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Pareto-improving Risk Selection in Social Health Insurance

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I. INTRODUCTION

Social health insurance has two main justifications. One, widely accepted by economists, is the possibility of market failure. The other is equity, calling for redistribution in favor of high risks. Usually, this is interpreted as a requirement to have identical contributions from low and high risks. However, this condition creates incentives for competing health insurers to eschew high risks while attracting low risks (Newhouse, 1996). To avert market failure while securing redistribution, most governments impose mandatory membership in a single pool comprising risks of all types. Such a monopolistic scheme has the advantage of providing coverage at low cost due to the absence of a loading for acquisition expenses (Mitchell and Zeldes, 1995). However, it also has its disadvantages. First, not being subject to the pressure of competition, it does not guarantee the efficient use of resources (in the sense of least-cost production of insurance). Second, heterogeneous preferences of consumers regarding the extent and structure of insurance coverage are not likely to be respected [for empirical evidence suggesting heterogeneity of preferences with regard to health insurance see e.g. Zweifel and Leukert-Becker (2014)]. Lacking the exit option available in a competitive insurance market, consumers have to fall back on the (political) voice option, which is less effective by far for expressing preferences (Hirschman, 1970).

In an attempt to create incentives for the efficient provision of social health insurance, several

countries (in particular Germany, The Netherlands, and Switzerland) have introduced competition to this branch of social insurance (Van de Ven et al., 2007). However, as long as contributions do not reflect differences in risk and hence expected cost, competing social health insurers have an incentive to attract consumers with low expected future healthcare expenditure (HCE) while eschewing those with high expected HCE. This 'risk skimming' is generally viewed as undesirable, calling for a risk adjustment (RA) scheme to complement premium regulation (Van de Ven and Ellis, 2000; Glazer and McGuire, 2014). However, payments into the RA scheme ultimately fall on the low risks in the guise of increased premiums, while high risks benefit from RA. Therefore, RA needs to neutralize risk-selection incentives both on the part of insurers and on the part of consumers (Zweifel, 2013a).

On the other hand, total absence of risk selection amounts to a situation where the insured have neither an incentive nor the possibility to express their preferences regarding type and amount of coverage. Therefore, this paper addresses the question of whether risk selection in social health insurance could be efficiency-enhancing, resulting in Pareto improvement. It will be shown that both under perfect and imperfect RA, risk selection can make some risks better off without worsening the situation of the others. The condition is that they pay for the coverage of their choice according to a contribution function that keeps the amount of transfer in favor of the high risks constant. When it comes to reducing coverage, the terms of this contribution function are less favorable than those of the pooling contract imposed by social health insurance; in return, the low risks are released from purchasing the concomitant amount of coverage, which is excessive for them.

This paper starts with the case of perfect RA (Section I). After a short introduction to RA (Section II), it will be shown that risk selection can be Pareto-improving over the pooling contract usually imposed by social health insurance. These results then are extended to the case of imperfect risk RA (Section III). Section 4 concludes.

II. SOCIAL HEALTH INSURANCE UNDER PERFECT RISK ADJUSTMENT

The benchmark model is one of a competitive insurance market without any redistribution. Individuals

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are characterized by a von Neumann-Morgenstern utility function $U(Y)$ with $U'(Y) > 0$ and $U''(Y) < 0$, indicating risk aversion with regard to wealth Y . High risks (index H) have a higher probability of loss $\pi_H > \pi_L$, i.e. than low risks (index L).

Contrary to popular assumptions, in this paper insurers are viewed as capable of distinguishing between the two types (otherwise, there would not be too much point in engaging in risk-selection activities and in attempting to counteract them through RA). The many ways insurers can acquire information for categorizing risks are described e.g. in Crocker and Snow (2014). They also show the potential of Pareto improvement by risk classification, without however taking into account RA, which has been prominent in health insurance.

With the amount of loss (L) the same for the two types for simplicity, expected utility of the low risks is given by

$$EU_L = \pi_L U(Y - P_L - L + q_L L) + (1 - \pi_L) U(Y - P_L), \quad (1)$$

and for the high risks,

$$EU_H = \pi_H U(Y - P_H - L + q_H L) + (1 - \pi_H) U(Y - P_H). \quad (2)$$

Initial wealth Y is exogenous. In the no-loss state, individuals pay premiums (P_L, P_H); in the loss state, they receive payment equal to the shares (q_L, q_H) of the loss.

Let there be two competitive insurance plans, one insuring the high, the other the low risks. They must satisfy the break-even condition,

$$P_i = \phi \pi_i q_i L, \quad i = L, H. \quad (3)$$

Premiums cover not only expected cost but also contain a loading factor ($\phi > 1$) for administrative expense that is assumed to be the same for both risks [see Zweifel (2013b) for the case where the loading factor for high risks exceeds that for the low ones and hence the potential of partial coverage imposed by mandatory social insurance to result in Pareto improvement]. Substituting (3) into (1), differentiating (1) w.r.t. q_L and rearranging terms gives an implicit condition for the optimal rate of coverage (if positive),

$$\frac{U'_{Loss}}{U'_{No Loss}} = \frac{(1 - i)}{1 - \phi \pi_i} > 1, \quad i = L, H; \quad (4)$$

[see e.g. Doherty (1976)]. Since the marginal utility of wealth must be higher in the loss than in the no-loss state, condition (4) implies less than complete coverage ($q_i < 1$). A private health insurance market would therefore lead to an equilibrium with low risks buying partial insurance coverage, thus attaining expected utility EU_L^o . High risks, on the other hand, would (given

the single crossing property assumption) prefer a higher degree of (still partial) insurance coverage, yielding expected utility EU_H^o , with $EU_H^o < EU_L^o$.

