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Risk adjustment in health insurance and its long-term effectiveness☆

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ABSTRACT

This paper seeks to create new insights when judging the impact different risk adjustment schemes may have on the incentive to select risks. It distinguishes risk types with high and low profit potential and estimates long-run profits associated with risk selection in four scenarios (no risk adjustment, demographic only, including prior hospitalization, and including prior hospitalization and Pharmaceutical Cost Groups). The database covers 180,000 Swiss individuals over 8 years, 3 of which are used for model building and 5, to estimate insurers' profits due to risk selection in the four scenarios. While these profits prove to be very high without risk adjustment and still substantial with demographic risk adjustment, they become surprisingly low when the crude morbidity indicator 'prior hospitalization' is included in the formula. These results clearly indicate the need for health status-related risk adjustment in insurance markets with community rating, taking into account insurers' planning horizon.

1. Introduction

Enthoven's proposal for regulated competition between social health insurers (Enthoven, 1978) has been used as a blueprint for reform in several countries (see van de Ven et al., 2007). One example is Switzerland with its comprehensive mandatory coverage for all citizens, offered by some 80 competing nonprofit health insurers. The new law of 1994 calls for semiannual open enrollment and community-rated premiums within the same fund. Premium reductions for adults within a given fund are only possible for contractual differences such as a higher deductible. However, with every adult paying the same premium – within a given fund for the same type of contract – but expected health care expenditure (HCE) varying widely, strong incentives for risk selection are created in the absence of an adequate risk adjustment scheme. Although risk selection is illegal, its prevalence in Swiss social health insurance has been reported repeatedly (Beck and Zweifel, 1998; Beck et al., 2003). As van de Ven and Ellis (2000, Section 2.5) argue, risk selection produces no benefits to society (unless a dynamic view is adopted, where the threat of being classified as an unfavorable risk in the future helps to reduce moral hazard).

The objective of risk adjustment is to mitigate incentives for risk selection. To this end, insurers with a below-average share of female and elderly consumers have to contribute to the risk adjustment fund, while insurers with an above-average share receive a payment from the fund. So far, the different schemes have been judged mainly in terms of their ability to predict individual HCE 1 year ahead (Newhouse et al., 1989; van Barneveld et al., 2000; Holly et al., 2003).

This criterion is subject to at least two criticisms. First, risk selection is not costless to insurers. As pointed out by van Barneveld et al. (2000) as well as Zweifel and Breuer (2006), this means that they will invest in this activity only if expected profits exceed the cost. However, the regression criterion of minimizing squared prediction error with regard to HCE fails to take cost considerations into account. In our model, we address the problem of costly risk selection activities by restricting attention to selection profits and losses exceeding a given annual threshold. Second, Zweifel and Breuer argue that insurers who want to stay in business must have an eye on present values rather than one-period profits.

This paper, then, follows the lead of Shen and Ellis (2002) by estimating expected profits attainable from risk selection, given the information available to the insurer. It therefore only models the

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classification of risk types, neglecting the problem of how to attract or deter types. However, if profits are large enough, strategies to perform risk selection will most certainly be developed by crafty insurers.

However, unlike Shen and Ellis (2002), the present analysis assesses the impact of risk adjustment if insurers' planning horizon exceeds 1 year. In an attempt to reflect longer planning horizons (which agree with insurers' preference for long-run contracts and guaranteed renewability unless prevented by regulation (Pauly et al., 1998)), the period of observation for expected profits is extended to 5 years in the body of the paper. This permits to take into account the fact that a currently favorable risk may develop into an unfavorable one, switch to a competitor, or die. Conversely, an unfavorable risk may recover to become a favorable one in the future. In the theory of statistics, these effects are known as "regression towards the mean" (Welch, 1985; Beck, 2004). The empirical relevance of the regression towards the mean effect is assessed by varying the planning horizon from one to 5 years. This is possible thanks to a panel data set covering some 180,000 individuals over 8 years.

The reminder of this article is structured as follows. In Section 2, a model of the insurer's decision to select risks is formulated, which subsequently permits to calculate the financial reward from this activity. After a description of the risk adjustment schemes and the database in Section 3, the details of the empirical estimation are explained in Section 4. Results are presented in Section 5. They indicate that even a crude adjustment in the risk adjustment formula to take future HCE into account serves to neutralize incentives for risk selection to a substantial extent also over a longer planning horizon. The final Section 6 is devoted to a summary and conclusions.

