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Socioeconomic Institute
Sozialökonomisches Institut

Working Paper No. 0513

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Publisher Sozialökonomisches Institut
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Cost Sharing in Health Insurance: A Risk Selection Instrument?

Karolin Becker and Peter Zweifel*

This version

November 17, 2005

Abstract: Health insurance is potentially subject to risk selection, i.e. adverse selection on the part of consumers and cream skimming on the part of insurers. Adverse selection models predict that competitive health insurers can eschew high-risk individuals by offering contracts with low deductibles or copayment rates, while attracting low-risk individuals with higher copayments, resulting in a separating equilibrium. This contribution seeks to determine whether in competitive Swiss social health insurance policies with deductibles in excess of the legal minimum do indeed serve as an instrument of risk selection. In a discrete choice experiment, effected in 2003, some 1,000 individuals were given the hypothetical choice of alternative insurance contracts that differed both in terms of deductibles and copayments and in benefits covered. Results suggest that healthy individuals, i.e. those not having consulted medical services during the past six months, were more likely to select a policy with a high deductible. Compensation demanded for voluntarily accepting an increase in the annual deductible also varies with socioeconomic characteristics and increases with the current level of deductible, as predicted by theory and constituting evidence in favor of the risk selection hypothesis. The experiment allows to compute necessary premium reductions and provides guidance for the pricing policy of insurers when offering differentiated products.

Keywords: health insurance, deductible, copayment, willingness-to-pay, adverse selection

JEL: C35, C93, D61, I11, I18

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We are indebted to Harry Telser and Rainer Winkelmann (University of Zurich) for helpful comments and suggestions.

1 Introduction

As with all insurance, asymmetric infomation plays a major role in health insurance. Yet, in most mandatory health insurance schemes insurers are prevented from solving this problem by offering differentiated contracts (to overcome adverse selection by inducing a separating equilibrium) or by charging risk-rated premiums (to equalize expected profit margins across risk types, obviating cream-skimming efforts). The assumption that individuals not only differ in their expected future health cost, but also in their preferences with respect to insurance coverage, is plausible in view of observed product differentiation in private insurance contracts (Spence, 1978). However, benefit packages in social health insurance are usually regulated to be uniform for all insured, with premiums either a uniform share of income or per capita contribution.

In partial contradistinction Swiss funds have, since the introduction of mandatory health insurance in 1996 (Health Insurance Law, KVG) the possibility of offering policies that differ in terms of cost sharing. They thus can cater to differences in preferences and attitudes towards risk and in expectations regarding future health care expenditures (HCE) among the insured population. At the same time, as of 2004 there is a minimum annual deductible of CHF 300 (1 CHF=0.8 US$ at 2005 exchange rates) and a 10 percent copayment rate on all HCE exceeding this deductible, up to a maximum amount of CHF 600. Beyond the CHF 300 minimum, insurers can offer higher deductibles (CHF 400, 600, 1,200 and 1,500) in exchange for lower premiums.

During the first years since the introduction of the Health Insurance Law, these options were little used; however, they have become increasingly popular with rising premiums over the past years (see Table 2). Increased cost sharing should also have a mitigating effect on moral hazard effects - the other problem burdening insurance, both private and social, reducing its contribution to social welfare (Zweifel and Manning, 2000). Effective 2005, Swiss health insurers have the right to offer additional deductibles up to a maximum of CHF 2,500 annually, resulting in premium reductions of up to 50 percent. This deregulation was introduced by the Swiss government in the hope of curbing the 'cost explosion' in health care, which appears to have caused the health share of GDP to rise from 9 percent in 1996 to an estimated 11.5 percent in 2004.

Models of adverse selection predict that individuals choose the insurance contract that fits their risk type (Rothschild and Stiglitz, 1976; Wilson, 1977).

While information on risk type is private and cannot be observed, the insurer may succeed to screen the population by letting individuals reveal their risk type through their choice of insurance contract. In the present case, the level of deductible is hypothesized to serve as the screening device. Thus, high-risk types are expected to select contracts with low copayment, whereas low-risk types, viz. those of good health and a low future probability of becoming ill, would tend to choose a higher copayment. The introduction of differentiated copayments can thus be considered welfare-improving (Breyer, 1984; Osterkamp, 2003). Moreover, Arrow (1971) has shown that risk-averse individuals prefer partial over full coverage whenever insurance is not actuarially fair. However, cost sharing optimally is in the guise of a deductible (beyond which coinsurance should be zero unless there are moral hazard effects (Pauly, 1974)).

The present contribution seeks to determine the extent to which Swiss social health insurers may use deductibles as an instrument for risk selection. Previous research had posed the question the other way around, asking whether the substantial savings achieved by higher-deductible plans indeed reflect reduced moral hazard effects or rather successful selection of favorable risks (Schellhorn, 2001; Werblow and Felder, 2003; for the case of Managed Care, see Lehmann and Zweifel, 2004). Thus, this work is more in the spirit of Cutler and Reber (1998), who investigated the 'death spiral' resulting in the discontinuation of certain plans offered by Harvard University (the traditional comprehensive planning having lost most of its low risks). In the Harvard case, however, health insurers had been passive, while in the present case, Swiss health insurers would have pursued an active cream-skimming strategy.

For such a strategy to work, however, consumer preferences with regard to health insurance must be sufficiently diverse. Diversity of preferences can be established by measuring willingness-to-pay (WTP) for hypothetical contractual alternatives to the status quo. Since the pertinent market experiments were performed in 2003, i.e. at a time when the political debate over increased deductibles was still going on, some of these alternatives were indeed hypothetical, precluding the inference of WTP from observed behavior.

The remainder of this paper is structured as follows. Section 2 is devoted to a literature review concerning health insurance contracts that differ in terms of copayment. In section 3, an adverse selection model (screening by the insurer that results in a separating equilibrium) is discussed. In section 4, discrete choice experiments (DCE) are described as the preferred method for measuring WTP for goods

not available on the market (yet), such as the higher-deductible contracts considered in 2003. Descriptive results of DCE and a first analysis of the determinants of choice are provided in section 5, as well as the full estimation results of the DCE. WTP values are derived for different socioeconomic groups to test for preference heterogeneity. The evidence indeed suggests a higher propensity among the young and high-income individuals to opt for a higher-deductible contract with compensation demanded. Therefore, Swiss social health insurers seem to be confronted with a considerable degree of preference heterogeneity that may make cream skimming worthwile but also calls for differentiated contracts.

2 Literature review

This section is devoted to a review of the literature on the possibilities of differentiation of copayment in (health) insurance and the role of deductibles in particular.

With symmetric information, risk-averse individuals will purchase policies with full coverage when insurance is actuarially fair (Mossin, 1968). However, not many insurance contracts offer full coverage. As shown by Arrow (1971), in the presence of administrative expense the Pareto-optimal contract stipulates a deductible, beyond which there is no cost sharing. Schlesinger (1981) proves that more risk-averse individuals and - under certain assumptions - individuals with lower initial wealth or a higher probability of a loss purchase insurance contracts with lower deductibles. Raviv (1979) shows that a positive rate of copayment is either a result of risk aversion of insurers or of nonlinearity in insurance costs. However, all of these results are conditional on the absence of moral hazard.

With moral hazard effects present, deductibles combined with a positive rate of copayment become optimal (Shavell, 1979). Ellis and McGuire (1990) and Eggleston (2000) distinguish between demand- and supply-side cost sharing as a means to control the quantity of health services consumed.

In this paper, the focus lies on cost sharing on the demand side. Previous research has analyzed various designs of cost sharing in health insurance. A general goal of a mandatory health insurance is to minimize consumers' risk due to unexpected medical expenditure. Criteria for cost-sharing schemes are thus the variability of final income (Breyer, 1984; Osterkamp, 2003) and the severity of the health condition. Since moral hazard effects may differ between types of illness, contracts should optimally contain differentiated cost-sharing provisions (Nyman, 2003, Ch. 9; Zweifel and Breuer, 2005). The result would be high deductibles for low-

cost risks and no deductible for catastrophic risks, or different deductibles for long-term and emergency cases, respectively (Eeckhoudt, 2002). A differentiation with respect to the treatment chosen is suggested by Chernew *et al.* (2000) in order to give financial incentives to seek out less costly alternatives and to integrate patients into decision-making. Another distinction that points in the same direction is made by van de Voorde *et al.* (2001) and Schellhorn (2001), who propose different deductibles for services provided by general practitioners and specialists.

Asheim *et al.* (2003) consider not only the risk of HCE but also of income loss due to illness, raising the question of how individuals with different (unobserved) earning capabilities and different probabilities of falling ill will decide about coverage. Their analysis relies on the standard Rothschild-Stiglitz model with asymmetric information, which has a separating equilibrium where low-risk individuals with high ability choose a contract with copayment and high-risk individuals with low ability choose no copayment. The authors also analyze a "deductible in pain" which consists in only partial restoration of health as a consequence of settling for a less costly treatment alternative.