Although this equilibrium would be sustainable and Pareto-efficient, it may not be acceptable in social health insurance for distributional reasons. Let, acceptable' mean having high and low risks pay the same premium \bar{P} for the same coverage \bar{q} , in keeping with the solidarity philosophy of social health insurance. If g denotes the proportion of low risks in the insured population, this uniform premium would have to be set at

$$\begin{aligned} \bar{P} &= g \cdot \phi \bar{q} \pi_L L + (1 - g) \cdot \phi \bar{q} \pi_H L \\ &= [g \pi_L + (1 - g) \pi_H] \phi \bar{q} L = \phi \bar{\pi} \bar{q} L, \end{aligned} \quad (5)$$

with $\bar{\pi} = g \pi_L + (1 - g) \pi_H$. Therefore, $\bar{\pi}$ denotes the average probability of loss in the entire population. Throughout, it is assumed for simplicity that the two risk types call for the same loading factor ϕ , regardless of the way insurance is organized. Obviously, $P_H \geq \bar{P} \geq P_L$. However, this implies $\bar{P} < \phi \bar{q} \pi_H L$, causing the plan enrolling high risks to become insolvent (given lack of observability of risk type). In order to prevent this from happening, a RA scheme is needed that compensates a plan for enrolling high risks and sanctions a plan for enrolling low risks (Van de Ven and Ellis, 2000; Glazer and McGuire, 2014). By implementing (perfect) RA, a social insurance scheme can permit competition between regulated health insurers, as e.g. in The Netherlands.

In this section, RA is assumed to be perfect.¹ In a perfect RA scheme, the high-risk insurer is fully compensated for its excess expenses caused by its unfavorable insurance population. It therefore receives a transfer given by

$$T_p = (1 - g)(\phi \bar{q} \pi_H L - \phi \bar{q} \bar{\pi} L), \quad (6)$$

with T_p denoting the RA transfer in case of a perfect RA scheme. This implies that the after-transfer premium paid by the high risks after transfer is given by

$$\begin{aligned} P_H^t &= P_H - \frac{T_p}{1 - g} \\ &= \phi \bar{q} \pi_H L - \frac{(1 - g)(\phi \bar{q} \pi_H L - \phi \bar{q} \bar{\pi} L)}{(1 - g)} \\ &= \phi \bar{q} \bar{\pi} L = \bar{P} \end{aligned} \quad (7)$$

¹ For the case of imperfect risk adjustment, see Section III.

By analogy, using (3) and (6), the premium to be paid by the low risks including the transfer can be shown to equal \bar{P} ,

$$P_L^t = P_L \frac{T_p}{g} = \bar{P}. \quad (8)$$

With perfect RA, every insurer can calculate its premium as though its members constituted a sample having exactly the same risk characteristics as the population at large. This also means that the expected losses incurred by the high-risk plan amount to the expected gains accruing to the low-risk plan, resulting in budget balance of the RA scheme,

$$g \cdot (\bar{P} - \phi \bar{q} \pi_L L) = (1 - g) (\phi \bar{q} \pi_H L - \bar{P}) = T_p \quad (9)$$

in view of (6). Solving the first equation of (9) for yields condition (5), which proves that perfect RA implies budget balance.

In terms of figure 1 below, any pooling of low and high risks calls for a premium that is represented by a straight line lying between AB_L and AB_H . Let AD_p represent the pool that comprises the population at large. With perfect RA, every plan can offer insurance coverage at that price as long as all members get identical coverage \bar{q} , which has to be prescribed by the government. Government-mandated coverage must be ample enough to make sure that high risks enjoy a higher expected utility in social insurance (EU_H^S) than they could achieve in a competitive insurance market without any redistribution (EU_H^0). Formally, this condition reads,

$$\begin{aligned} EU_H^S &= \pi_H U(Y - \bar{P} - L + \bar{q}L) \\ &\quad + (1 - \pi_H) U(Y - \bar{P}) \geq \\ EU_H^0 &= \max_{q_H} EU_H = \pi_H U(Y - P_H - L + q_H L) \\ &\quad + (1 - \pi_H) U(Y - P_H). \end{aligned} \quad (10)$$

The existence of a uniform contract (\bar{P}, \bar{q}) that satisfies condition (10) can be demonstrated as follows. For $\bar{q} = q_H$, one has $EU_H^S > EU_H^0$ because by assumption, the high risks opted for some coverage at a premium P_H that was higher than \bar{P} . Conversely, for $\bar{q} = 0$, their expected utility must be less than EU_H^0 . Therefore, there exists a $0 < \bar{q} \leq q_H$ which permits the high risks to attain an expected utility level EU_H^S at least as high as EU_H^0 .

