing coinsurance from 30% to 0%.

The substantial income effect observed here also suggests that the "labeling" of the subsidies matters for insurance choices. Intuitively, one would expect an income increase to have the same effect on insurance coverage regardless of its source (e.g., a subsidy vs. a salary raise). If that were true, consumers would treat subsidy money like any other income, allocating it in a utility-maximizing way across all consumption. However, my findings contradict this expectation and align with the concept of mental accounting. Gruber et al. (2024) show that consumers' insurance decisions are influenced by the source of funds, implying they do not treat all income as fungible. This suggests that transferring a subsidy directly to an insurer (in kind) versus to an individual (in cash) can lead to different outcomes. Consistent with this evidence, Kaufmann et al. (2017) find in the Swiss market that giving the subsidy directly to the insurance firm increases coverage more than an equivalent transfer to the consumer.

The results indicate a strong substitution effect. At the HD plan's zero-price threshold, a CHF 100 increase in subsidy leads to a 6.2% increase in LD plan take-up. This estimate is similar in magnitude to findings from other markets. Tebaldi (2024) finds a 2-4 percent decrease in enrollment for a $100 premium increase in the California Affordable Care Act (ACA) exchange.[1] Finkelstein et al. (2019) suggest a 5.3 percent decrease in take-up for a $100 premium increase.[2] The difference arises for two main reasons. First, this work studies the extensive margin demand. Second, nearly 40% of the unsubsidized population in our setting have selected the LD plan (bought the top-up option), leaving less room for additional uptake when subsidies are introduced.

Approximately 29% of the increase in insurance coverage due to subsidies is driven by the income effect. To interpret these patterns, I develop a demand model in the spirit of Chetty (2008), presented in the Appendix. In this model, an individual's decision depends on their income after

[1] Tebaldi (2024) estimates a 2-4 percent decline in enrollment for an across-the-board $100 annual premium increase for subsidized enrollees without children.

[2] Finkelstein et al. (2019) find that a $40 increase in monthly premiums (equivalent to $468 annually) leads to a 25% decrease in insurance take-up, which scales to a 5.3% decrease for a $100 annual increase.

paying the HD premium and the price of the top-up option. A subsidy first reduces the HD plan's premium, thereby increasing the individual's post-premium income. As the subsidy grows and the HD premium reaches its floor, further subsidy reductions apply to the top-up premium. Overall, subsidized individuals have a 56.9% take-up rate for the most generous plan, compared to 39.8% among the unsubsidized, representing a difference of 17.1 percentage points. The model indicates that without any substitution effect, the income effect alone would raise top-up take-up from 39.8% to 44.8%.

When the HD plan becomes the $0 plan, its enrollment rate jumps from 30.8% to 45.6%, and average medical spending drops substantially. Specifically, mean medical expenditures fall from CHF 3,992 to CHF 3,302. This decline occurs because a share of people switch to the HD plan due to zero price. Notably, those induced into the HD plan at the zero-price point spent only CHF 1,109 on average, whereas they would have spent roughly CHF 5,687 had they remained in the LD plan. This stark cost reduction signals the overuse of healthcare when people have the more generous LD plan. It is important to note that this moral hazard behavior is concentrated in a relatively small, young segment of the subsidized population, since only the healthier individuals are likely to switch to the HD plan when it becomes free.

This paper furthers the literature that estimates consumers' risk preferences and behavioral responses to insurance using expected utility models (Einav et al. (2010); Cohen and Einav (2007); Handel (2013); Tebaldi (2024)). Those studies, as well as analyses of moral hazard (see Einav et al. (2013)), typically assume that premium changes do not affect overall wealth, effectively holding income constant to concentrate on substitution effects. While this approach is appropriate for small-stakes decisions, it means that wealth-mediated impact on insurance demand is omitted. Empirical research on insurance markets, such as the ACA exchanges (Tebaldi (2024); Frean et al. (2017)) and Massachusetts' insurance expansion (Finkelstein et al. (2019); Chan and Gruber (2010)), highlight significant price sensitivities, implying potential roles for both substitution and income effects. Furthermore, survey experiments reveal generally low WTP among the uninsured (Krueger and Kuziemko (2013)), underscoring the importance of accurately capturing income effects in evaluating consumer behavior. Behavioral insights also suggest that consumers may not treat subsidies as fully fungible with other income (Hastings and Shapiro (2013); Kaufmann et al. (2017)), These findings highlight that subsidy design accounts for mental accounting effects. The results suggest that, in the context of sizable premium subsidies, this omitted channel is quantitatively important. Such suggestions directly indicate that economists and policymakers should consider the role of the income effect and design the subsidy policy for the target purpose while designing the subsidy policy.

2 Institutional background

This paper examines the Swiss health insurance system, in which basic insurance is mandatory for all citizens. Each contract offers standardized services and covers an identical scope of benefits. The insured are offered six vertically differentiated insurance options. These options differ only in terms of the insurance provider and the deductible level. The six deductible levels begin at the default of CHF 300 (LD plan) and increase to CHF 500, CHF 1,000, CHF 1,500, CHF 2,000, and finally CHF 2,500 (HD plan). A co-insurance rate of 10 percent applies to all costs exceeding the respective deductible, while the out-of-pocket co-insurance amount is capped at CHF 700.

The difference in premiums between the default insurance product (CHF 300 deductible plan) and the contract with the extra deductible is fixed at a maximum of 70 percent. For instance, the price difference between the CHF 2,500 deductible (HD deductible) contract and the CHF 300 deductible contract (LD deductible plan) is always CHF$(2500 - 300) \times 70\% =$ CHF 1540. [3] Insurance companies bid competitively for the premiums of the default CHF 300 deductible plan, and all premiums for the other plans are fixed according to the 70% premium difference rule.

Health premiums are community-rated for the same age groups within each price region. There are three main age groups: children under 18[4], young adults between ages 18 and 25, and adults aged 26 and older. Each family member is individually insured.

Premium subsidies To ensure the access of low-income individuals to health insurance, the federal and cantonal governments provide financial aid for health insurance to insured individuals with modest economic conditions. Cantons have the decisive power to regulate subsidy design for their insured population. Cantons have the decisive power to regulate subsidy design for their insured population. Two main subsidy schemes are implemented across the 26 cantons, either in an income-linear subsidy or a step-wise[5] decreasing function with reference to income. 8 cantons apply the step-wise method (similar to the ACA in the US market), while the remaining 18 cantons[6] implement an income-linear subsidy. This paper focuses on the income linear subsidy cantons.

The linear subsidy form ensures that the post-subsidy net premium is a proportion of the prior household income. Cantons define the net premium and pay the subsidy to the gross premium. For example, in the canton of Nidwalden (NW), where the net premium should not exceed 10 percent of household income, a 30-year-old single male with a taxable income of CHF 40,000 in 2017 and an

[3] More specifically, for unemployed individuals, the percentage is 69.6 percent; for employed individuals, the rate is 64.8 percent.

[4] The premium levels vary in accordance with different age groups within cantons. For children 18 and under, the options structure is different in that it is divided into seven deductible levels: CHF 0, CHF 100, CHF 200, CHF 300, CHF 400, CHF 500, and CHF 600.