Deductibles have a negative effect on the number of physician and hospital visits. The RAND Health Insurance Experiment assigned participants to contracts with different deductibles to exclude risk selection effects. It found a price elasticity of -0.2 (Manning *et al.*, 1987; Newhouse, 1996; Ellis, 1995) that was in line with findings from earlier studies (Scitovsky and Snyder, 1972).[1]

Chiappori *et al.* (1998) benefited from a controlled natural experiment due to a policy change when some but not all French insured were exposed to a higher copayment rate on physician visits. Their estimation results do not provide any evidence for a reduced total number of physician visits among the group facing the higher copayment rate, suggesting a price elasticity of demand close to zero. However, demand for home visits decreased, possibly because a change in net money price translates fully into a change of total price, nonmonetary costs such as travel and waiting time being negligible in this type of medical service (Acton, 1975).

Schellhorn (2001) also finds that HCE of Swiss individuals that choose a high-deductible plan are lower. He attributes at least part of the effect to self-selection of low risks. Indeed, higher age goes along with a lower deductible, whereas income is not a significant predictor of contract choice. An analysis of Dutch administrative

[1] Newhouse (1978) reviews the early literature on cost-sharing effects on the demand for medical care, whereas Rice and Morrison (1994) and Zweifel and Manning (2000) look at more recent literature on this topic.

data was conducted by VAN VLIET (2004) to estimate price sensitivity of demand for healthcare of different specialities, finding an overall price elasticity of -0.14, with -0.40 for general practioners and -0.12 for specialists. In contrast to the RAND study and CHIAPPORI *et al.* (1998), this research does not control for the endogeneity of contract choice. Using Swiss data again, WERBLOW and FELDER (2003) try to separate moral hazard from risk-selection effects by distinguishing three stages in the demand for health care services. In the first stage, individuals select a deductible, conditional on uncertain future HCE. In the second stage, they decide on whether or not to consult a physician. In the third stage, intensity of treatment is determined as an outcome of patient-physician interaction. Taking into account the endogeneity of contract choice in this way, the authors find that deductibles still serve to reduce HCE significantly.

In sum, both theory and empirical evidence suggest that increased cost sharing contributes to mitigating moral hazard effects in health insurance. However, part of the observed effect may be due to both adverse selection by consumers and cream skimming by insurers. A necessary condition for these strategies to occur is sufficient heterogeneity of risk types and/or preferences. Interestingly, apart from heterogeneity with regard to risk types (see the studies of SCHELLHORN (2001) and WERBLOW and FELDER (2003) cited above), there is comparatively little empitical evidence concerning heterogeneity in other dimensions. COURBAGE and DE COULON (2005) find that UK individuals purchasing private health insurance differ from those remaining within the National Health Service by income, political orientation, and possibly preventive effort. However, this heterogeneity determines choice between systems rather than choice within the system, where the imposition of uniformity risks to burden society with considerable cost in terms of efficiency losses (ZWEIFEL *et al.*, 2005). The DCE presented in this paper permits to quantify the extent of heterogeneity with regard to not yet existing health insurance policies in population.

Conclusion 1 *Preference heterogeneity facilitates both adverse selection and cream skimming in insurance markets with asymmetric information. However, there is little direct evidence on the actual importance of preference heterogeneity in health insurance.*

3 Screening and adverse selection: theoretical considerations

This section takes the standard Rothschild-Stiglitz-Model (1976) as the backfoil which says that the observed holdings of insurance contracts are the outcome of risk selection by individuals on the one hand and screening efforts by insurers on the other.

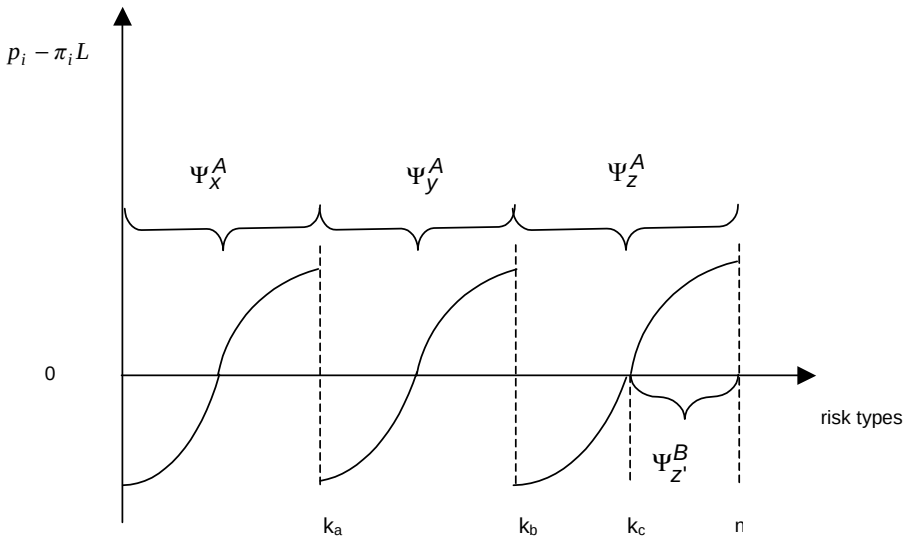
On the part of individuals, both preference and risk heterogeneity (the latter usually emphasized because of possible adverse selection effects) lead to differences in contract choice. The two reasons cannot be distinguished easily: In health insurance, a consumer may opt for comprehensive coverage because of a high degree of risk aversion (preference) or because of private knowledge about a (high) future probability of incurring (high) HCE (risk). For Switzerland, there is no definite evidence with regard to the preference side, e.g. women being more risk averse than men. To the contrary, a study by SCHUBERT *et al.* (1999) finds that less risk-averse choices by Swiss females can be explained by differences in budget constraints rather than preferences. On the risk side, marked socioeconomic differences both in the likelihood of positive HCE and the amount of HCE have been found (see e.g. ZWEIFEL *et al.*, 1999 or ZWEIFEL, 1985), and it is credible to assume that individuals are at least to some extent aware of them. Therefore, risk heterogeneity (and possibly preference heterogeneity) are expected to be determinants of contract choice in Swiss health insurance. The results of the DCE reported in section 5 below seek to establish such heterogeneity, albeit without discriminating between its two sources.

On the part of insurers, risk heterogeneity is of course the raison d'être for implementing cream-skimming strategies. However, to the extent that preferences correlate with risk, preference heterogeneity is also important for the success of such strategies. For example, preference for a neighborhood with low environmental quality may serve as a signal of high future probability of incurring (high) HCE, triggering the infamous 'red lining'. However, the more precisely health insurers can scale their premiums to risk, the less incentive they have to engage in cream skimming (PAULY and HERRING, 1999; ZWEIFEL and BREUER, 2005). Conversely, regulation imposing community rating makes this incentive strong. It still may be mitigated by the risk of backfiring on the cream-skimming insurer (WILSON, 1977). Competitors who become insolvent because they are flooded by high risks will 'unload' them back on their successful competitor.

SPENCE (1978) analyzes such a competitive insurance market, where insurers react to the products offered by their competitors, and considers $i = 1, .., n$ discrete risk types (with loss probabilities $\pi_i > \pi_{i+1}$; thus type i causes higher costs than type $i + 1$) and their risk preferences. As in the Rothschild-Stiglitz-case, preferences are not observable, making product differentiation attractive for screening individuals. This formulation seems to be a fair description of Swiss social health insurance with its many insurers each offering several contracts with respect to cost sharing or Managed-Care elements. This diversification may well provide an instrument for risk selection.

Figure 1

Product differentiation on an insurance market



Source: Spence (1978).

Figure 1 illustrates the situation of insurer A offering three different contracts, $\Psi^A = (\Psi_x^A, \Psi_y^A, \Psi_z^A)$ each subsuming a group of similar types. On the vertical axis, $p_i - \pi_i L$ denotes the expected profit for the insurer, with p_i denoting the insurance premium and $\pi_i L$, the expected loss of individual i. Within contracts, cross-subsidization is allowed, describing a realistic feature of an insurance market. The 'best' risks within each contract agree on paying a premium that is marginally higher than their expected losses. In terms of risk preferences, their compensation

demanded for accepting risk (in the guise of cost sharing) is lower than it would be in the case of a perfectly separating equilibrium with individually risk-adjusted premiums. This commitment avoids the very bad risk (or very risk-averse) types migrating to the contract tailored to the subpopulation to which these 'best' risks pertain. In Figure 1, this could be a move from contract Ψ_y^A (written by A for a subpopulation y) to Ψ_z^A (targeted to subpopulation z, with $E(HCE_z) < E(HCE_y)$). Insurers thus realize a negative profit on some individuals within a policy, viz. those that have high but not high enough $E(HCE)$ to qualify for the 'next' contract with a lower deductible and a higher premium. Since there are profitable and non-profitable individuals within one policy, there is an incentive for a competitor B to cream skim and offer a contract $\Psi_{z\prime}^B$ that only attracts profitable individuals. Insurer A cannot cross-subsidize the 'worse' risks within contract Ψ_z^A any longer, causing it to withdraw this contract from the market. The individuals on the interval $[k_b, k_c]$ (i.e. those yielding negative expected profits) must now search for a new contract, which induces competitors to adjust their offers.