However, the government might want to fix a minimum level of insurance coverage not only in the interest of high risks but of all individuals in an attempt to prevent them from relying on public welfare in case of loss, acting as free riders. To avoid free riding, low risks

too may be obliged to buy minimum coverage in this case, which causes the scope of Pareto improvement through risk selection to be reduced (see Section 2.3). In practice, compulsory coverage in social health insurance is likely to be politically determined, as analyzed e.g. in a median voter model (Breyer, 1995). For present purposes, it can be set arbitrarily, subject only to the restriction (10).

The effect of perfect RA in combination with social health insurance can be shown as follows. Let government-mandated coverage be AF in figure 1, with rate of coverage \bar{q} . Given budget balance for the RA scheme, a movement away from A along AF reflects a higher amount paid into and subsidies received from the RA scheme. This can be seen from differentiating (6) w.r. to \bar{q} , yielding

$$\frac{\partial T_p}{\partial \bar{q}} = (1 - g) (\phi \pi_H L - \phi \pi_L L) > 0. \quad (11)$$

Compared to the equilibrium that prevails in the insurance market without any governmental regulation, at point F high risks enjoy a higher expected utility, as shown in the text below eq. (10). However, low risks may suffer a loss compared to the situation without any government regulation. They would have selected point C on the insurance line ABL (recall that premiums contain a proportional loading) given the assumption that insurers are able to categorize risks.

Since according to eq. (8) the transfer has to be financed by the low risks, eq. (11) implies that an increase of \bar{q} at the uniform premium imposed by social insurance serves to reduce the expected utility of low risks. Note that this statement needs to be qualified in the presence of supplementary private health insurance (Dahlby, 1981). In that case, the low risks have to trade off their higher average contribution against the relaxation of the rationing constraint imposed on them by the separating contracts written by private insurers. Dahlby's analysis has been extended to include moral hazard effects (Boadway et al., 2006), insurance regulation (Neudeck and Podczek, 1996), and combined with taxation (Crocker and Snow, 1985). However, private supplementary insurance is neglected for simplicity and because the possibility of Pareto improvement through risk selection within social health insurance is emphasized here.

In sum, low risks gain if permitted to curtail coverage imposed by social health insurance, *ceteris paribus*. However, such a reduction would fail to be Pareto-improving since it would amount to a reduction of the transfers received by the high risks, causing them to suffer a welfare loss. Pareto improvement requires that low risks pay a unit price for their insurance coverage according to a specific contribution function, to be derived in the next section.

The contribution function for low risks

In social health insurance, the subsidies for the high risks are financed by the low risks, who are forced to be in the common insurance pool. Since mandated coverage \bar{q} is fixed in the interest of the high rather than the low risks [see condition (10)], low risks presumably gain if permitted to choose their own degree of coverage q_L . The condition for this to be true will be derived in Section III; the objective at this point is merely to derive the contribution function for low risks, specifying the conditions on which low risks can deviate from \bar{q} without affecting the size of the transfer T (and hence the welfare of high risks). Intuitively, low risks might be permitted to buy less insurance coverage but at a higher price per unit (or more insurance coverage at a lower price per unit, respectively).

For formally obtaining the contribution function, the budget balance condition (9) for the RA scheme is modified to read,

$$g(P_L - \phi q_L \pi_L L) = (1 - g)(\phi \bar{q} \pi_H L - \phi \bar{q} \bar{\pi} L). \quad (12)$$

This reflects the fact that low risks may now opt for their own rate of coverage q_L at premium P_L . From eq. (12), the contribution function P_L' of a low risk can be written as,