[5] Detailed information on step-wise subsidy design can be found in Appendix A.2

[6] The following cantons specify their subsidy model as a mix of step-wise subsidy and the income-linear subsidy. These cantons are: the Canton of Lucerne, Obwalden, Glarus, Fribourg, Solothurn, Appenzell I.Rh, St Gallen, Graubuenden, Ticino, and Vaud. In essence, these cantons implement income-linear subsidy within the specific household types.

indicative premium of CHF 4,500 would receive a subsidy of CHF $4,500 - 40,000 \times 10\% =$ CHF 500.

Two factors determine the entitled subsidy: the indicative premium regulated by the canton government and the net premium rate which is the percentage of the net premium based on household taxable income. For administrative reasons, the household taxable income used to determine eligibility is taken from the tax declaration made two years prior.[7] This taxable income is adjusted for the type of household, including marital status and the number of children.

Premium subsidies are fixed coupons across different plans Across all cantons except Neuchatel, the subsidy amount is calculated based on the indicative premium of the most generous plan (default CHF 300 deductible plan). Therefore, it is a fixed coupon regardless of the deductible plans being selected by the subsidy recipients. The canton of Neuchatel, however, regulates the subsidy received, which varies with the choice of deductible.

Price variation across markets Switzerland has 26 cantons. A universally mandated health insurance package with a list of distinct options is offered across each canton. Each canton has the decisive power to regulate the indicative premiums on the LD deductible plan (CHF 300 deductible level) based on the supply side of the health cost, the administrative cost, the cost of living, wages, and other factors, such as physician density. The costs vary among cantons. The average annual premium for the CHF 300 deductible contract varies between cantons, from CHF 4,164 (approximately 4,538 US dollars) to CHF 5,976 (approximately 6,513 US dollars).

Furthermore, since 2014, all 26 cantons have been required by federal law to apply an in-kind transfer, which transfer the subsidy directly to the insurance firms. In 2014, 9 of the 26 cantons transitioned from cash (to consumers) to in-kind transfers (to insurers). Kaufmann et al. (2017) examine this regional reform, particularly focusing on the impact on health insurance deductible choices. Their findings indicate that in-kind transfers result in a 4-percentage-point increase in the uptake of LD contracts compared to cash transfers. However, they observed that this increase in insurance coverage does not affect healthcare utilization. The absence of moral hazard behavior contrasts with other works studying the Swiss market (Boes and Gerfin (2016); Gerfin et al. (2015); Trottmann et al. (2012)). Subsidies are generally paid out on a monthly basis. Each Swiss resident is insured individually, even within a household; however, the subsidy is calculated by family unit and distributed evenly to all adult household members.

[7] There are also cantons where the taxable income is tax record one year or three years ago.

3 Data and methodology

3.1 Data and variables

This paper relies on two datasets. The first is the individual administrative data (from the Federal Office of Public Health) that covers all individuals in Switzerland from 2019 to 2022. The data includes basic socio-demographic data (age,gender), region of residence, deductible choice, annual medical expenditure, premiums, and subsidies. The second dataset is a sub-sample of the administrative data linked with registered household survey data, which includes registered income information.

I use the following cleaning steps to restrict the data. First, I restrict my attention to all adults aged 26 and up who face the same choice set. As in the entire population, I observe the subsidy receipt without income information. I then define the subsidized and unsubsidized groups based on the subsidy recipients' information. The survey-linked sample suggests that around 10% of subsidy recipients, although eligible for a subsidy, are not receiving the subsidy. I assume this could be a trivial subsidy amount for individuals and, therefore, will not affect the primary analysis in the group. Second, to rule out the COVID-19 impact, I restrict the data to records in 2019.

3.2 Method

I use regression kink discontinuity(RKD) to study the deductible choice behavior at the kinks in the subsidized market. The empirical challenge in identification lies in two assumptions. First, the distribution of the assignment variable (income) should be smooth at the kink, suggesting that there is no systematic individual behavior that reduces the income to be eligible for a subsidy. Second, the social demographic characteristics should evolve smoothly with the assignment variable at the kink.

Following Card et al. (2015), the RKD estimation focuses on the estimation of the change in the slope of the conditional expectation function of the outcome given the assignment variable at the kink. This can be done by running parametric polynomial models of the form:

$$E[Y_i \mid w_i] = \mu_0 + \sum_{p=1}^{\overline{p}} \gamma_p (w_i - k_i)^p + \sum_{p=1}^{\overline{p}} \nu_p (w_i - k_i)^p D_i \tag{1}$$

where $D_i = \mathbf{1}\{w_i \geq k_i\}$ and $|w_i - k_i| \leq h$.

In equation (1), Y_i denotes the outcome variable for individual i (e.g., deductible choice). The assignment variable w_i represents the household income level, and k_i is the kink threshold, which may vary by canton or household type. The indicator variable $D_i = \mathbf{1}\{w_i \geq k_i\}$ equals one if the household income is greater than or equal to the kink threshold, and zero otherwise. μ_0 is the intercept term. The coefficients γ_p capture the effect of the p-th order polynomial of the running

variable to the left of the kink, while ν_p represents the change in the p-th order polynomial coefficient at the kink, reflecting the difference in slope (and higher-order derivatives, if applicable) to the right of the kink. Estimation is restricted to observations within a bandwidth h around the kink.

The subsidy amount differs depending on household types, including marital status, number of children under 18, and number of dependent children under 26. The premium and subsidy levels differ across cantons. To evaluate the impact of the subsidy, I cluster the cantons by transferring the subsidy amount relative to the corresponding household income threshold. For instance, an individual has a subsidy scale equal to 0.9, indicating that his household income is 90% of the corresponding income threshold.

4 Empirical Analysis

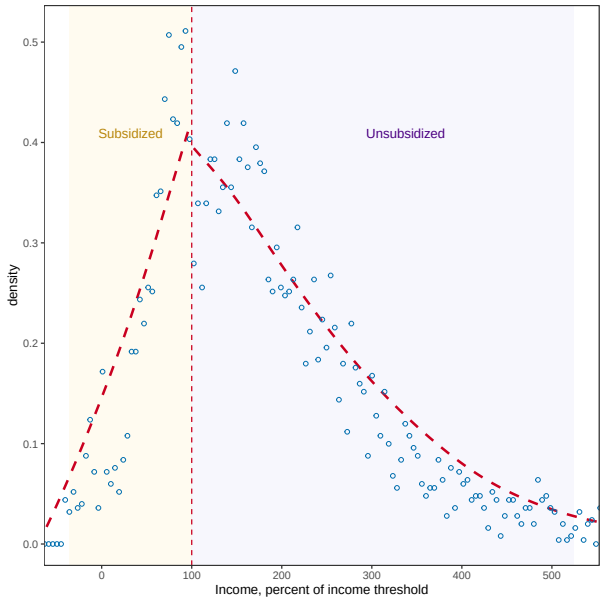
In this section, I present empirical evidence on deductible choices and medical spending.

Validation of RKD Figure 2 illustrates the validity assumptions. First, Figure 2a shows that the size of the eligible population is smooth around the income threshold at which subsidy eligibility changes. The McCrary test yields a p-value of 0.2488, which is consistent with the visual evidence of no manipulation. There are two main reasons for this minimal manipulation. First, cantonal governments publish only an indicative premium annually, limiting individuals' ability to precisely anticipate the threshold. Second, the income used to determine subsidy eligibility is based on earnings from two years prior, further reducing the scope for strategic income reporting.