Still, cream skimming may turn out not to be feasible. Already in the Rothschild-Stiglitz case of just high and low risks, separating contracts may fail. If high probability of positive HCE does not go along with high amounts of HCE, because if those who often see the doctor often submit petty claims, attracting the right individuals to the right policies already becomes difficult. In addition, there are usually far more than two categories to be distinguished. Finally, there is a considerable likelihood of transition in that a low risk may become a high one and vice versa, a consideration of importance to any insurer whose planning horizon extends beyond one period, a year, say (see Zweifel and Breuer, 2005).

In the case of Switzerland, social health insurers, while competing with premiums, must charge a uniform premium for all adults of a defined local market (often coincident with a Canton). This constitutes a strong incentive for risk selection. A recent Swiss study indeed found that up to two-thirds of the savings achieved by Managed-Care alternatives were due to risk selection effects (Lehmann and Zweifel, 2004). It is highly unlikely that these risk selection effects could be traced to consumer behavior in their entirety; after all, these alternatives had to be developed and launched by insurers. These considerations provide the basis for the hypothesis to be tested in this paper, viz. that policies with increased cost sharing in Swiss health insurance may attract consumers with certain preferences and risk profiles, thus serving as an instrument for risk selection.

Conclusion 2 *While adverse selection by individuals can be expected to be relevant*

in the Swiss market for social health insurance, there are reasons to expect cream-skimming efforts by insurers, which could profit from preference heterogeneity using differentiated deductible levels of cost sharing.

4 Discrete-choice experiments

4.1 Theoretical background

Based on random utility theory (Luce, 1959; Manski and Lerman, 1977; McFadden, 1981 and 2001), discrete choice experiments (DCE) are designed to allow individuals to express their preferences for non-marketed goods or goods which do not yet exist. The number of applications of DCE to the valuation of healthcare programs has increased during the past few years (see Ryan and Gerard, 2003 for an overview; Scanlon *et al.*, 1997). In a DCE individuals are given a hypothetical choice between many or just two (binary choice) commodities. From the trade-offs respondents implicitly make between the different attributes of the product, the researcher can derive the (expected) utility associated with product characteristics. By including a cost or price attribute, the monetary valuation of the remaining product attributes can be computed. Biases that might occur when individuals are asked about their WTP directly (as in Contingent Valuation) are less likely to be observed in DCE (Ryan, 2004).

The first step of a DCE involves the definition of the attributes of the commodity and the levels assigned to them (Louviere *et al.*, 2000; Ryan and Gerard, 2003). In the present case of Swiss health insurance, attributes that currently are in the political debate were chosen to describe the different benefit packages (for more details, see Table 1),

- variation in the annual deductible;
- different levels of copayment;
- variation in coverage of treatment methods in alternative medicine;
- variation in the drug benefit;
- variation in access to innovative treatments;
- variation in the premium as a result of these extensions or limitations of benefits (this constitutes the price attribute).

Table 1

Product attributes and levels in the main survey

Attribute	Label	Levels
Deductible	deductible	- Status quo: CHF 230, 400, 600, 1200, 1,500 per year - CHF 0, 2,400, 4,800 per year
Copayment	copayment	- Status quo: 10%, maximum level of CHF 600 annually (=0) - 20%, maximum level of CHF 1,200 annually (=1)
Alternative medicine	altmed	- Status quo: some treatment methods are covered (=0) - Fewer alternative treatment methods are covered (=1) - More alternative treatment methods are covered (=-1)
Generics	generics	- Status quo: all drugs on the list are reimbursed (=0) - the cheapest product on the market is covered (=1)
Innovation	innovation	- Status quo: all treatment methods are covered as soon as they get approved (=0) - innovative treatment methods are covered only three years after introduction (=1)
Premium	premium	- Increase of the monthly premium by CHF 50, 25 or 10 - Reduction of the monthly premium by CHF 50, 25 or 10

These six attributes and their levels combine for a very large number (768 possible combinations) of choice sets. Using statistical design optimization procedures (KUHFELD *et al.,* 1994; HARDIN and SLOANE, 1993 and 1994), their number was reduced to 27 and randomly split into three groups. One choice was included twice in each choice set for testing of consistency (RYAN and BATE, 2001), resulting in 10 choices per person. Each of the 10 alternatives had to be evaluated against the status quo insurance contract.

As a rational subject, a respondent will choose the alternative with the higher level of utility. The decision making process within a DCE can thus be seen as a comparison of utility values V_{ij},

$$V_{ij} = v\left[b_j, p_j, y_i, s_i, \varepsilon_{ij}\right] \tag{1}$$

where $v\left[\cdot\right]$ represents the value of the indirect utility function of an individual for an insurance contract with a vector of attributes b_j and a premium denoted by p_j. The income of individual i is y_i, the sociodemographic characteristics are denoted by s_i, and the error term by ε_{ij}.

With an additive error term, the individual will choose contract j over contract l if

$$w\left[b_j, p_j, y_i, s_i\right] + \varepsilon_{ij} \geq w\left[b_l, p_l, y_i, s_i\right] + \varepsilon_{il} \tag{2}$$

Here, $w_i[\cdot]$ is the deterministic component of the utility that can be estimated, while the error terms reflect unobservable factors that vary with the individual and the alternatives. The utility function $w(\cdot)$ can be inferred from observed choices by assuming that the probability P_{ij} of choosing alternative j over l, given the vector of attributes, equals the probability of the difference in utilities given in (2) occurring. Therefore,

$$P_{ij} = \Pr\left(w\left[b_j, p_j, y_i, s_i\right] + \varepsilon_{ij} \geq w\left[b_l, p_l, y_i, s_i\right] + \varepsilon_{il}\right) \tag{3}$$

Rearranging this inequality into a stochastic and a deterministic part leads to the following expression,

$$P_{ij} = \Pr\left(\left(\varepsilon_{ij} - \varepsilon_{il}\right) \geq \left(w\left[b_l, ...\right] - w\left[b_j, ...\right]\right)\right). \tag{4}$$

Moreover the utility function is usually assumed to be linear[2],

$$v_i = c_i + \gamma_1 b_1 + \gamma_2 b_2 + ... + \varepsilon_{ij} \tag{5}$$

where c_i is a constant, $\gamma_1, ...\gamma_K$ are the parameters to be estimated, and $b_1, ...b_K$ (K=6 in the present case) are the different attributes of the commodity. The parameters $\gamma_1, ...\gamma_K$ can be interpreted as the marginal utilities of the attributes; they are constant in the case of a linear utility function. This rather strong assumption might not be satisfied for attributes covering a wide range such as the deductible or the premium. To test for nonlinearity, quadratic terms of these two regressors will be included in the empirical specification. The marginal rate of substitution between two attributes k and m is given by

$$MRS_{k,m} = -\frac{\partial v / \partial b_k}{\partial v / \partial b_m}, \tag{6}$$

with the marginal utilities retrieved from the estimated utility function.

The WTP for a specific attribute can thus be calculated by dividing the respective slope parameter of the indirect utility function by the parameter pertaining to the price variable (in the present case the monthly premium, reflecting the marginal utility of income[3]). This ratio then indicates how much income respondents are

[2]There is empirical evidence that a linear specification leads to good predictions in the middle ranges of the utility function (Hensher *et al.*, 1999).

[3]This can be shown by Roy's Identity (Telser, 2002, p. 58, ch. 3.4). Quantity demanded equals the negative ratio of partial derivatives of the indirect utility function with respect to price and income, $x_j(\cdot) = -\frac{\partial v(\cdot)/\partial p_j}{\partial v(\cdot)/\partial y_i}$. Since the quantity demanded can be set to one ($x_j = 1$) for the one alternative to be chosen, the expression simplifies to $\frac{\partial v}{\partial y_i} = -\frac{\partial v}{\partial p_j}$. Thus the marginal utility of

willing to forego in order to get an increased amount of the other attribute.

The model is usually estimated by logit and probit techniques, depending on the assumption made on the distribution of the error term. Since respondents have to make several choices, observations have a panel structure, making a random-effects specification appropriate (for a more detailed explanation, see LOUVIERE *et al.*, 2000 and BEN-AKIVA and LERMAN, 1985). Limiting the specification to the product attributes and excluding already the squared premium variable ($premium^2$) which proved insignificant, one obtains the following indirect utility function

$$\begin{aligned} V_{ij} &= c_i + \gamma_1 deduct + \gamma_2 deduct^2 + \gamma_3 copayment + \gamma_4 altmed \\ &\quad + \gamma_5 generics + \gamma_6 innovation + \gamma_7 premium + \varepsilon_{ij}. \end{aligned} \tag{7}$$

In the DCE conducted in this study, the dependent variable is (0,1), indicating whether the individual chooses the alternative or keeps his or her existing contract. According to the random utility model, the individual evaluates the difference between the two alternatives presented. For the dummy variables representing copayments, alternative medicine, generics, and innovation, this does not require any adjustments of the variables entering the estimation function. The premium variable is defined as the absolute change in Swiss Francs from the actual contract; it takes on six discrete values (see Table 1 again). For the deductible, the difference between the level proposed in the alternative contract and the one in the status quo contract needs to be entered.