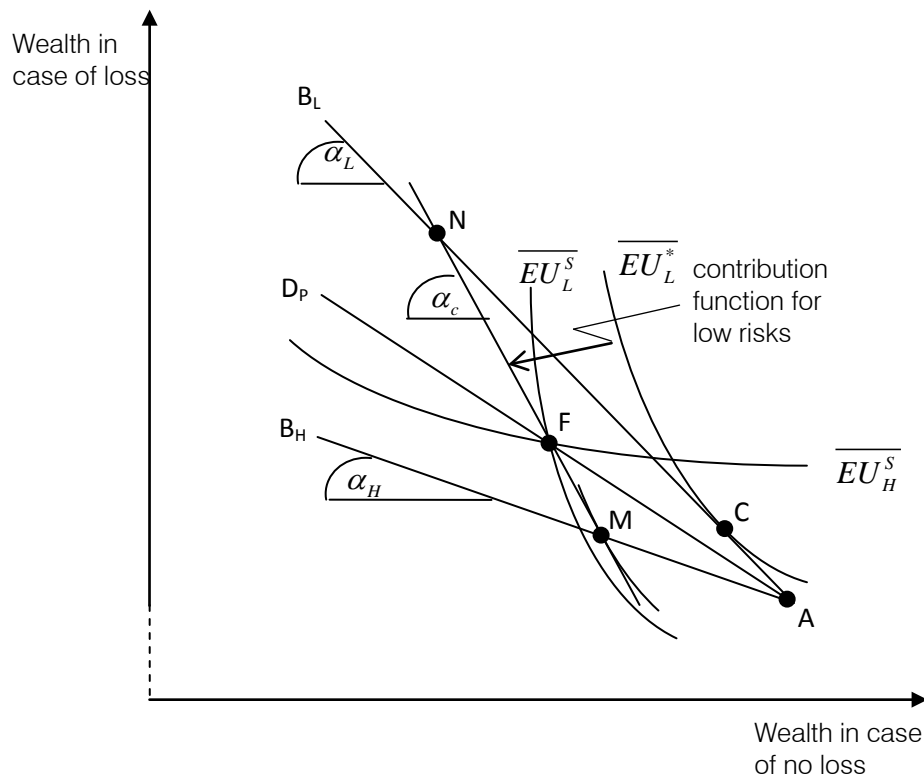


Figure 1 : The contribution function for low risks

$$P'_L = \frac{1-g}{g}(\phi \bar{q} \pi_H L - \phi \bar{q} \pi_L L) + \phi q_L \pi_L L$$

$$= \frac{T_p}{g} + \phi q_L \pi_L L, \quad (13)$$

with T_p defined in eq. (6). The first term after the second equality is the transfer going to the high risks per low-risk individual. The second term shows the sum needed to cover the expected loss of the low risks themselves.

The contribution function is illustrated in figure 1. The indifference curves \overline{EU}_H^S and \overline{EU}_L^S indicate expected utilities of the high and low risks, respectively, associated with government-mandated coverage AF.

The contribution function for low risks may be described as follows. One of its elements is represented by point N in figure 1 on the straight line AB_L , showing a situation where the low risks would be obliged to buy health insurance coverage in excess of \bar{q} if they were to benefit from a unit price of coverage below \bar{P} . In return, at N they would not contribute to the RA scheme. Thus, N is an extreme point used for construction of the contribution function. Conversely, point M on NFM indicates the optimum of a low risk (with indifference curve just outlined). Thus, low risks can choose to buy less coverage than \bar{q} provided they pay a higher price per unit of insurance coverage. Points M, F, and N represent the contribution function as given by eq. (13) which is associated with different amounts of coverage bought by low risks; they lie on a straight line because eq. (13) shows P'_L to be linear in q_L .

In figure 1, the rates at which wealth can be transferred from the no-loss state to the loss state are represented by the angles α_L (for the low risks) and α_H (for the high risks), respectively. The corresponding rate pertaining to the contribution function is indicated by α_c . It is given by

$$\alpha_c = \frac{q_L L - P'_L}{P'_L}. \quad (14)$$

This angle amounts to the benefit paid net of the premium, relative to the premium (transfers included). Substituting (13) into (14) gives α_c for the low risks as a function of their insurance coverage, with transfers to the high risks T_p held constant²,

$$\alpha_c = \frac{q_L L - \phi q_L \pi_L L - \frac{T_p}{g}}{\phi q_L \pi_L L + \frac{T_p}{g}}. \quad (15)$$

Differentiation of eq. (15) with respect to q_L yields the decrease of α_c that low risks have to accept when they want to reduce their rate of coverage in social health insurance,

$$\frac{\partial \alpha_c}{\partial q_L} = \frac{g L T_p}{(g \phi q_L \pi_L L + T_p)^2} > 0, \text{ i.e.}$$

$$\frac{\partial (1/\alpha_c)}{\partial q_L} < 0. \quad (16)$$

Therefore, low risks face more favorable insurance terms when they buy more coverage -- albeit at a decreasing rate, with the decrease the more marked, the higher the share of favorable risks g and the higher the loading factor ϕ , with the effects of the two reinforcing each other [see the denominator of eq. (16)]. Conversely, the price per unit insurance coverage $(1/\alpha_c)$ paid by the low risks unambiguously increases in response to a decrease in q_L , and progressively so with increasing values of g and ϕ , reflecting the need to ensure constancy of the transfer in favor of high risks.

Figure 2 illustrates the dependence of $(1/\alpha_c)$ on q_L and \bar{q} .³ First, a reduction in the degree of coverage opted for by the low risks q_L corresponds to a movement from left to right on the q_L -axis. The contribution function exhibits a progressively increasing slope, indicating that low risks who reduce their coverage are confronted with increasingly unfavorable terms. Since membership in social health insurance is not voluntary, $\alpha_c < 1$ may occur, resulting in a marginal price of (decreased) coverage $(1/\alpha_c) > 1$. Second, $(1/\alpha_c)$ also increases progressively with \bar{q} , the degree of coverage mandated by social health insurance \bar{q} , reflecting the ever higher amount of cross-subsidization in favor of the high risks that needs to be financed through the contribution function.

² Clearly $\alpha_c > 1$ under normal circumstances because otherwise the insured would have to give up a unit of his income in terms of premiums with probability of one while receiving less than a unit in the event of loss, which occurs with probability less than one (but see the remark at the end of this subsection). Thus they could do better by simply saving. However, the straight line AD_p in figure 1 is drawn with a flat slope to make the figure more easily readable.