2. Modeling risk selection

2.1. What risks to attract or deter?

The objective of this section is to model a health insurer's decision to attract or deter certain risk types. This decision is assumed to reflect insurers' expected profits or losses ($E[\pi_{i,j}]$) pertaining to costumer (i), taking into account the risk adjustment formula (j) applied by the regulator. To estimate this quantity, five elements must be considered; viz. (1) the expected fair community-rated premium ($E[P_{i,t,j}]$), (2) expected health care expenditure ($E[HCE_{i,t}]$), (3) the expected contribution to the risk adjustment scheme ($E[RA_{i,t,j}]$), a positive quantity for favorable risks, a negative one for unfavorable ones, its value depending on the risk adjustment formula (j),[1] and (4) the probability of an individual dying ($p^{death}_{i,t}$) or (5) switching to a competitor ($p^{switch}_{i,t}$). This all boils down to expression (1), with the interest rate r (set to 0.06 throughout this paper) used to discount future payments:

$$E[\pi_{i,j}] = \sum_{t=2000}^{2004} \left(E[P_{i,t,j}] - E[HCE_{i,t}] + E[RA_{i,t,j}]\right) \prod_{h=2000}^{t} (1 - p^{death}_{i,h}) \prod_{k=2001}^{t} (1 - p^{switch}_{i,k}) \frac{1}{(1+r)^{t-2000}} \quad (1)$$

Loadings for administrative expenses are neglected, because they are part of $E[P_{i,t,j}]$ and $E[HCE_{i,t}]$ but do not enter $E[RA_{i,t,j}]$. Note that HCE does not depend on the type of risk adjustment imposed, although insurers' incentives to combat moral hazard (by launching product innovations) may well be weakened by risk adjustment (Zweifel, 2007). The assumed planning horizon comprises the years 2000 (defined as "current") to 2004. Insurers' actual planning horizons might be even longer; however, data availability dictates one of no more than 5 years. This should be sufficient to at least approximate expected long-term profits. Following the approach proposed by van Barneveld et al. (2000), only "sufficiently large" profits or losses are assumed to cause risk selection activities. Profits in principle are "sufficiently large" if returns to risk selection exceed its total cost, which not only comprises the expenses for product development, marketing, and actual administration of the risk portfolio but also the loss of reputation if found out by the media or the regulator. Clearly, information to estimate this quantity is not publicly accessible. Therefore, it is simply assumed that expected profits from risk selection must exceed CHF 1000 (=$ 800 at 2006 exchange rates) per annum and individual in present value to trigger selection activities. In a sensitivity analysis, results changed surprisingly little when the threshold was lowered to CHF 400 and increased to CHF 1200 p.a. The impact of this ad hoc assumption is therefore limited.

Table 1
Assumed risk selection strategies, 1 CHF ≈ 0.8 $.

Risk type	Characterization	Strategy
A	Expected profit >1000 CHF p.a.	Attract
B	Expected profit ≤1000 CHF p.a.	Passive
C	Expected loss ≤1000 CHF p.a.	Passive
D	Expected loss >1000 CHF p.a.	Deter

According to Table 1, all customers are divided into four mutually exclusive subsets. Group A contains all individuals with expected profits in excess of CHF 1000 p.a., while B has those with expected profits up to CHF 1000 p.a. Conversely, C contains all individuals with expected losses up to CHF 1000 p.a. and D those with losses beyond CHF 1000 p.a.

Therefore, A is the set of risks the insurer seeks to attract, D contains the risks it wants to deter, while B and C are the risks that do not call for any risk selection effort. It is important to note that risk selection does not describe a "young-and-healthy-people-only" strategy under all circumstances. As shown in Section 5.2, risk adjustment can turn elderly and even chronically ill individuals into favorable risks.

2.2. Profits due to risk selection

In order to assess the effectiveness of risk adjustment, the insurer's profits are calculated under the assumption that it had successfully applied the selection strategy described in Table 1. The ex-post or realized profits generated by individual i and associated with risk adjustment scheme j are specified as follows:

$$\pi_{i,j} = \sum_{t=2000}^{2004} \left(P_{i,t,j} - HCE_{i,t} + RA_{i,t,j}\right) \frac{1}{(1+r)^{t-2000}} \frac{1}{\tau_t}$$

$$\text{with } \tau_t = \frac{\sum_i HCE_{i,t} / \sum_i m_{i,t}}{\sum_i HCE_{i,2000} / \sum_i m_{i,2000}} \quad (2)$$

[1] All formulas are constructed in a way to guarantee that the sum of contributions to risk adjustment paid by low risks is exactly balanced out by the sum of subsidies paid out for high risks.