The φ_{ij} are assumed to be normally distributed and to have a random component structure[4] such that

$$\varphi_{ij} = \mu_i + \eta_{ij}, \tag{8}$$

where μ_i is a stochastic component, varying only with the individual but not across choices, and μ_i and η_{ij} being uncorrelated with the vector of attributes $(b_{i1}, ..., b_{iK})$. In the probit model, μ_i and η_{ij} are assumed to be $iid \sim N(0, \sigma_\mu)$, and $iid \sim N(0, \sigma_\eta)$ respectively, with $\sigma_\eta = 1$ as the standard assumption so that

$$Var\left[\varphi_{ij}\right] = \sigma_\mu^2 + \sigma_\eta^2 = \sigma_\mu^2 + 1 \tag{9}$$

income is equals the negative derivative of the indirect utility function with respect to price.

[4]Estimating a fixed-effects model would necessitate the estimation of individual-specific constants, increasing the number of dummy variables tremendously and thus causing multicollinearity problems. This would preclude estimation of age and other socioeconomic effects, which are at the focus of this study.

and

$$Corr\left[\varphi_{ij}, \varphi_{ir}\right] := \rho = \frac{\sigma_\mu^2}{1 + \sigma_\mu^2}. \tag{10}$$

Here, ρ indicates how strongly the different choices j and r of a given individual are correlated over the course of the experiment (Greene, 2000, Ch. 19.5). A high and significant value of ρ indicates that the random-effects specification is justified. Another advantage of the probit model (which is retained in the following) is that it relaxes the strong IIA (independence of irrelevant alternatives) assumption of the logit model (Train, 2003; Ben-Akiva and Lerman, 1985).

4.2 Setup of the study

To test for possible preference heterogeneity of the Swiss residential population concerning their health insurance, a representative telephone survey with 1,000 persons aged over 25[5] living in the German- and French-speaking parts of Switzerland was conducted. The survey, fielded during September 2003, was in two steps. In a first telephone contact, individuals who agreed to particiate were asked to look up their personal monthly premium and annual deductible for the compulsory part of their insurance policy. This information on the status quo is essential for respondents to be able to make a choice between their current contract and a proposed alternative. They also were sent a package of information material to make sure that they had the same infomation on the actual coverage of their policy and the variations considered in the experiment.[6]

The second telephone contact was by appointment and consisted of the questionnaire itself. It started with questions concerning utilization of healthcare services, overall satisfaction with the healthcare system, insurer and insurance policy, and general attitudes toward new elements in the insurance package. Sociodemographic variables surveyed were age, sex, education, total household income, education (seven categories from primary school to university degree), place of residence, occupation, and marital status.

The DCE was implemented in the second part of the interview. Participants were asked to compare the status quo, i.e. their current insurance contract, with 10 hypothetical alternatives defined by the six attributes named in section 4.1. The attributes retained for describing the contracts had been checked in a pretest for

[5] Below the age of 25 reduced premiums for young adults and children apply.

[6] See also San Miguel *et al.* (2005) for the importance of a priori information for choice consistency in a DCE.

their relevance, occasioning some adjustments to the deductible attribute, whose range had to be decreased to avoid protest responses for lack of realism.[7] To mitigate learning or fatigue effects, the order of the choice alternatives was randomly changed (Merino-Castellò, 2003).

5 Results

5.1 Descriptive statistics

The sample consists of 780 respondents from the German-speaking part of Switzerland and 220 of the French-speaking population. One-half of the sample are women, the other half are men. Other key socioeconomic characteristics in the sample reflect the proportions in the Swiss population. Since health-related issues are debated frequently, 46 percent of the persons interviewed stated very high interest, with a still higher share among those aged over 65 years. This might reflect a selection effect because people interested in health issues were more likely to participate.

Also, 80 percent of the respondents stated that they currently were in very good or good health. This distribution correponds closely to the results of the survey 'Healthmonitor 2001' (gfs, 2001). Considering utilization of medical services during the past six months, the following answers were given. 28 percent of the sample had not used any medical service during the past 6 months, 12 percent had been in hospital, 50 percent had received outpatient care, 21 percent had seen a dentist, 10 percent had consulted a healer, and 39 percent had taken medications. Again these frequencies accord with the results of the survey 'Healthmonitor 2001' (gfs, 2001).

On average, the interviewed paid a monthly premium of CHF 240 (US$ 192) for their mandatory health insurance. This average is lower than the CHF 270 (US$ 216) computed for the whole of Switzerland by the Federal Agency for Social Insurance. This difference can be explained by three factors. First, the official figure includes only the (expensive) contracts with the lowest deductible, whereas the sample also includes (less expensive) contracts with higher deductibles and Managed-Care alternatives. Second, the canton Tessin, a canton with traditionally high HCE and high premiums, was not sampled for this study. Third, the official figure includes contributions to accident insurance, which were excluded here.

The frequencies of the different annual deductibles are shown in Table 2. With

[7] For potential difficulties with the cost attribute, see Slothuus-Skjoldborg and Gyrd-Hansen, 2003.

Table 2

Frequencies of deductible levels in Swiss health insurance (in percent)

Deductibles in CHF	Survey (2003) (N=1000)	Official Health Insurance Statistics (1998) [a]	Official Health Insurance Statistics (2003)	Official Health Insurance Statistics (2005)[b]	
				Deduct.	%
230	36.1	47.6	41.8	300	45
400	22.4	30.8	22.1	500	28
600	14.3	7.6	10.2	1000	3
1200	2.4	3.2	2.6	1500	18
1500	24.8	3.9	15.0	2000	1
other	0.8	7.0	8.3	2500	5

[a] First year with minimum deductible of CHF 230.

[b] Preliminary data in the first year with newly introduced deductible levels.

1 CHF=0.8 US$ at 2005 exchange rates.

Source: Federal Agency of Health (2005).

24.8 percent, the highest deductible of CHF 1,500 (US$ 1,200) is over-represented. According to official statistics for 2002, only 15 percent chose the highest level. However, this share was still lower in 1998, viz. 3.9 percent (BAG, 2005). Therefore, a tendency towards higher deductibles can be observed, indicating increased pressure on households to save on premiums or an increasing reflection of preferences for more differentiated contracts. Still, there is the possibility that people who are willing to take part in a health-related survey are more informed about the different options that result in premium reductions. However, over-representation of the maximum deductible may also be the result of risk selection. Indeed, the sample has a modal age of 35, an age group with rather good health status that has proven to opt for higher deductibles in previous studies and official statistics.

5.2 Estimation results from the DCE

Equation (5) is the simple core model traditionally used for DCE, in which marginal utilities and hence WTP values do not depend on socioeconomic characteristics. This random-effects probit estimation results in highly significant coefficients with the expected signs (Table 3). Therefore, it can be said that the six product attributes distinguished proved relevant for choice. However, the highly significant (negative) constant provides evidence of status quo bias, i.e. the alternative is valued less

than the status quo insurance contract as a general tendency (SAMUELSON and ZECKHAUSER, 1988).

The two variables capturing cost sharing, viz. *deductible* and *copayment,* seem to have different degrees of influence on the choice decision. The negative coefficient of the deductible points to a decreasing likelihood of choosing an alternative if the difference in the deductibles between alternative and status quo is marked. This result is intuitive, showing that individuals with a low current deductible are least likely to opt for a very high-deductible alternative. However, the significantly positive coefficient of the squared deductible (*deduct*2) indicates that marginal disutility decreases at high values of deductible.

Values of marginal WTP for the attributes can be derived from equations (6) and (7). Estimates are shown in Table 4, with standard errors calculated using both a bootstrap with 100 replications and the Delta method (STATA, 2004). The marginal WTP values for all contract attributes are highly significant. In the following, emphasis will be on the cost-sharing attributes.

Table 3

Random-effects probit estimation results for the DCE (simple model)

	expected sign	coefficient	std.err.	z-value	marg. effect
deductible	-	-0.00057**	0.00003	-18.64	-0.00007
deductible2	+/-	3.80e-08**	7.88e-09	4.82	4.45e-09
copayment	-	-0.27058**	0.04282	-6.32	-0.03201
altmed [a)]	+	0.35371**	0.04198	8.43	0.04265
generics	-	-0.19710**	0.04211	-4.68	-0.02334
innovation	-	-0.54942**	0.04807	-11.43	-0.06479
premium	-	-0.01431**	0.00061	-23.63	-0.00171
constant	0	-0.76362**	0.05893	-12.96	

$\sigma_{\upsilon} = 0.91029$, $\rho = 0.45314$

Log likelihood: -3134.5289

$\chi^2(0) = 745.05$, Prob > $\chi^2 = 0.0000$

n = 9569

[a)] coding for alternative medicine (0=restriction; 1=expansion).

** (*) significant at the 1 (5) percent level.

Evidence on WTP for higher deductibles and copayments adds to the discussion on cost sharing in Switzerland (SCHELLHORN, 2001; WERBLOW and FELDER, 2003) and other European countries. While ex-ante rational individuals would want

to limit their ex-post moral hazard by opting for a positive rate of coinsurance (Zweifel and Breyer, 1997, Ch. 6), it is not clear how far away from zero the optimal rate is in presence of a deductible and insurance premiums that are not fair at the margin.