³ In figure 2, the values for the other variables are as follows: $L = 40$, $\phi = 1.1$, $g = 0.5$, $\pi_H = 0.5$, and $\pi_L = 0.25$. For a meaningful interpretation of eqs. (9) to (16) and figure 2, note that of course \bar{P} must not exceed the expected loss (including the loading factor) of the high risks, because otherwise the high risks would subsidize the low risks. Conversely, for a given \bar{P} , it does not make sense to let \bar{q} become too small.

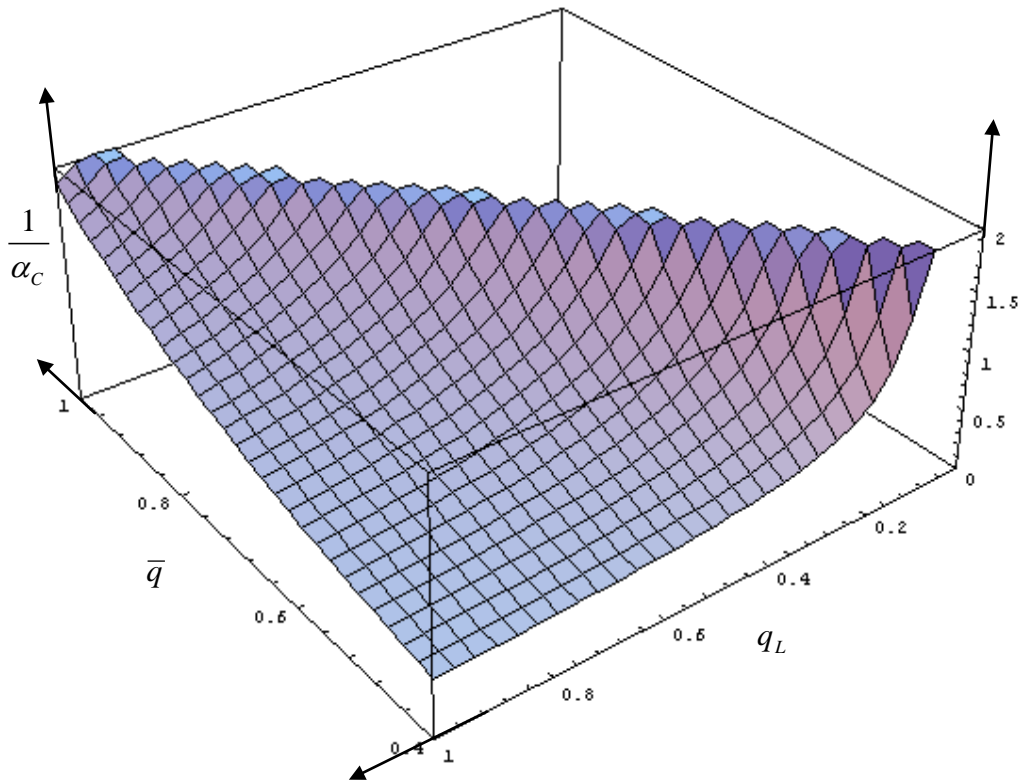


Figure 2 : Price per unit of coverage $1/\alpha_c$ as a function of degrees of coverage q_L and \bar{q} , respectively

Conclusion 1: Under perfect risk adjustment, a contribution function for the low risks can be determined such that they can freely choose their degree of coverage, provided their amount of transfer to the high risks remains constant. For a reduction of coverage, this function calls for a progressively increasing price per unit coverage.

III. PARETO IMPROVEMENT IN SOCIAL HEALTH INSURANCE

a) Perfect Risk Adjustment

In this section, a RA scheme is introduced. In a first step, it is assumed to be perfect for a benchmark, although this can be shown to be an impossibility (see Section III below). Pareto improvement requires that when permitted to move away from the combination \bar{P}, \bar{q} initially prescribed by social insurance, the low risks enjoy an increase in expected utility over the pooling contract without causing that of the high risks to decrease,

$$\max_{q_L} EU_L^t > EU_L^s[\bar{P}, \bar{q}] \quad (17)$$

$$\text{s.t. } EU_H^s[\bar{P}, \bar{q}] = \text{constant, with}$$

$$EU_L^t = \pi_L U(Y - P_L^t - L + q_L L) + (1 - \pi_L) U(Y - P_L^t),$$

EU_L^s and EU_H^s denoting expected utilities associated

with mandated coverage (see point F of Figure 1), and P_L^t given by eq. (13). Thus, the constraint is satisfied if the high risks continue to be able to attain (\bar{P}, \bar{q}) . This means that the low risks pay the contribution P_L^t . Using eq. (13), the problem (17) can thus be rewritten as

$$\begin{aligned} \max EU_L^t &> EU_L^s[\bar{P}, \bar{q}] \\ \text{s.t. } P_L^t &= \frac{T_p}{g} + \phi q_L \pi_L L. \end{aligned} \quad (18)$$

Next, one needs to show that by choosing $q_L < \bar{q}$, low risks indeed attain higher expected utility. First, note that the optimality condition (4) causes that the contribution function (13) does not modify the marginal cost of coverage. Indeed, differentiating (13) with respect to q_L yields

$$\frac{\partial P_L^t}{\partial q_L} = \phi \pi_L L, \quad (19)$$

which corresponds to differentiating eq. (3) for $i = L$. Condition (4) thus needs to be satisfied again for $i = L$. Given that (\bar{P}, \bar{q}) entails partial coverage, condition (4) is satisfied at that point. However, if low risks move away from (\bar{P}, \bar{q}) , the reason must be that they can attain

higher expected utility. With the constraint in (18) satisfied, this proves Pareto improvement.