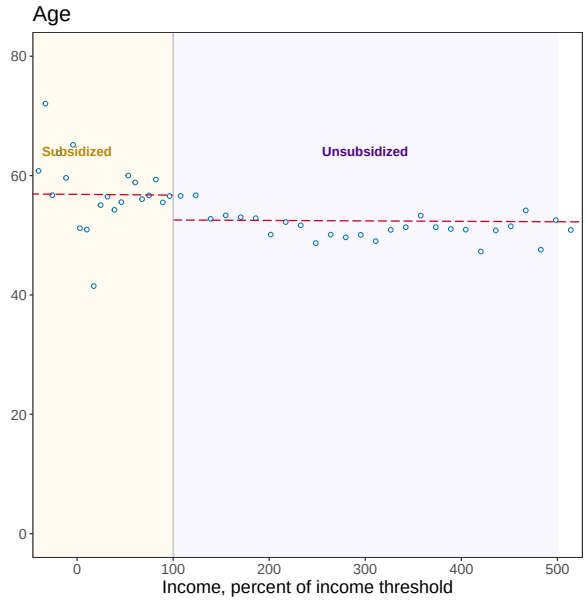
Second, Figure 2 suggests that the covariates generally evolve smoothly at the kink, indicating that the two groups around the kink are otherwise comparable with observable characteristics. The subsidy recipients are overall older than the non-eligible ones, as shown in panel (b), and females are slightly more likely to be eligible for subsidies (see panel (c)). Higher education could increase income levels and make people more resistant to financial shocks, and therefore they are less likely to receive government aid (Panel (d)).

Size of income effect Figure 3a reveals an increase in the take-up rate for the uptake of the LD plan. The RKD estimate is -0.3712, estimated with the MSE-optimal bandwidth of $h = 0.438$. This estimate corresponds to a semi-elasticity of -0.0183, implying that a CHF 100 increase in the marginal subsidy increases the take-up rate of CHF 300 deductible contracts by 1.83 percent. The semi-elasticity is computed as: semi-elasticity $\varepsilon_b = \frac{\partial \text{Insurance}/\partial Income}{\partial \text{Subsidy}/\partial Income} \times 100 = \frac{-0.3712}{2031.537} \times 100 = -0.0183$.. In this expression, $\frac{\partial \text{Insurance}}{\partial x}$ is the RKD estimated coefficient, and $\frac{\partial \text{Subsidy}}{\partial x}$ is the subsidy increase within the bandwidth, which is from 0 to CHF 2031.

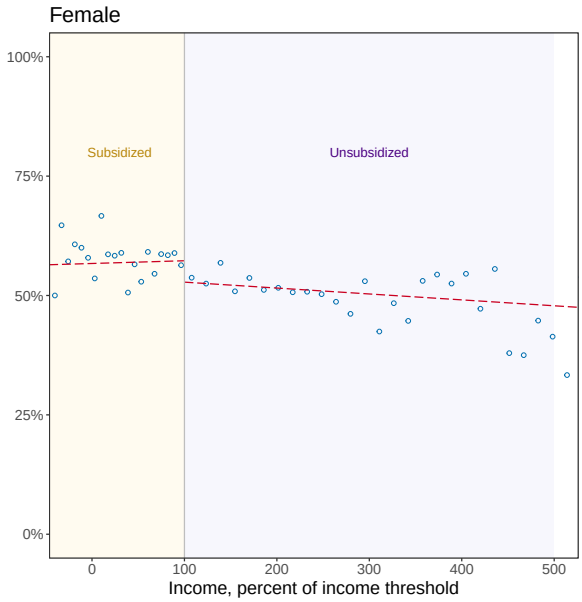
Furthermore, Figure 3a also reveals a negative correlation between income and demand for LD plans for the unsubsidized. Without controlling for other covariates, every CHF 10,000 increase in income will decrease 0.2 percentage points of the take-up of the LD plan. Liquidity constraints could



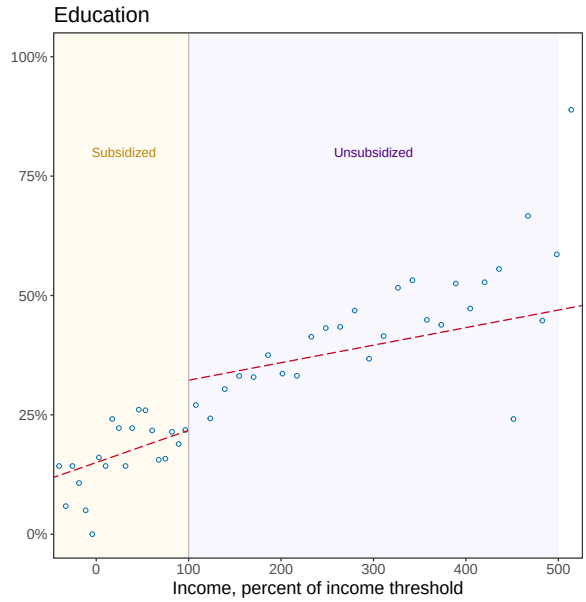
(a) McCrary test



(b) Smooth test: Age



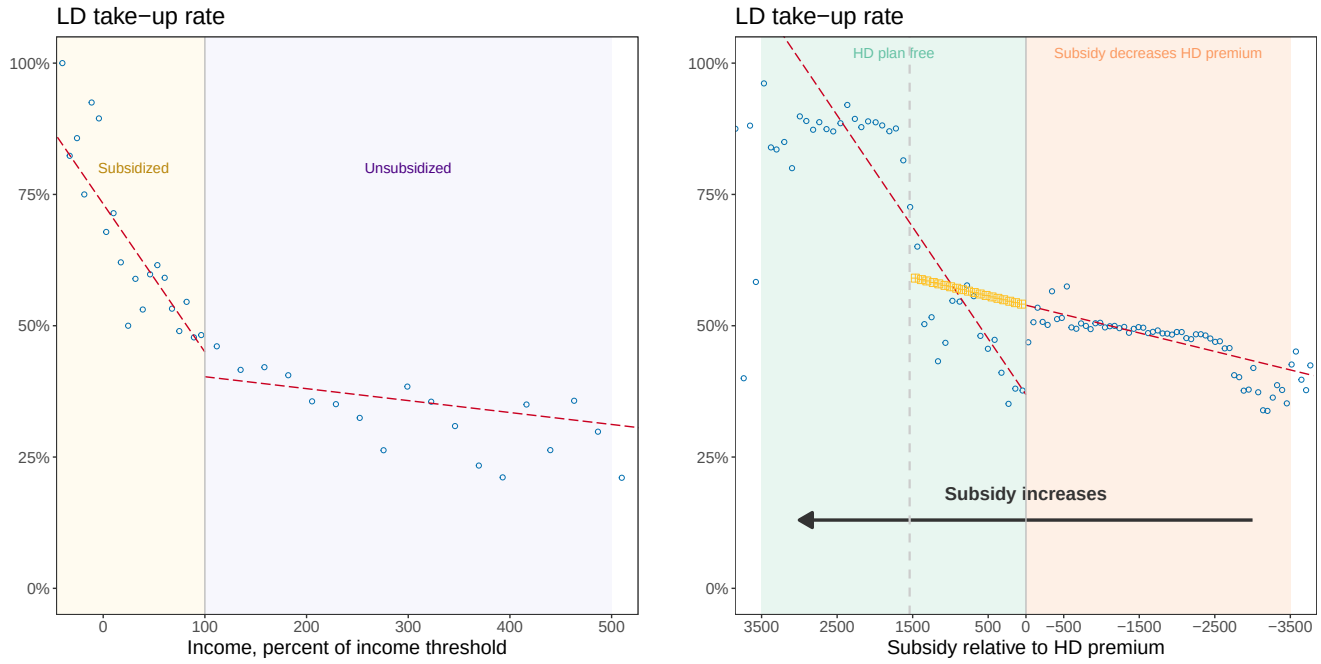
(c) Smooth test: Female



(d) Smooth test: University degree

Figure 2: RKD smoothness test: Panel A presents the income distribution; Panels B, C, and D present the smoothness test for different variants from age, gender, and education. The running variable is household income corresponding to the relative income threshold. Subsidies are available when the running variable is smaller than the poverty line. When income is smaller than zero, individuals receive the maximum subsidy and additional social aid for co-payment and health insurance. Subsidies are available when the running variable is smaller than 100.