The results for the cost-sharing elements from the simple model (without controlling for socioeconomic variables, see equation (7)) read as follows (see Table 4). For a median individual with a current CHF 400 deductible, an increase in the annual deductible by CHF 1 has to be compensated with a monthly premium reduction of 3.77 cents (s.e. 0.204 cents). Neglecting variation in risk aversion for extrapolation, one can infer that the transition from a deductible of CHF 400 to CHF 1,500 would have to be compensated by a reduction of roughly CHF 38 in the monthly premium.[8] This compares favorably with the premium reduction actually granted, which amounts to an average of about CHF 86 as of 2003.[9] However, these resultss only seem to apply to those individuals who opted for an alternative contract in the DCE at least once. The significant constant indicates a status quo bias that can be expressed in monetary units as well. A compensation of CHF 53 is demanded to consider a change in the insurance contract at all.[10]

Second, there is an estimated WTP for avoiding a 20 percent rate of copayment of CHF 19 (s.e. CHF 3.3). This is a relatively small amount, as shown by the following calculation. Given a mean HCE of some CHF 2,500 paid by the insurers as of 2003 (BAG, 2005), an increase of the rate of coinsurance by 10 percentage points implies an additional financial exposure of CHF 250 on average. By way of comparison, an increase of the deductible from CHF 400 to 1,500 must have a probability mass of no more than 0.5 in view of the skewness of the cost distribution[11], inducing a financial exposure of roughly CHF 475 [=0.5*(400+1500)/2]. This is 90 percent more than the CHF 250 associated with the increased copayment; yet it must be compensated by 100 percent more [=38/19]. Since copayment causes a higher variance of out-

[8] From equation (6) one can derive $MWTP_{deduct} = \frac{\gamma_1 + 2\gamma_2 * deduct}{\gamma_7}$ and compute the WTP for a higher deductible by integrating this function over the interval $[400, 1500]$: $\int_{400}^{1500} MWTP_{deduct} = [\frac{1}{-0.01431}(-0.00057 * deduct + 3.08e-08 * deduct^2]_{400}^{1500} = 38.3$.

[9] In spite of this favorable comparison, only 25 percent of respondents have the maximum deductible (see Table 2).

[10] If the model is estimated only including those individuals that chose at least once one of the alternatives proposed, the constant turns out to be insignificant. Computing again the compensation for deviating from the status quo, a premium reduction of CHF 6 would be sufficient for this group (estimation results for the reduced sample of 'switchers' are given in Table A1 of the Appendix).

[11] This distribution is confirmed by insurance data from one of the major Swiss health insurers.

Table 4

Mean marginal WTP for attributes (in CHF per month) – derived from the simple model

	WTP		std. err. (bootstrapped)	std. err. (by Delta method)
deductible [a)]	-0.03770	***	0.00204	0.00168
copayment	-18.91	***	3.30448	2.98148
altmed [b)]	24.71	***	3.01507	3.10385
generics	-13.77	***	3.14571	3.06017
innovation	-38.39	***	3.36486	3.32203

[a)] compensation in Swiss Francs required for a CHF 1 increase in the annual deductible for the median individual.

[b)] coding for alternative medicine (0=restriction; 1=expansion).

*** significant at the 1 percent level.

1 CHF=0.8 US$ at 2005 exchange rates.

of-pocket outlay by the insured, it should be resisted more strongly by risk-averse insured than a financially equivalent deductible. However, the higher deductible must be compensated somewhat more than proportionally.

The CHF 19 demanded to compensate for a 20 percent rather than 10 percent rate of copayment cannot be juxtaposed directly to variations in actual premiums because the present rate is set uniformly at 10 percent. However, it amounts to about 8 percent of the sample average premium of CHF 240. Since a 10 percentage point increase in the rate of copayment necessarily reduces insurance payments by at least 10 percent (HCE borne by the insured plus mitigation of moral hazard effects), health insurers on average should be able to offer premium reductions of at least 10 percent, sufficient to overcome insureds' resistance against a moderate increase in copayment.

5.3 Testing for preference heterogeneity

If heterogeneity of preferences plays an important role, market processes tend towards a separating rather than a pooling equilibrium.[12] Thus, it is important to have evidence concerning the degree of preference heterogeneity in a population

[12]The characteristics determining choice decisions in health insurance are outlined in various earlier studies. Schellhorn (2001), Werblow and Felder (2003), Lehmann and Zweifel (2004), and Holly *et al.* (1998) analyze the exercise of choice in Swiss health insurance. For general studies analyzing different health plan choices see e.g. Schwarze und Anderson (2001); Schut *et al.* (2003); Strombom *et al.* (2002); Gress *et al.* (2002); Buchmueller and Feldstein (1997).

to be insured. To this end, a comprehensive model is estimated. The nature of the random utility specification, viz. equations (3) and (4), requires the inclusion of socioeconomic characteristics as interaction terms with the product attribute in question. Differences in utility causing choice may, however, not be fully determined by differences in attributes, but may be due to unobservable characteristics that are captured in the constant. Control variables included are gender, age and income (each in three categories), the actual monthly premium paid, household size, language as a proxy for region and the concomitant premium differences, and a proxy variable for health status, i.e. whether the respondent has made use of outpatient and/or inpatient care during the past 6 months. Selecting age as an example, equation (7) can thus be expanded to read

$$\begin{aligned} V_{ij} &= c + \gamma_1 deduct + .. + \gamma_7 premium + \gamma_{15} a2539 * deduct + .. \\ &\quad + \gamma_{22} a63^{+} * deduct + .. + \gamma_{72} a2539 + \gamma_{73} a63^{+} + .. + \varepsilon_{ij}. \end{aligned} \tag{11}$$

In this comprehensive specification, the socioeconomic characteristics entered at the end can be interpreted as interaction terms involving the constant, pointing to a misspecification if significant. In the random utility model differences are taken between the two alternatives considererd, leading to a cancellation of individual terms. If the specification in equation (11) was fully correct, the constant itself as well as the socioeconomic variables should have a value of zero.

While the signs of the six product attributes continue to accord with theoretical expectations (see Table A2 of the Appendix), *copayment*, *altmed*, *generics*, and *innovation* lose statistical significance. However, they retain (or come very close to) 5 percent significance in at least one interaction term. Thus the attributes, with the exception of *generics*, can be said to still have empirical relevance in this specification. Moreover, their estimated coefficients are reasonably close to those pertaining to the simple specification (see Table 3), with the only exception of *innovation*.

Most importantly, Table A2 contains strong evidence of preference heterogeneity. No less than 6 of the 14 regressors involving age are significant, while gender differences can be ascertained in 3 out of 6 cases. The French-speaking minority clearly is less concerned about delayed access to innovation than the rest of the population. Out of a total of 14 interaction terms involving income, 6 are significant (3 of them very highly).

The differences in WTP (derived from the comprehensive model of the Appendix

using equation (6)) are documented in Table 5. Most of the estimates are highly significant with regard to an increase in the deductible (by CHF 1) but mostly insignificant with regard to an increase in the rate of copayment (from 10 to 20 percent). The latter result is not surprising since the attribute *copayment* loses significance in the specification with interactions (see Table A2).

Male and older respondents (63+, with age groups 25-39, 40-62, 63+) demand a lower compensation for a marginal increase in the deductible and require less compensation for accepting 20 percent rate of copayment. As to income effects, estimates conform with theoretical expectations. Premium reductions would have to be highest for low-income individuals (4.4 cents per CHF, s.e. 1.9 cents). This amount drops with increasing income, to 2.2 cents (s.e. 0.8 cents) per CHF additional deductible. A similar tendency seems to hold with respect to copayment (WTP values cannot be distinguished from zero, however). Individuals of the French-speaking part of Switzerland suffer a significantly higher disutility from higher deductibles (but possibly not from higher copayment). An astonishing result is that health status (proxied by past utilization of medical services) does not make a difference. Individuals who have undergone treatment during the past 6 months demand the same compensation for higher deductibles as 'healthy' individuals.

Finally, compensation demanded for accepting a still higher deductible increases with the initial value of the deductible, conforming to theoretical expectations.

Conclusion 3 *The simple (attributes-only) model yields estimation results that are in full accordance with theoretical expectations. The comprehensive model (with interactions) results in WTP estimates for increased deductibles that differ between age and income groups, suggesting preference heterogeneity.*

The heterogeneity in preferences with respect to higher deductibles can be traced back to differences in risk aversion whereas preferences for an ample coverage of alternative medicine or a direct access to innovations are more likely to express a taste for a differentiated benefit package, the latter being neglected in the following analysis.