The geometry is shown in figure 3, which repeats elements (points A and F as well as straight lines AB_L and AD_P and the indifference curves) of figure 1. The contribution function GBL' runs parallel to AB_L , in keeping with eq. (19). Movement away from A along AG reflects the reduction in wealth suffered by the low risks as they have to bear an increasing transfer in favor of the high risks. This transfer equals T_p/g [see eq. (13)]; since it is independent of insurance coverage, it amounts to a tax that diminishes wealth irrespective of the occurrence of loss.

Competing social health insurers can offer coverage along GBL' without harming high risks as long as RA is perfect. The low risk depicted in figure 3 opts for decreased coverage (optimum at point E, indifference curve just outlined), which is the normal case. Depending on preferences, a low risk might also choose to do without any insurance coverage and just pay the social health insurance tax (optimum at point G). Finally, if initially prescribed coverage were as low as GD, even the low risk depicted would opt for an extension of coverage (optimum at point E). All of these adjustments result in Pareto improvement.

However, to make sure that low risks pay the transfers in full irrespective of their choice of insurance plan, RA must have a particular property. Indeed, transfer payment needs to be fixed at (\bar{P}, \bar{q}) before the low risks get a chance to reduce their health insurance coverage. Otherwise, the appropriate contribution level cannot be determined. In terms of figure 3, both risk types must be at point F initially.

Conclusion 2: Under perfect risk adjustment and the concomitant contribution function for low risks, risk selection results in Pareto improvement over the pooling contract usually imposed by social health insurance.



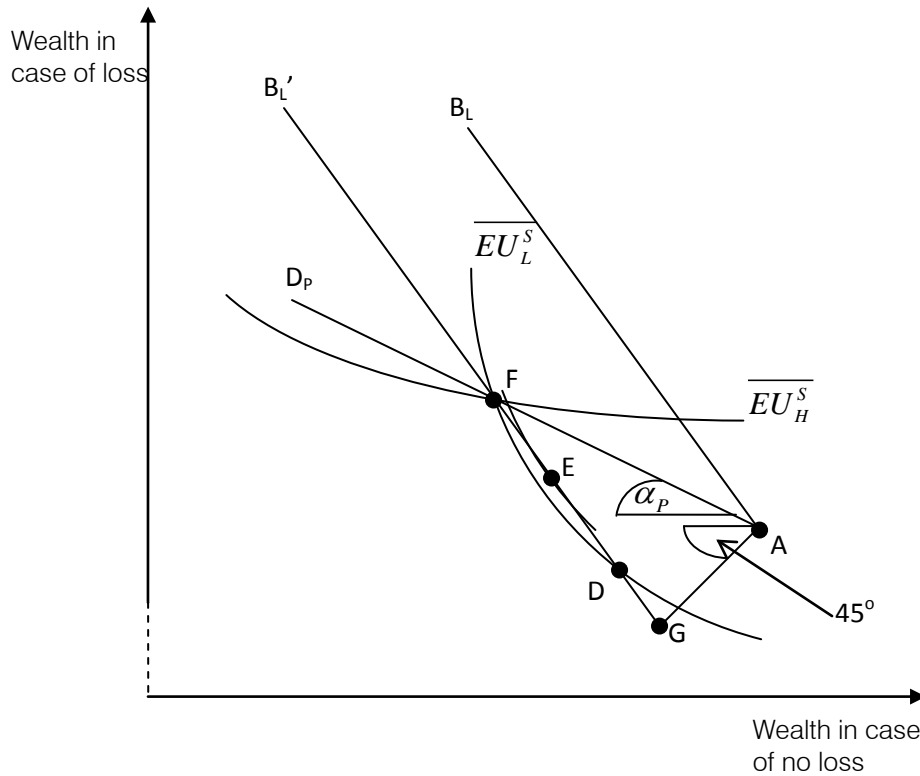


Figure 3 : Pareto-improving choice of insurance by low risks

b) Imperfect risk adjustment

In this section, the assumption of perfect risk adjustment (RA) is dropped. Imperfections of RA arise due to the fact that differences in loss probabilities do not constitute public information. A RA scheme in health insurance must rely on publicly observable indicators such as age and sex. However, observable indicators explain only a small share of the variance of HCE (for details regarding imperfections in RA schemes, see Van Vliet, 2000). Moreover, for reasons cited at the end of Section III, these imperfections are certain to prevail in the future, motivating an extension of the analysis to include imperfect RA. The aim of this section is therefore to show that Pareto improvement through risk selection is still possible, even though the amount of transfer from low to high risks is reduced.