either increase the insurance demand to avoid financial shocks or reduce the insurance demand to avoid the premium (Ericson and Sydnor (2022)). My findings are consistent with the previous one. This is also consistent with the theory that predicts that people who possess more wealth/and or resources demand less insurance coverage (Gropper and Kuhnen (2024)).



(a) Income effect

(b) Substitution effect

Figure 3: Take-up of **LD plan - CHF 300**. The raw take-up rate is in blue. Panel A presents the take-up rate for the LD plan across kink 1. The individuals whose incomes are larger than the income threshold are unsubsidized. Individuals who earn an income below the income threshold are subsidy recipients. When the income is smaller than 0, these people receive social benefits. Panel B shows the take-up rate for the LD plan for all subsidized individuals. The running variable shows the subsidy after paying for the HD plan. After the $0 point, the HD plan is free. Additional subsidies reduce the price of switching from the HD plan to the LD plan. The take-up rate of the LD plan in the Figure 3a shows a low point among subsidy recipients. This decrease is captured in Figure 3b. In Panel B, the estimated value is in yellow.

Size of substitution effect Figure 3b shows the take-up rate of the LD plan among subsidy recipients. The running variable is the subsidy amount relative to the HD premium. As the subsidy increases to the point at which the HD plan becomes free (the zero-price point), the LD take-up rate remains modest. Although the subsidy generates a positive income effect, the overall increase in take-up is limited, likely because the income effect is largely offset by recipients' lower income levels. Nevertheless, a CHF 100 increase in the subsidy corresponds to a 6.6 percent increase in LD plan take-up. At the zero-price point, however, the take-up of the LD plan drops sharply from 48% to 38%. Beyond this point, at which the subsidy exceeds the HD premium, the LD plan take-up rate rises more steeply, eventually reaching close to 88%.

Table 1: RKD Estimates and robustness results: income effect and substitution effect

Panel A: Main RKD Estimates at Kink 1: income effect

Outcome	LD take-up (dummy)	Age	Female	Education	Medical Spending
α (RKD effect)	-0.372	-4.382	0.167	-0.171	-19,179.15
	(0.223)	(9.159)	(0.320)	(0.284)	(7,326.00)
p-value	0.095	0.632	0.602	0.547	0.009
Bandwidth h	0.438	0.364	0.382	0.329	0.383
Observations (Total)	5,438	5,438	5,438	5,438	5,438

Panel B: Robustness results for RKD for LD take-up: income effect

Bandwidth h	Bias	Coefficient $\hat{\alpha}$	p-value	Subsidy change	Semi-elasticity ε_b
0.230	0.902	-0.5481	0.3563	1745.751	-0.0314
0.250	0.902	-0.5452	0.2870	2180.041	-0.0250
0.300	0.902	-0.5706	0.1402	2304.204	-0.0248
0.350	0.902	-0.5048	0.1030	2471.618	-0.0204
0.400	0.902	-0.4429	0.0818	2307.661	-0.0192
0.438	0.902	-0.3712	0.0959	2031.537	-0.0183
0.450	0.902	-0.3445	0.1089	1920.468	-0.0179
0.500	0.902	-0.2386	0.1957	2118.913	-0.0113
0.550	0.902	-0.1852	0.2503	2093.585	-0.0088
0.600	0.902	-0.1742	0.2245	2329.880	-0.0075
0.650	0.902	-0.1902	0.1402	2814.983	-0.0068

Panel C: Robustness results for RKD for LD take-up at kink 2: substitution effect

Bandwidth h	Bias b	Coefficient $\hat{\alpha}$	p-value	Avg. LD Take-up	Semi-elasticity ε_b
50	50	0.0271	0.0000	0.4848	0.0559
100	100	0.0185	0.0001	0.4848	0.0381
150	150	0.0122	0.0012	0.4848	0.0252
200	200	0.0345	<0.0001	0.4848	0.0712
270	270	0.0430	<0.0001	0.4848	0.0887
302.71	567.44	0.0300	0.0000	0.4848	0.0619
350	350	0.0337	<0.0001	0.4848	0.0695
400	400	0.0306	<0.0001	0.4848	0.0632
450	450	0.0332	<0.0001	0.4848	0.0684

Panel D: LD take-up rate when subsidy relative to HD premium $\in [0, 1540]$ at kink 2: substitution effect

Subsidy level	LD take-up (observed)	LD take-up (income effect)	LD take-up at kink 2	Subsidy increase	Substitution effect ε_b	Observations
[1540, 1560)	0.6904	0.5937	0.4922	1540	0.01276	4,467
[1540, 1580)	0.7187	0.5940	0.4922	1540	0.01645	9,518
[1520, 1560)	0.7292	0.5933	0.4922	1540	0.01793	8,793
[1500, 1580)	0.7329	0.5934	0.4922	1540	0.01840	17,801
[1800, 1900)	0.8723	0.6041	0.4922	1800	0.03027	50,013
[1800, 2000)	0.8802	0.6060	0.4922	1800	0.03095	103,927
[1800, 2500)	0.8894	0.6148	0.4922	1800	0.03099	352,977

Note: Panel A presents the RKD estimates for five outcomes at kink 1. Panel B reports robustness checks for the LD dummy outcome across bandwidths. Semi-elasticity is computed as $\hat{\alpha} \cdot \frac{1}{Y}$. Panel C presents the RKD estimates at kink 2. Panel D presents the take-up rate with extrapolation result. Elasticity is standardized by mean take-up. The optimal bandwidth is highlighted by yellow color.

The RKD estimates will be biased because the presence of a zero-price point introduces a mechanical drop in the LD take-up rate, which artificially generates a negative coefficient. I use the following method to estimate the substitution effect. First, I employ a more traditional estimation strategy that examines how take-up responds to increasing subsidy levels. Specifically, I examine the increase in LD take-up as the subsidy rises from CHF 0 to CHF 1,540. Starting from a baseline take-up rate of 49.2%, I extrapolate the pre-kink trend to estimate the counterfactual take-up rate in the absence of the policy kink, which reaches approximately 59%. The observed take-up, however, rises to 87%, suggesting that the remaining difference, 28 percentage points is attributable to the substitution effect, as shown in Panel D of Table 1. This implies that a CHF 100 increase in the subsidy leads to an estimated 3.01 percent increase in LD take-up due to substitution. Second, using the extrapolated value, I implement an RKD estimate, which suggests an elasticity increase of 6.19 percent for each CHF 100 increase in the subsidy, as shown in the Panel C result. The traditional method is lower compared to the RKD estimate. The take-up LD rate is already relatively high at the kink point, which mechanically reduces the potential demand response.