The comprehensive model controls for socioeconomic differences that capture the risk type of the insured to some extent. The differences in compensations demanded between age groups or gender might thus be interpreted as an expression of differences in risk preferences. Figure 2 shows the differences in the compensations demanded for higher deductibles between age groups and gender. They are less marked in the lower ranges of deductibles, that were available in 2003. Young

Table 5

Marginal WTP for deductible and coinsurance (in CHF per month) for selected socioeconomic groups (evaluated at the group mean) – derived from the comprehensive model

	Deductible[a]				Coinsurance			
	WTP		std.err.	95%-CI	WTP		std.err.	95%-CI
Male	-0.0293	***	0.0105	[-0.050 ; -0.009]	-8.82		11.4908	[-31.34 ; 13.70]
Female	-0.0371	***	0.0132	[0.063 ; -0.011]	-16.75	*	9.7855	[-35.92 ; 2.43]
Age 25-39	-0.0421	**	0.0197	[-0.081 ; -0.004]	-20.16		16.5978	[-52.69 ; 12.37]
Age 40-62	-0.0363	***	0.0121	[-0.060 ; -0.013]	-15.57		10.6938	[-36.53 ; 5.39]
Age over 62	-0.0192	***	0.0058	[-0.031 ; -0.008]	-0.80		7.6650	[-15.83 ; 14.22]
Income < CHF 1500[b]	-0.0445	**	0.0193	[-0.082 ; -0.007]	-29.40		20.5578	[-69.69 ; 10.89]
Income CHF 1500-3000	-0.0340	**	0.0139	[-0.061 ; -0.007]	-10.14		9.3448	[-28.46 ; 8.18]
Income CHF >3000	-0.0216	***	0.0081	[-0.038 ; -0.006]	-10.52		13.0126	[-36.03 ; 14.98]
German	-0.0305	**	0.0128	[-0.056 ; -0.005]	-14.70	*	8.5193	[-31.39 ; 2.00]
French	-0.0323	**	0.0113	[-0.010 ; -0.055]	-8.89		12.4167	[-33.22 ; 14.45]
Notreat[c]	-0.0337	**	0.0135	[-0.060 ; -0.007]	-3.20		10.9393	[-24.64 ; 18.24]
Treat[c]	-0.0325	***	0.0105	[-0.053 ; -0.012]	-19.96	*	10.6883	[-40.91 ; 0.98]
Current deductible 230	-0.0300	***	0.0100	[-0.050 ; -0.010]	-13.69		9.5456	[-32.39 ; 5.02]
Current deductible 400	-0.0311	***	0.0107	[-0.052 ; -0.010]	-13.80		10.0267	[-33.45 ; 5.86]
Current deductible 600	-0.0355	**	0.0132	[-0.061 ; -0.010]	-12.21		10.7286	[-33.24 ; 8.81]
Current deductible 1200	-0.0420	*	0.0216	[-0.084 ; 0.001]	-12.55		15.0386	[-42.02 ; 16.93]
Current deductible 1500	-0.0364	***	0.0136	[-0.063 ; -0.010]	-11.37		11.0013	[-32.93 ; 10.19]

[a] monthly compensation in Swiss Francs required for a CHF 1 increase in the annual deductible.

[b] monthly per capita income.

[c] use of hospital and/or ambulatory services during the past 6 months.

*** (**,*) significant at the 1 (5,10) percent level.

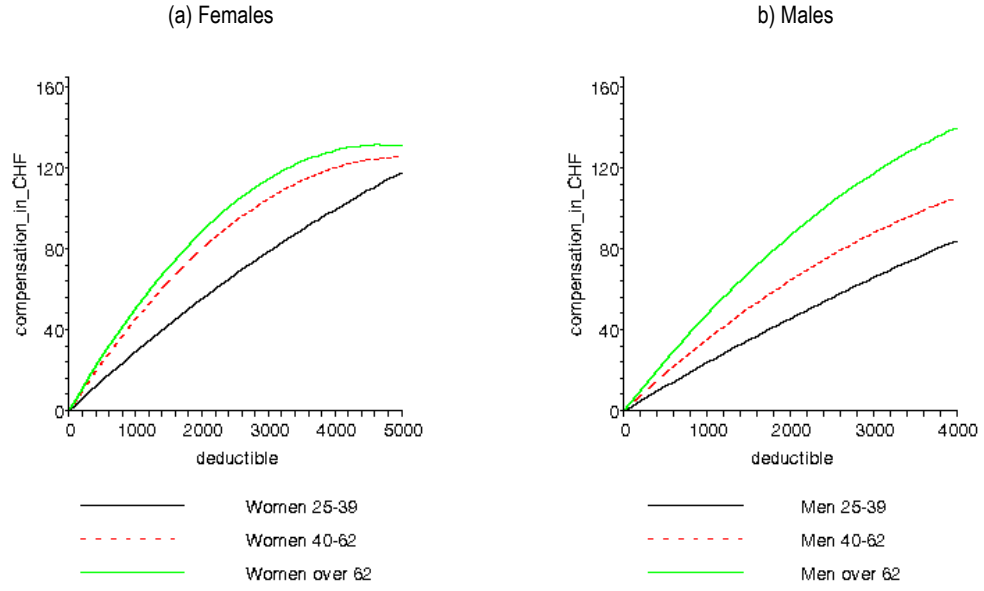
1 CHF=0.8 US$ at 2005 exchange rates.

individuals, men as well as women, demand lower compensations, and their disutility from going from CHF 400 to levels beyond about CHF 2,000 (one of the newly introduced levels in 2005) does not increase as fast as that of the older age groups. To change from the minimum level of CHF 230 to CHF 1,500 a 25 to 39-year-old person (male and female combined) has to be compensated with a premium reduction of CHF 38 (maximum exposure of CHF 1,270), the 40 to 62-year-olds with CHF 50, and the oldest with CHF 60. Again, the constant, now also speficic to socioeconomic characteristics, needs to be considered to control for willingness to deviate from the status quo at all. The compensation demanded for the young and the old can be computed relative to the reference group of the 40 to 62-year-old persons. To consider a change of insurance contract elderly demand as much as CHF 22

more monthly compensation than the mean individual of the reference group (CHF 57). The 25 to 39-year-old young are willing to change to an alternative contract if they are compensated with CHF 46, which is CHF 11 less than the reference group. Thus, the difference between them young and old adds up to less than CHF 33 or some 14 percent of average premium.

Figure 2

Demanded compensation for a higher annual deductible by age groups and gender, initial deductible CHF 230



The reductions asked for a deductible as high as CHF 2,500 are of particular interest. They were not available (but debated) in 2003 when the DCE was fielded but constitute the new maximum effective 2005. A person aged 25 to 39 with a minimum deductible of CHF 230 would have to receive CHF 63, a 40 to 62-year-old CHF 82, respectively CHF 96 for the group of the over 62–year-olds (additional maximum exposure of CHF 2,270). This result indicates that looking only at marginal WTP values distorts estimates of compensation demanded for high deductibles. For the newly introduced deductible levels, risk preferences may play an important role for the choice of a high-deductible plan. Since younger individuals have to be compensated less for higher cost-sharing, they are predicted to be over-represented among those who in fact opted for a deductible of CHF 2,500 in 2005 (5 percent, see Table 2) Still, predictions such as this one must be qualified by the fact that that the

control variables for health status and income are measured with considerable error.

5.4 Likelihood of choosing higher deductibles

Ideally, the results of DCE could be used to predict the holding of contracts with deductibles in excess of the legal minimum. However, respondents cannot be traced after the experiment. This leaves the possibility of explaining their choice of contract some time before the experiment, resulting in postdiction rather than prediction. The difference between the two is not very important, however, because most respondents will have the same contract one or two years after the time of the DCE.

Since DCE are about deviating from the status quo, it may be worthwile to first check whether respondents in fact have changed their health insurance in the past. In the course of 5 years (i.e. 1999 to 2003), 77 percent of the sample did not change their *insurer*, 20 percent changed once, and 2 percent changed more than once. Respondents also changed the *type of insurance.* They can choose between 'tradtional' coverage with free access to all general practitioners and specialists or a Managed-Care alternative, such as a Health Maintenance Organization (HMO) or a gatekeeping model. Additionaly, they have a choice between five different deductible levels. Overall, 66 percent have stayed with their previous insurance contract during the 5 years preceding the DCE. Among respondents younger than 40, this figure drops to 58 percent. Therefore, there seems to be some scope for postdiction.

In the DCE itself a total of 10,000 decisions could be made by the 1,000 individuals in the sample. 18 percent of these decisions were made in favor of the alternative, rather than the status quo contract. This figure, while low at the first sight, is around the expected percentage for a DCE of such a high degree of complexity, entailing considerable status quo bias among risk-averse and/or ambiguity-averse individuals (Kunreuther *et al.*, 1993; Telser, 2002, ch. 4.2; Telser *et al.*, 2004). Moreover, the relatively few changes that occur might be concentrated among few individuals only, which would limit the predictive power of the DCE. However, only some 40 percent of the respondents never chose the alternative insurance contract. Therefore, some 60 percent proved flexible in that they deviated from their status quo at least once.

This figure should not be taken as a predictor of actual choice behavior of the Swiss population. It is known that actual decision making is subject to considerable status quo bias that is especially marked for certain socioeconomic groups (Samuelson and Zeckhauser, 1988). Indeed, a binary probit model, with opting at least once for the alternative as the dependent variable, resulted in significantly

negative coefficients for age and being female but positive ones for education and the current premium paid, indicating increased flexibility (results not shown).