With imperfect RA, the transfer does not fully compensate the insurer enrolling the high risks for its excess expenses anymore. Therefore, eq. (6) is modified to read,

$$T_{imp} = (1-r)(1-g)\phi\bar{q}\pi_H L - \phi\bar{q}\pi L, \quad (20)$$

with $0 \leq r \leq 1$ indicating the degree of imperfection of RA. With $T_{imp} < T_p$, equalities (7) and (8) indicate that the low-risk insurer can now charge a lower premium than the high-risk insurer for the prescribed rate of coverage \bar{q} . However, this does not imply that it becomes insolvent. Recall that by assumption, insurers

are able to recognize risk types, enabling them to engage in risk selection. The common endowment point (\bar{P}, \bar{q}) simply has to be replaced by two, (P_L, \bar{q}) and (P_H, \bar{q}) , respectively. Both P_L and P_H satisfy the zero expected profit condition.

In analogy to (17) and (18), a Pareto improvement relative to these endowment points obtains if

$$\max_{q_L} EU_L^t > EU_L^S[\bar{P}, \bar{q}] \quad (21)$$

$$\text{s.t. } EU_H^S[P_H, \bar{q}] = \text{constant},$$

or equivalently,

$$\max_{q_L} EU_L^t > EU_L^S[\bar{P}, \bar{q}]$$

$$\text{s.t. } P_L^t = \frac{T_{imp}}{g} + \phi q_L \pi_L L. \quad (22)$$

Evidently, all that needs to be done is to replace the transfer T_p as defined in eq. (6) by T_{imp} as defined in eq. (20). Since T_{imp} differs from T_p only by a factor $(1-r)$, the contribution function for low risks retains the properties laid down in eqs. (14) to (16).

Figure 4 illustrates. Insurers do not write the uniform pooling contract AD_p anymore; rather, the low-

risk insurer offers coverage along $AB_{L,1}$ (which is not quite as favorable as $AB_{L,0}$ prior to RA but more favorable than AD_P), while the high-risk insurer offers coverage along $AB_{H,1}$ (which is more favorable than $AB_{H,0}$ for high risks but less favorable than AD_P). Evidently, the greater the angle between $AB_{L,1}$ and $AB_{H,1}$, the less perfect is the RA scheme.

Endowment points are given by K for the low and E for the high risks such that their relative distances from the security line are equal, reflecting the uniform rate of coverage \bar{q} ($AK/AY = AE/AZ = AF/AX$).

Clearly, compared to a separating equilibrium without any governmental intervention, high risks still profit even from imperfect RA; without any RA, they would opt for D (recall that policies always contain a loading). However, compared to the situation with perfect RA, where they could reach F, high risks lose. Low risks in turn are better off with imperfect RA than with a perfect one since their transfer to the high risks is lower ($T_{imp} < T_p$). Consumers of all risk types would prefer K, of course; yet with insurers able to recognize risk types, K is unavailable to the high risks.

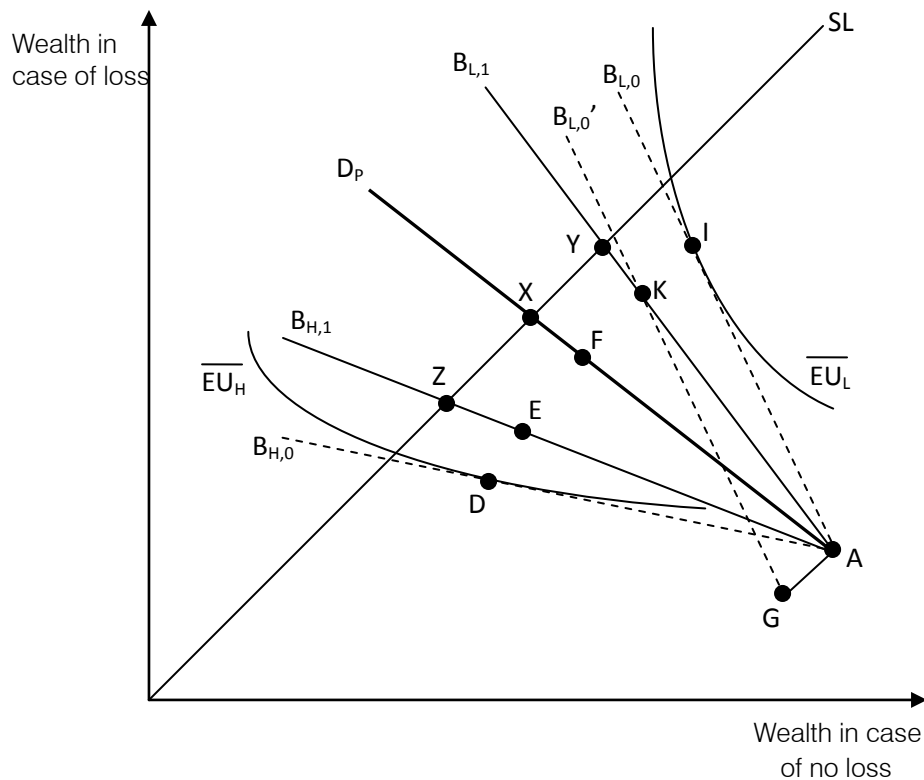


Figure 4 : Imperfect pooling of risks through mandatory social insurance

The crucial point, however, is that Pareto improvement continues to be possible in the presence of imperfect RA, at least relative to the modified endowment points E and K associated with it. Indeed, (20) determines the modified contribution function $GB_{L,0}$ along which the transfer T_{imp} to the high risks remains