This estimate is roughly comparable to estimates from other Markets, though on the lower bound. Tebaldi (2024) finds a 2-4 percent decrease in enrollment for a $100 premium increase in the California ACA exchange.[8] Finkelstein et al. (2019) suggest a 5.3 percent decrease in take-up for a $100 premium increase.[9] The differences between my findings and those in these studies can be attributed to two main factors. First, while both studies focus on increasing insurance coverage among the uninsured, this study focuses on the extensive margin of upgrading to higher coverage, leading to a lower demand response potential. Second, in the Swiss context, over 50% of the subsidized population already selects the LD plan, leading to a lower potential sensitivity to premium changes in the results.

The marginal effect of income effect Following the model of Chetty (2008), I develop a framework (detailed in the Appendix) to simulate the marginal income effect. As shown in Panel D in Table 1, the take-up of the LD plan increases by approximately 38.80 percentage points (increased from 49.22% to 88.02%) after the zero-price point, reflecting a combination of income and substitution effects. Based on the extrapolation estimates, the income effect alone is responsible for a 11.38-percentage-point (from 49.22% to 60.60%) increase in the take-up rate. This suggests that around 29% of the increase in insurance coverage due to the subsidy can be attributed to the income effect ($11.38/38.80 = 0.2868$).

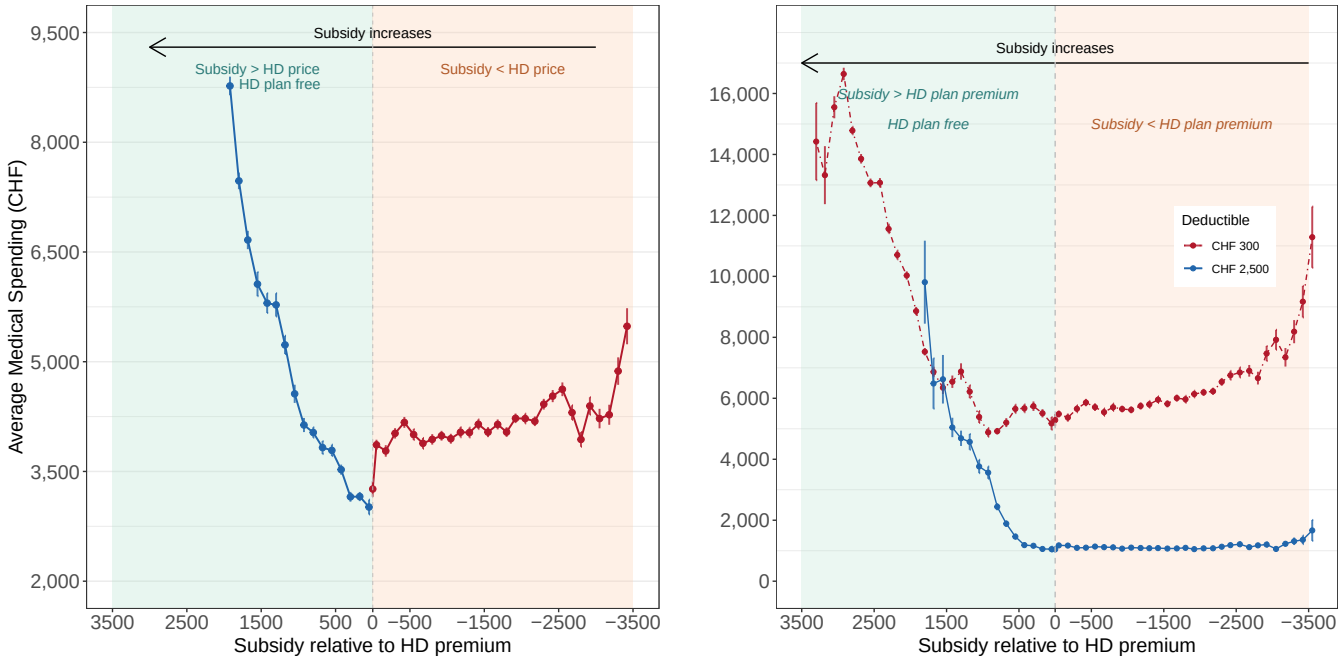
Counterfactual policies These results imply asymmetric implications for different subsidy policies. These estimates have implications for understanding enrollment in the CommCare market. For instance, Finkelstein et al. (2019) find that a $40 increase in monthly premiums, equivalent to

[8] Tebaldi (2024) estimates a 2-4 percent decline in enrollment for an across-the-board $100 annual premium increase for subsidized enrollees without children.

[9] Finkelstein et al. (2019)find that a $40 increase in monthly premiums (equivalent to $468 annually) leads to a 25% decrease in insurance take-up, which scales to a 5.3% decrease for a $100 annual increase.

$468 annually, results in a 25% decrease in insurance take-up, which corresponds to a 5.3% decrease in take-up for every $100 increase in annual premiums. My estimates indicate that 29% of the 5.3% decrease (approximately 1.54 percentage points) is due to the income effect, while the remaining 71% (approximately 3.76 percentage points) is attributable to the substitution effect. In contrast, my estimates further suggest that penalizing individuals the same amount will only lead to a 2.22% increase in the take-up rate (3.76% - 1.54%).

Utilization impacts How does the subsidy affect the health expenditure utilization? Figure 4a examines the overall health expenditure across subsidy levels, including all plans, while Figure 4b scrutinizes health expenditures across varying subsidy levels by insurance plans.



(a) Average cost at different subsidy levels

(b) Average cost by deductible plan

Figure 4: The two figures show the average cost at different subsidy levels (panel A) and by different deductible plans (panel B), with vertical dashed lines indicating when the various contracts become zero-price plans subsequently, starting from the cheapest plan on the left.

Figure 4a presents the health expenditure by the subsidy level. Health expenditures by subsidy level remain stable at around CHF 3,992 per enrollee (standard error = CHF 129) until the subsidy reaches the HD zero-price point, where it notably decreases to CHF 3,302. The cost reduction is primarily driven by 14.7 percentage of individuals (take-up of HD plan increases from 30.8% to 45.6%) enticed by the zero-priced HD plan. When these people switch from the lower deductible plan to the HD plan at the zero-price point, they adjust their medical spending to the plan. I observe that the medical spending by the plan in Figure 4b is stable at the HD zero-price point. Suppose these people who would otherwise select the LD plan are at higher risk compared to those who were originally in the HD plan; I expect them to have higher medical utilization and, therefore, increase the average medical spending in the HD plan at the HD zero-price point. I observe the

contrary evidence. In particular, individuals in the LD plan incur higher health expenditures, with the average cost for LD plan enrollees being CHF 5,687 (standard deviation = 189), compared to CHF 1,109 (standard deviation = 35) for HD plan enrollees. This substantial cost reduction highlights the moral hazard behavior induced by the subsidy.

5 Conclusion

While the extant research largely assumes the absence of the income effect, this paper provides the first empirical evidence delineating the distinct roles played by income and substitution effects. I identify strong and sizeable income effects. This result has important implications for future research. The presence of income effects necessitates adjustments to accurately gauge WTP across different income levels. This insight directly informs the interpretation of demand-response as WTP, as seen in the work of Finkelstein et al. (2019), among others. Ignoring income effects could lead to overestimations or underestimations of consumer valuation, thereby affecting policy recommendations and welfare assessments.