After these preliminary investigations, the actual choice of deductible prior to DCE is analyzed using an ordered probit model. Ordered probit models allow to take the ordinal nature of the different deductible levels into account without assuming them to be equally spaced. Here, level 1 stands for the minimum deductible of CHF 230 (as of 2003), and level 5 for the maximum of CHF 1,500.

The likelihood of choosing a certain deductible level is driven by various observable socioeconomic variables s_i and unobservable factors ε_i (reflecting e.g. risk aversion) that are normally distributed by assumption. Individuals choose the deductible level that maximizes their expected utility (Eu^*)

$$\begin{aligned} Eu^*[d] &= \beta s_i + \varepsilon_i, \text{ with} \\ d &= \begin{cases} 1 \text{ if } Eu^* \leq \mu_1 \\ 2 \text{ if } \mu_1 < Eu^* \leq \mu_2 \\ 3 \text{ if } \mu_2 < Eu^* \leq \mu_3 \\ 4 \text{ if } \mu_3 < Eu^* \leq \mu_4 \\ 5 \text{ if } Eu^* > \mu_4, \end{cases} \end{aligned} \tag{12}$$

where the $\{\mu_1, ..., \mu_4\}$ denote the expected utility thresholds that cause the individual to choose the next higher deductible.

The individual probabilities [$\Pr(\cdot)$] of choosing a certain deductible level can be expressed as follows,

$$\begin{aligned} \Pr(d &= 1) = \Phi[-\beta s_i] \\ \Pr(d &= 2) = \Phi[\mu_1 - \beta s_i] - \Phi[-\beta s_i] \\ \Pr(d &= 3) = \Phi[\mu_2 - \beta s_i] - \Phi[-\beta s_i] \\ \Pr(d &= 4) = \Phi[\mu_3 - \beta s_i] - \Phi[-\beta s_i] \\ \Pr(d &= 5) = 1 - \Phi[\mu_4 - \beta s_i], \end{aligned} \tag{13}$$

where $\Phi[\cdot]$ denotes a standardized normal *cdf*.

Estimation results pertaining to equation (13) are summarized in Table 6. The likelihood of having choosen a deductible in excess of the legal minimum of CHF 230 generally increases significantly with education, income, not making use of medical services in the past 6 months (*notreat*), and household size. It significantly decreases

with age and a higher current premium. This last-mentioned effect is puzzling at first sight but may be the consequence of parameters β not being allowed to vary across segments. Therefore, if the propensity to choose the next higher deductible, while positive on the whole, decreases strongly with premium above a certain threshold, the pertinent β_{prem} may turn negative. The standard ordered probit model, however, does not allow the sign of the marginal effects to change more than once across the various thresholds.[13]

Table 6

Results of the ordered probit model: actually chosen deductible

	exp. sign	coefficient[a)]		std. err.	z-value
age	-	-0.00912	***	0.00279	-3.27
male	+/-	0.15314	*	0.07858	1.87
french	+/-	0.12344	**	0.08577	2.20
income[b)]	+	0.00011	***	0.00003	4.16
education[c)]	+	0.07516	***	0.02434	2.98
premium	-	-0.00052	***	0.00017	-3.21
notreat[d)]	+	0.26838	***	0.07815	3.84
household size	+	0.12239	***	0.03685	3.13
alternatives_in_dce	+	0.12978	***	0.02122	6.11
thresholds					
μ_1 (CHF 400)		0.35221		0.24324	
μ_2 (CHF 600)		0.99542	***	0.24459	
μ_3 (CHF 1200)		1.46215	***	0.24595	
μ_4 (CHF 1500)		1.54629	***	0.24625	
Log-likelihood: -1142.72					
χ^2 (9) = 163.91, Prob > χ^2 = 0.000					
N = 865					

a) STATA computes marginal effects only for the probabilities of the thresholds.

b) monthly per capita income.

c) primary school=1, university=7.

d) in the past 6 months

***(**,*) significant at the 1 (5,10) percent level.

Evidence for a changing marginal effect is given in Table 7. They do change signs between the deductibles of CHF 400 and CHF 600. Insured with high deductibles

[13] For a more general formulation of ordered probit models see Boes and Winkelmann (2005).

are less likely to react to a high current premium by opting for a still higher deductible. This finding is supported the language effect, $french = 1$ is associated with an increased propensity to have a deductible of CHF 600 or higher. But it is in the French-speaking part of Switzerland, that premiums are higher due to higher costs of the (cantonal) health systems. Income also has the expected effect, with a marked likelihood of opting for high-deductible plans as per capita income of the household increases. This reflects the ambiguity of theoretical predictions (ZWEIFEL and EISEN, 2004, ch. 3.6.2). On the one hand, demand for safety should increase with income and wealth. On the other hand, absolute risk aversion may decrease with wealth, causing WTP for insurance coverage to decrease as well. It is this second effect that seems to dominate here, resulting in an increased propensity of higher-income respondents to have a contract with a high deductible. The marginal effects seem to be small at a first sight; however, CHF 1,000 more income per capita are predicted to reduce the likelihood of choosing the minimum deductible by 4 percentage points and to increase the likelihood of opting for the highest deductible level by 3 percentage points.

Table 7

Marginal probability effects of the deductible choice (for selected characteristics from the ordered probit model)

level of deductible (in CHF)	current premium		french		alternatives_in_dce		income [a)]	
d = 230	0.00020	***	-0.06819	**	-0.04777	***	-0.00004	***
d = 400	0.00001		-0.00528		-0.00239	*	-2.02e-06	*
d = 600	-0.00004	***	0.01356	**	0.01005	***	8.51e-06	***
d = 1200	-0.00001	**	0.00348	**	0.00247	***	2.09e-06	***
d = 1500	-0.00016	***	0.05643	**	0.03764	***	0.00003	***

[a)] monthly per capita income.

***(**,*) significant at the 1 (5,10) percent level.

The explanatory variable $alternatives\_in\_dce$ is of particular interest because it directly links the actual choices of respondents to the DCE.[14] Its highly significant positive sign indicates that those individuals who made more choices in favor of a proposed alternative are also more likely to opt for a higher deductible plan. For

[14] Since the decision in the DCE is most likely driven by the same personal characteristics of the individuals a problem of endogeneity might arise. However, due to the lack of adequate instruments an estimation of two-step model was not considered. Potential measurement errors might lead to a more severe bias.

example having opted for the alternative one additional time lets the probability of having a deductible of CHF 600 rather than a lower increase by 1 percentage point (see Table 6). This effect even increases with higher deductibles, reaching a maximum of 3.8 percentage points at CHF 1,500 (Table 7).

Conclusion 4 *The information contained in the choices made in the course of the market experiment contribute to the explanation of actual contract choice. The effect of preference heterogeneity, while important, cannot unambiguously be separated from those related to the initial risk type of individuals.*

The results suggest that Swiss health insurers may hope to attract e.g. young, male, and higher-income individuals by offering contracts with higher deductibles. Interpreting the results from DCE, however, indicates that launching policies differentiated in terms of cost sharing cannot be seen as a fail-safe instrument of risk selection. Other preferences, notably regarding access to care (as evidenced in Zweifel *et al.*, 2005), the comprehensiveness of benefits that are not captured in this DCE may play an important role in the actual choice of health insurance.

6 Conclusions

Asymmetric information plays an important role in any health insurance setting. The standard Rothschild-Stiglitz (1976) model suggests that offering differentiated contracts allows to separate high risks from low risks. However, in mandatory social health insurance schemes, insurers are prevented from solving this information problem. Neither the supply of differentiated contracts in order to overcome adverse selection nor the implementation of risk-rated premiums to equalize expected profit margins are usually permitted. However, product differentiation would allow to cater to the differentiated preferences of the insured not only with regard to differences in expected future HCE, but also due to differences in preferences for health insurance coverage, So far, there has been limited evidence concerning such heterogeneity supporting this claim (Conclusion 1).

In the case of Switzerland, some elements of choice, mainly with respect to cost sharing, have already been implemented since the introduction of the Health Insurance Law in 1996, with an increasing number of individuals opting for an alternative insurance contract. The present study seeks to analyze the choice behavior of different socioeconomic groups for various cost-sharing elements within Swiss social health insurance and to determine the extent to which insurers may use deductibles as an

instrument for risk selection. They certainly have an incentive to do so (Conclusion 2). Ever since the Rothschild-Stiglitz (1976) model, the prediction has been that individuals in a better health condition are more likely to opt for high-deductible plans.

In a discrete-choice experiment (DCE), 1,000 Swiss individuals of a representative sample were given the hypothetical choice of alternative insurance contracts that differed both in terms of deductibles and copayments and in benefits covered. Utility losses for accepting a higher deductible or copayment are expressed by willingness-to-pay (WTP) values. A simple model including contract attributes only proved highly significant, with a higher deductible or rate of copayment serving to lower the likelihood of choosing the alternative. However, at the margin disutility decreases at high values of deductible. An increase in the deductible or a higher rate of copayment of 20 rather than 10 percent causes respondents to shy away from the alternatives as well.