the same while permitting the low risks to reach a point that is higher-valued than K . Using the same line of argument as the one leading to Conclusion 2, one has

Conclusion 3: Pareto improvement over the pooling contract is also possible if there initially is an arbitrary degree of imperfection in risk adjustment; the

contribution function for the low risks needs to be modified accordingly.

Critics might argue that the relevant benchmark is one of perfect RA, which is undermined by letting the low risks choose their degree of coverage, resulting in a transition from perfect to imperfect RA. However, this argument amounts to a Nirwana approach. As already shown by Zweifel and Breuer (2006), RA cannot be perfect as soon as health insurers are expected to act as prudent purchasers of healthcare services. In their negotiations with providers, their rate of time preference must remain private information for them to be successful; however, time preference determines the present value of costs and benefits associated with risk selection efforts (which constitute an investment). A second reason, emphasized by Zweifel (2013a), is that RA has one instrument only (payments into and out of the RA scheme), while it needs to neutralize the incentives both of low risks (who prefer an insurer offering them a low amount of RA surcharge) and the high risks (who seek out an insurer offering a great deal of cross-subsidization). In view of Tinbergen's (1952) rule stating that the number of instruments must be at least be equal the number of targets to be attained, this is a rather profound reason. Therefore, considering a transition from perfect to imperfect RA is a moot point.

IV. SUMMARY AND CONCLUSIONS

With continuing premium regulation in the guise of community rating, the introduction of competition between insurers in social health insurance has caused insurers to step up their risk selection efforts. Since contributions fail to reflect true risk, the incentive to "exploit unpriced risk heterogeneity and break pooling arrangements" (Newhouse, 1996) is strong, leading to undesired outcomes in social health insurance.

However, absent competition, different types of problems have surfaced particularly in health insurance. First, there is inefficiency in providing insurance services, and second, the amount of coverage does not conform to consumer preferences. In particular, low risks are predicted to prefer a lower degree of coverage than mandated as part of a pooling contract imposed by uniform social health insurance. As a precondition for Pareto improvement, this contribution develops a contribution function for the low risks that keeps the amount of transfer in favor of the high risks constant. Reductions in coverage require an increasing price per unit coverage (Conclusion 1). Under perfect RA, risk selection is then shown to result in Pareto improvement over the pooling contract with uniform coverage (Conclusion 2). This finding proves to be robust, as a contribution function for the low risks can be shown to exist that preserves Pareto improvement also in the case of imperfect RA (Conclusion 3).

This analysis can be extended in several ways. First, the case for Pareto improvement can be strengthened by noting that the partial coverage opted for by the low risks implies cost sharing, which serves to rein in moral hazard effects. After controlling for risk selection effects in Swiss social health insurance, Trottman et al. (2011) find substantial reductions in HCE among individuals having policies with deductibles in excess of the legal minimum. This evidence is consistent with the view that consumers who opt for partial coverage use this option as a commitment device designed to control their moral hazard. In this way, they contribute to the overall efficiency of health insurance and hence Pareto improvement.

Second, private health insurance coverage is frequently available to supplement social insurance (Dahlby, 1981). Assuming that private insurers need to impose separating contracts to counteract adverse selection, mandatory partial social insurance can be Pareto-improving because it gives high risks a better deal, while the low risks have to trade off a higher average premium against the relaxation of their rationing constraint. However, the present analysis need not be modified as long as deviations from prescribed coverage occur according to the contribution function for low risks designed to ensure Pareto improvement.

Third, social health insurance often pools not only high and low risks but earners of high and low incomes, as e.g. in Germany. With a suitably modified contribution function for the risks that seek to adjust their coverage, Pareto improvement is again possible. Finally, new forms of RA such as mandatory risk pooling for the highest risks as suggested by Van Barneveld et al. (1988) may reduce the degree of RA imperfection. However, as shown here, risk selection combined with a suitable contribution function can be Pareto-improving for an arbitrary degree of imperfection.

In conclusion, risk selection has its place in social health insurance. It permits a closer matching of contracts available and consumer preferences, which is a major benefit of competition. For ensuring Pareto improvement, all it takes is a suitably defined contribution function for the low risks designed to keep the amount of transfer in favor of the high risks constant. However, Pareto improvement which entails unchanged welfare for some but an increase in welfare for others presupposes an envy-free society, a condition unlikely to be satisfied everywhere [see e.g. Fehr and Schmidt (1999) for a theoretical analysis].

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