In addition, while the evidence on the "tagging" or "labeling" of subsidies is indirect in this work, it suggests that mental accounting may play a role in how subsidies are utilized. The potential for individuals to allocate subsidies in ways that deviate from utility-maximizing behavior is an area ripe for further investigation. If the mental accounting is true, it would indicate that the subsidy design needs to account for behavioral biases, ensuring that subsidies achieve their intended effects.

A Appendix

Table 2: Deductible choice menu

Deductible	Co-insurance rate	Cap co-insurance	Premium (CHF)
CHF 300	10%	CHF 700	4,960
CHF 500	10%	CHF 700	$4,960 - (500 - 300) \times 70\% = 4,829$
CHF 1,000	10%	CHF 700	$4,960 - (1,000 - 300) \times 70\% = 4,479$
CHF 1,500	10%	CHF 700	$4,960 - (1,500 - 300) \times 70\% = 4,129$
CHF 2,000	10%	CHF 700	$4,960 - (2,000 - 300) \times 70\% = 3,779$
CHF 2,500	10%	CHF 700	$4,960 - (2,500 - 300) \times 70\% = 3,429$

Notes: The table shows one pricing example for a certain insurance model. Insurance firms set the price for the CHF 300 deductible plan; all the other plans are automatically priced following the rules. More specifically, for unemployed individuals, the percentage of 70% in the table is specifically at 69.6%. For employed individuals, the percentage is 64.8%.

A.1 Summary statistics

A.2 Institutional background

A.2.0.1 Step-wise subsidy scheme The step-wise decreasing function form (see Figure 5) for subsidies is similar to the subsidy rules applied in the US Affordable Care Act (ACA) market (see Finkelstein et al. (2019) for more details). Subsidy amount is dependent on income level and the different groups to which the insured are assigned according to their household type. The main rationale for implementing a proportional subsidy is to ensure that health insurance is affordable to low-income individuals, while the step-wise subsidy scheme saves on administrative costs when distributing subsidies.

The subsidy distribution mechanism differs vastly across cantons. Six out of eight cantons implementing a step-wise subsidy scheme automatically transfer the subsidy.[10] For the most cantons[11] implementing the income-linear subsidy, eligible citizens receive notification via mail in June, and they then must file the application for the subsidy themselves in the regulated time. The effective time for filing the application varies across cantons from one month to twelve months. For instance, the canton of St. Gallen has a three-month application period, and the canton of Basel-Landeschaft offers 12 months to respond to the letter. The final subsidy amount would be noticed before the annual health insurance decision is made each year in November.[12]

[10]The six cantons are: BE, VS,NE,GE, JU. Canton of TG and ZH require individual application for subsidy.

[11]Canton of AI implements the income-linear subsidy, but they automatically distribute the subsidy amount.

[12]For the eighteen cantons implementing the 'income-linear' subsidy, eligible citizens residing in the canton of Basel (BS) are reliable to check the subsidy regulation and file applications for the subsidy themselves. For the rest cantons, eligible adults receive a notification letter, and they have limited time to apply for the subsidies.

Table 3: Descriptive statistics

	Entire Swiss		Representative sample	
	Unsubsidized	Subsidized	Unsubsidized	Subsidized
Dependent variable				
CHF 300	0.398	0.569	0.395	0.521
CHF 500	0.110	0.114	0.107	0.120
CHF 1,000	0.034	0.027	0.039	0.030
CHF 1,500	0.076	0.048	0.088	0.070
CHF 2,000	0.023	0.014	0.023	0.013
CHF 2,500	0.359	0.228	0.347	0.246
Premium				
Premium	4,026	4,501	4,362	4,693
Net premium	4,026	2,027	4,360	2,187
Subsidy	0	2,474	0	2,506
Health cost				
Total health cost	4,061	6,081	4,319	6,066
Cost shared by insured	618	631	698	649
Cost shared by insurer	3,443	5,450	3,621	5,417
Risk factors (*share*)				
Overnight hospital stay	0.062	0.102	0.062	0.090
Drug cost ($>$ 5,000)	0.025	0.044		
PCG (*69 listed chronic disease*)	0.207	0.269		
Insurance model(*share*)				
Base	0.248	0.275	0.243	0.216
DIV (*Telmed*)	0.194	0.172	0.199	0.215
Family doctor model	0.495	0.494	0.498	0.523
HMO (*Limited network*)	0.063	0.059	0.061	0.046
Social background				
Female	0.495	0.562	0.520	0.563
Age 26 − 45	0.375	0.477	0.312	0.427
Age 45 − 64	0.392	0.305	0.420	0.289
Age 65 +	0.233	0.218	0.250	0.215
Work = 1	0.421	0.584	0.462	0.587
Highest education: with university degree			0.370	0.213
Self−report health condition				
General health condition				
Good health			0.841	0.734
Bad health			0.025	0.074
Chronic disease			0.365	0.429
Unmet need for medical			0.035	0.057
Reason: too expensive			0.166	0.429
Financial condition				
Gross household income			155,887	95,296
Disposable household income			107,710	67,648
Equivalent household size			2	2
Happy with financial situation			0.822	0.473
Improved financial condition			0.110	0.114
Deteriorate financial condition			0.063	0.121
Able to handle unexpected CHF 2,500 expenditure shock			0.923	0.615
Arrears in health insurance			0.027	0.098
Observations	21,875,182	5,388,979	12,211	2,504
Shares	80.2%	19.8 %	83.0 %	17.0 %

Notes: The entire adult sample covers data from year 2019 to 2022. The representative sample covers data from 2019. The equivalised household size assigns a value of 1 to one adult, 0.5 to a young adult who is still dependent and aged 14, and 0.3 for children aged below 14. The DIV insurance model, known as Telmed, requires patients to call a medical center before visiting a doctor; the family doctor insurance model requires visiting a family physician, who acts as a gatekeeper, before accessing a hospital center; the HMO insurance model is another type of mandatory basic model in which a physician from the medical network serves as the initial contact before seeking treatment at a formal care center.