Theoretical considerations suggest that compensation required may be different between socioeconomic groups. In order to test for preference heterogeneity, a comprehensive model including seven socioeconomic characteristics was estimated. The premium reduction required for voluntarily accepting a higher degree of cost sharing is derived for various socioeconomic groups. Results show that compensation demanded does differ between age and income groups, pointing to heterogeneity in preferences (Conclusion 3). Contrary to expectations, no evidence was found with respect to health status. Whether an insured has received medical services during the past 6 months or not does not seem to influence the premium reduction demanded. These findings suggest that refined cream skimming through differentiated deductibles may not be possible.

An analysis of the data with respect to compensation demanded for higher deductibles is especially interesting in the light of newly introduced higher deductibles, effective 2005. Besides mitigating moral hazard effects, these additional cost-sharing schemes (CHF 2,000 and 2,500 deductibles) might allow insurers to improve on their risk selection efforts. This potential is even magnified by the fact that not every insurer is obliged to offer all possible deductible plans but can rather concentrate on a few, possibly resulting in separating contracts. Compensations demanded to take additional risk and change to an insurance contract with a high deductible are smaller for young and male individuals with amounts that are in a realistic range of the regulated premium reductions insurers are allowed to concede (Figure 2).

Results of an odered probit model for the choice of deductible indicate that

sociodemographic characteristics are determinants of the probability of choosing a certain deductible. However, these influences cannot be fully distinguished from those emanating from risk types (Conclusion 4). For example, higher-income individuals maybe higher risk-types (if demanding higher-quality treatment) or lower risk types (if excerting more preventive effort). In addition, low risks might become high risks over time and vice versa, making it difficult for insurers to precisely separate the various risk classes over an extended planning horizon. Finally, the possibility of the insured to change contract or insurer every year puts limits on payoffs from risk selection by insurers.

In sum, while this study does not provide clear evidence for cream skimming by Swiss health insurers the differences in WTP values derived from DCE point to risk or preference heterogeneity that faciliates cream skimming through offering innovative health plans. Even though only a minority will be attracted, there is potential for more differentiated contracts with higher deductibles since compensation offered in the guise of premium reductions can often be financed from cost savings. However, even if differentiated cost-sharing provisions may serve as an instrument for risk selection, they do serve heterogenous preferences and may thus well be efficiency-enhancing overall.

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A Appendix

Table A1

Random-effects probit estimation results for the DCE (simple model), only "switchers" [a)]

	exp. sign	coefficient		std. err.	z-value	marg. effect
deductible	-	-0.00043	***	0.00003	-14.83	-0.00043
deductible2	+/-	1.01e-08		7.73e-09	1.31	1.01e-08
copayment	-	-0.32582	***	0.04369	-7.46	-0.3258
altmed [b)]	+	0.40551	***	0.04266	9.51	0.40551
generics	-	-0.24807	***	0.04289	-5.78	-0.24807
innovation	-	-0.56158	***	0.04710	-11.92	-0.56158
premium	-	-0.01310	***	0.00060	-21.90	-0.01310
constant	0	-0.08108		0.05305	-1.53	

σ_υ = 0.04005***, ρ = 0.16843***

Log likelihood: -2616.4952

χ^2 (0) =125.61, Prob > χ^2 = 0.0000

n=5823

[a)] only those individuals who opted at least once for an alternative contract.

[b)] coding for alternative medicine (0=restriction; 1=expansion).

***(**,*) significant at the 1 (5, 10) percent level.

Table A2

Random-effects probit etsimation resualts for the DCE (comprehensive model)

	exp. sign	coefficient		std. err.	z-value
deductible	-	-0.00085	***	0.00012	-6.87
deductible2	+/-	1.12e-07	***	0.00000	3.53
copayment	-	-0.33744	*	0.18286	-1.85
altmed [a)]	+	0.28399		0.18338	1.55
generics	-	-0.07629		0.17453	-0.44
innovation	-	-0.00488		0.21739	-0.02
premium	-	-0.01508	***	0.00273	-5.53
a2539*deduct	+	6.75e-05		6.81e-05	0.99
a2539*deduct2	+/-	-1.15e-08		1.83e-08	-0.63
a2539*copay	+	-0.03366		0.09941	-0.34
a2539*altmed	+	0.12122		0.09702	1.25
a2539*generics	+	-0.01993		0.09753	-0.20
a2539*innovation		-0.23113	**	0.11262	-2.05
a2539*premium		-0.00322	**	0.00141	-2.29
a63+*deduct	+/-	0.00020	**	0.00010	1.93
a63+*deduct2	+/-	-1.44e-08		2.55e-08	-0.56
a63+*copay	-	0.26306	**	0.13380	1.97
a63+*altmed	+/-	-0.23687	*	0.13096	-1.81
a63+*generics	+/-	0.03280		0.13152	0.25
a63+*innovation	+/-	0.10810		0.14908	0.73
a63+*premium	-	0.00543	**	0.00183	2.97
male*deduct	+	0.00015	***	6.41e-05	2.34
male*deduct2	+/-	-2.88e-08	*	1.69e-08	-1.71
male*copay	+	0.08336		0.09139	0.91
male*altmed	-	-0.16156	*	0.08891	-1.82
male*generics	+	-0.08908		0.08939	-1.00
male*innovation	+	0.04951		0.10253	0.48
male*premium	+/-	0.00187		0.00128	1.46
french*deduct	+/-	2.89e-05		7.07e-05	0.41
french*deduct2	+/-	-1.38e-08		1.91e-08	-0.72
french*copay	+/-	0.13053		0.10135	1.29
french*altmed	+/-	-0.06019		0.09856	-0.61
french*generics	+/-	-0.07649		0.09841	-0.78
french*innovation	+/-	0.24711	**	0.11308	2.19
french*premium	+/-	0.00215		0.00141	1.53

…Table A2 continued

rich*deduct	+	0.00028	***	9.01e-05	3.07
rich*deduct2	+/-	-7.42e-08	***	2.65e-08	-2.79
rich*copay	+	-0.02325		0.09885	-0.24
rich*altmed	+	0.18744	*	0.10506	1.78
rich*generics	+	0.09924		0.10221	0.97
rich*innovation	+	0.21166	*	0.11320	1.87
rich*premium	+	0.00131		0.00148	0.88
poor*deduct	-	-0.00027	***	0.00011	-2.54
poor*deduct2	+/-	6.45e-08	**	2.76e-08	2.34
poor*copay	-	-0.18372		0.14008	-1.31
poor*altmed	-	0.00578		0.13762	0.04
poor*generics	-	-0.06435		0.13977	-0.46
poor*innovation	-	0.06104		0.16089	0.38
poor*premium	-	0.00319		0.00198	1.62
hh*deduct	-	4.55e-05		2.84e-05	1.60
hh*deduct2	+/-	-1.63e-08	**	7.51e-09	-2.16
hh*copay	-	-0.01334		0.04310	-0.31
hh*altmed	+	0.06510		0.04235	1.54
hh*generics	+/-	-0.00556		0.04229	-0.13
hh*innovation	-	-0.06685		0.04830	-1.38
hh*premium	-	-0.00035		0.00061	-0.58
notreat*deduct	+	8.46e-05		6.50e-05	1.30
notreat*deduct2	+/-	-7.73e-09		1.71e-08	-0.45
notreat*copay	+	0.29779	***	0.09277	3.21
notreat*altmed	+	0.16860	*	0.09023	1.87
notreat*generics	+	-0.09656		0.09067	-1.06
notreat*innovtion	+	0.11189		0.10367	1.08
notreat*premium	-	-0.00080		0.00130	-0.62
prem_pd*deduct	-	-3.12e-07		2.81e-07	-1.11
prem_pd *deduct2	-/+	1.39e-11		7.59e-11	0.18
prem_pd *copay	-	-0.00022		0.00039	-0.56
prem_pd *altmed	-	-0.00065	*	0.00039	-1.65
prem_pd *generics	-	-0.00046		0.00033	-1.37
prem_pd *innovovation	-	-0.00094	*	0.00052	-1.80
prem_pd *premium	-	-3.61e-06		6.29e-06	-0.57
a2539	0	0.13103		0.13352	0.98
a63+	0	-0.46353	***	0.17655	-2.63
male	0	-0.05830		0.13744	-0.42
french	0	-0.11770		0.15083	-0.78

Table A2 continued…

rich	0	-0.10998		0.13653	-0.81
poor	0	0.05966		0.20956	0.28
hhsize	0	0.00957		0.05781	0.17
notreatment	0	-0.18403		0.12322	-1.49
prem_pd	0	0.00068		0.00043	1.57
constant	0	-0.87395	***	0.23906	-3.66

$\sigma_{\upsilon} = 0.91029, \quad \rho = 0.45314$

Log likelihood: -2964.4978

$\chi^2(0) = 697.45$, Prob > $\chi^2 = 0.0000$

N = 9334

a) coding for alternative medicine (0=restriction; 1=expansion).

*** (**,*) significant at the 1 (5, 10) percent level

0: predicted to be insignificant in a random utility model

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