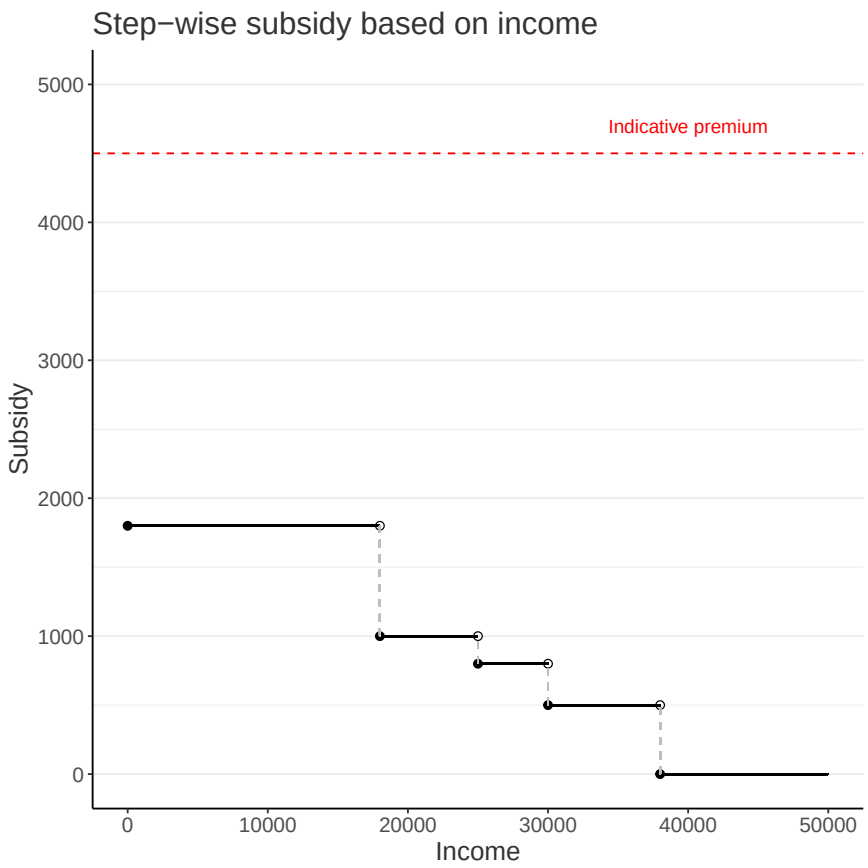


Figure 5: Step-wise subsidy schemes: the x-axis shows the taxable income two years ago

A.3 Smooth distribution of subsidy levels

Smooth distribution of subsidy levels To assess the assumption of randomness, in Figure 6, I plot a histogram of the subsidy levels in the spirit of the density test of McCrary (2008). The x-axis presents the subsidy levels but is normalized, with the 0 mark signifying the subsidy level at which the CHF 2,500 deductible plan (HD plan) becomes zero-priced. A primary challenge lies in the heterogeneous nature of subsidies across cantons. Not only do cantons differ in their subsidy scales, but also the exact subsidy amount varies, which makes the CHF 2,500 deductible zero-price. Thus, in the main analysis, I align the cantons based on when the zero-price point for CHF 2,500 becomes available. Different insurance firms have different pricing strategies for HD plans, so I selected the cheapest HD plan on the market. Importantly, the distribution of subsidy levels appears to be relatively smooth across the discontinuity point. In some cantons, the distribution is not smooth around the first kink, but when all cantons are pooled together, the distribution is smooth.

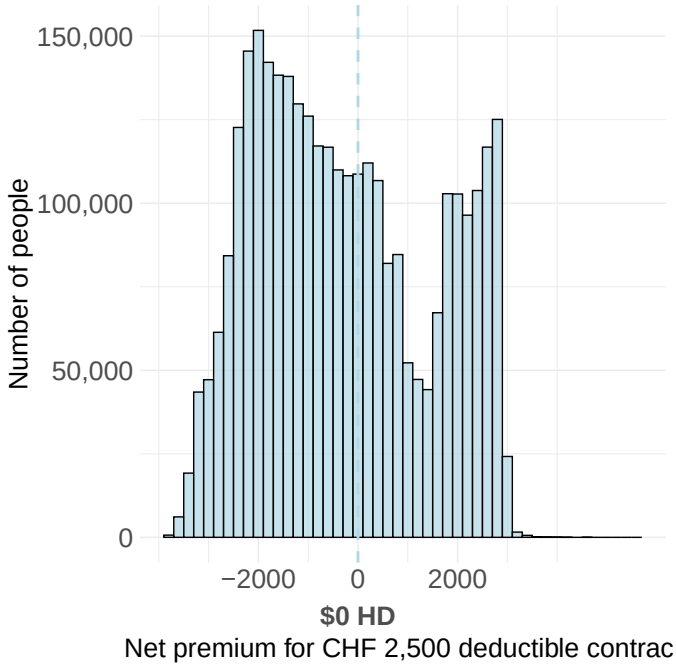


Figure 6: Subsidy distribution smoothness test: The x-axis depicts subsidy levels - premium for the CHF 2,500 deductible contract. The point '0' corresponds to the subsidy amount where the CHF 2,500 deductible plan becomes free (market rate is $0). This normalization is used to align different cantons based on their specific subsidy schedules and market rates. This figure shows the distribution of subsidy levels for all subsidy recipients in all cantons implementing the income-linear subsidy in 2019. In a few cantons, the distribution is not smooth around the zero-price kink, but when all cantons are pooled together, the distribution is smooth. The distribution figure will vary due to a few cantons using different bandwidths, but the main result of this paper is still the same. I also present the same analysis using specific cantons, such as the Argau. The analysis and result hold and are presented in the Appendix.

A.4 Robust test for RKD using different bandwidth

A.4.0.1 RKD estimates using different bandwidth This subsection presents the sensitivity analysis conducted to assess the robustness of the Regression Kink Design (RKD) results. To address the possibility of the non-linear relationship presented in the main result in Figure 3, the following analysis presents the RKD result using different cutoff points using different bandwidths.

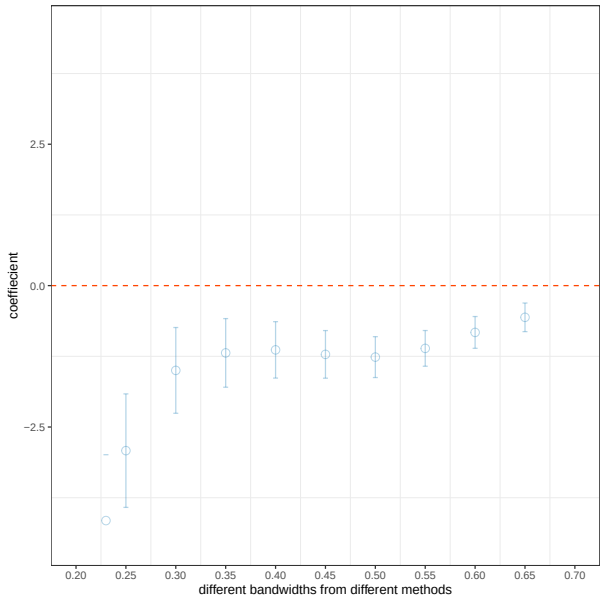
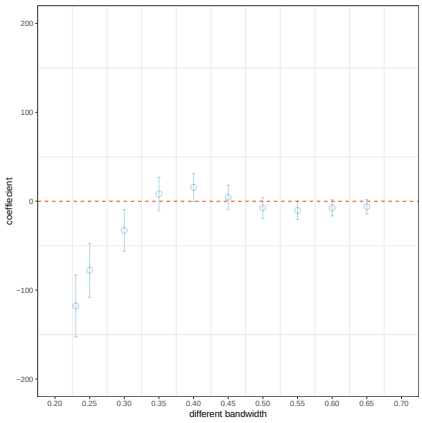
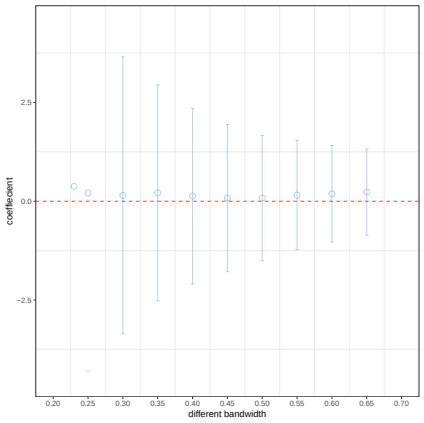


Figure 7: Coefficients for RKD main result using different bandwidths

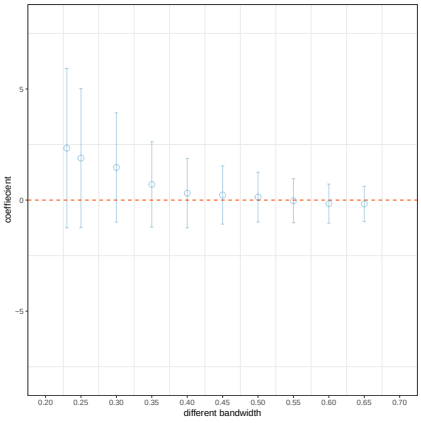
Note: This figure shows the coefficients from RKD regression using different bandwidths. The result from optimal bind-width is highlighted.



(a) Age



(b) Female



(c) University degree

Figure 8: Coefficients for RKD assumption using different bandwidths

Note: Figures show the coefficients from RKD assumption test using different bandwidths. The result from optimal bind-width is highlighted.

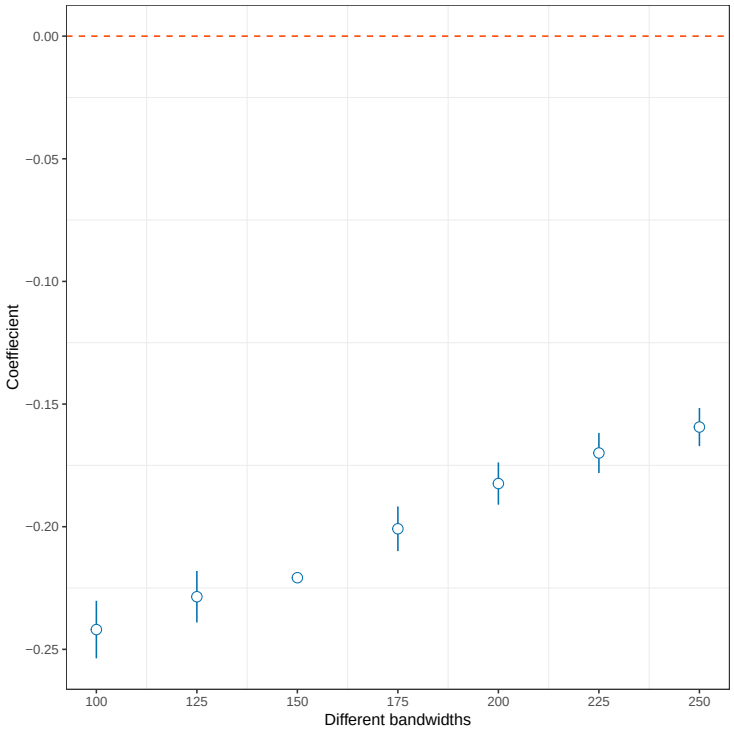


Figure 9: Figures show the coefficient from RKD regression using different bins.

A.5 Model

A.6 model

In this section, I used a simplified model in the spirit of Chetty (2008). This model shows the choice of buying the top-up option can be decomposed into two parts: income effect and substitution effect. Without considering the income effect, demand response to an increase in the subsidy for the top-up option only gives us a demand curve with respect to the price that is inclusive of the income effect, i.e., it is not reflective of income-constant WTP.

Agent's Problem Consider an individual who has an initial budget w_0. After paying for the basic coverage deductible plan p_{basic}, the remaining budget for considering the purchase of the top-up option is w. Assume the consumer faces a health risk, denoted by the random variable θ, which occurs with probability $p(\theta)$. The individual faces the option to buy full coverage for this risk by paying p_0 for the top-up insurance. In this model, the top-up insurance is simplified as a full insurance product that covers the entire risk θ.

Value Function for Different Conditions The value function for not purchasing the top-up option is defined as V:

$$V = V(w + y(s) - \theta) \tag{2}$$

The value function for choosing the top-up option is defined as U:

$$U = U(w - p_0 + p(s)) \tag{3}$$

Agent Decision Individuals decide to purchase a $(1 - x)$ share of the top-up option, where x represents the proportion of risk the individual decides to retain. They select x to maximize the expected value function $J(x)$:

$$J(x) = \mathbb{E}[xU + (1 - x)V - h(x)] \tag{4}$$

Here, $h(x)$ represents the cost associated with the decision-making process, which may increase as the individual retains more risk (x). This cost can capture factors like the mental burden or stress of retaining risk, known as the peace of mind effect, or the difficulty in making decisions when faced with complex choices such as insurance coverage levels.

Subsidy's Impact on Decision-Making: The influence of a subsidy s on an individual's decision-making unfolds through two primary channels, depending on its application and magnitude. When the subsidy does not directly affect relative prices, its role is more pronounced through the income channel. In this case, the subsidy s enhances the individual's available budget w, after accounting for the basic health insurance plan. This increased budgetary allowance makes the top-up

option more accessible. On the other hand, if the subsidy s leads to a reduction in the price of the top-up option, its effect is exerted through the price channel. Here, the direct lowering of the top-up insurance cost alters the individual's decision-making calculus in the function $J(x)$, making the additional coverage more financially attractive and likely to be chosen.

The optimal decision on whether to buy the top-up option is determined by the first-order condition:

$$h'(x) = \mathbb{E}[U - V]$$

This condition indicates that the observed demand response to an increase in the subsidy for the top-up option is a combination of both the income effect and the substitution effect.

Decomposition of the Subsidy's Impact: The effect of an increase in the subsidy s for the top-up option on the take-up of the top-up option can be decomposed into two distinct effects:

1. **Income Effect**: The subsidy s effectively increases the individual's available budget w by $y(s)$. This additional income makes the top-up option more affordable, even if the relative price p_0 does not change. This effect is reflected in the value function for not purchasing the top-up option:

   $$V = V(w + y(s) - \theta)$$

   Here, the increase in $w + y(s)$ due to $y(s)$ represents the income effect.

2. **Substitution Effect**: The subsidy s may also reduce the effective price p_0 of the top-up insurance by Δp_0, making the top-up insurance relatively cheaper compared to other spending options. This effect is reflected in the value function for choosing the top-up option:

   $$U = U(w - (p_0 - \Delta p_0) + p(s))$$

   Here, the decrease in p_0 by Δp_0 represents the substitution effect.

Consequently, the derived demand curve with respect to the price is inclusive of the income effect, meaning it does not represent an income-constant willingness to pay (WTP).

Table 4: Price effect regression result

	CHF 300 deductible contract	
	Pre-Kink	Post-Kink
Coefficient	0.00009***	0.00066***
	(0.0000)	(0.0000)
Intercept	0.1014***	-0.4005***
	(0.0019)	(0.0022)
Marginal Effect	0.0000***	0.0002***
	(0.0000)	(0.0000)
AIC	2559870	1380445
Observations	1,852,814	1,330,601

Note: The dependent variable is a binary variable indicating the choice of a low deductible plan (CHF 300). The key independent variable is subsidy level. Coefficients represent the change in the latent propensity to choose the CHF 300 deductible plan, and the marginal effects indicate the change in probability of choosing the LD plan for a CHF increase in subsidy levels. The models can be represented by the equation $\Pr(\text{CHF300}=1) = \Phi(\alpha_0 + \beta_1 \times \text{subsidy levels}_i)$ where Φ is the cumulative distribution function of the standard normal distribution. AIC represents the Akaike Information Criterion. Standard errors presented in parentheses below the coefficients. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

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