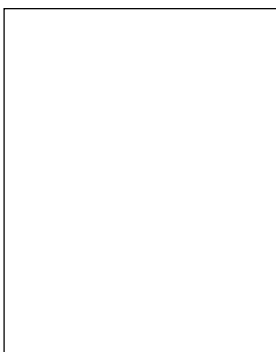


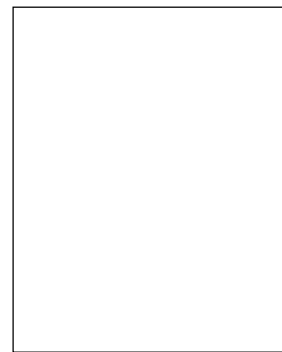
A mixed health insurance market under a high-cost protection scheme*

by Professor **Franz Haslinger**, Department of Economics, University of Hannover and Dr. **Per-Johan Horgby**, Department of Economics, Göteborg University



Franz Haslinger

In this paper, we argue for a mixed health insurance system where the state insures high medical costs, leaving low medical costs to the private health insurance market. An important finding indicates that a public coverage for high medical costs interacts with private coverage for low costs as the high-cost protection reduces the variance of an average health risk in the private market.



Per-Johan Horgby

I. Introduction

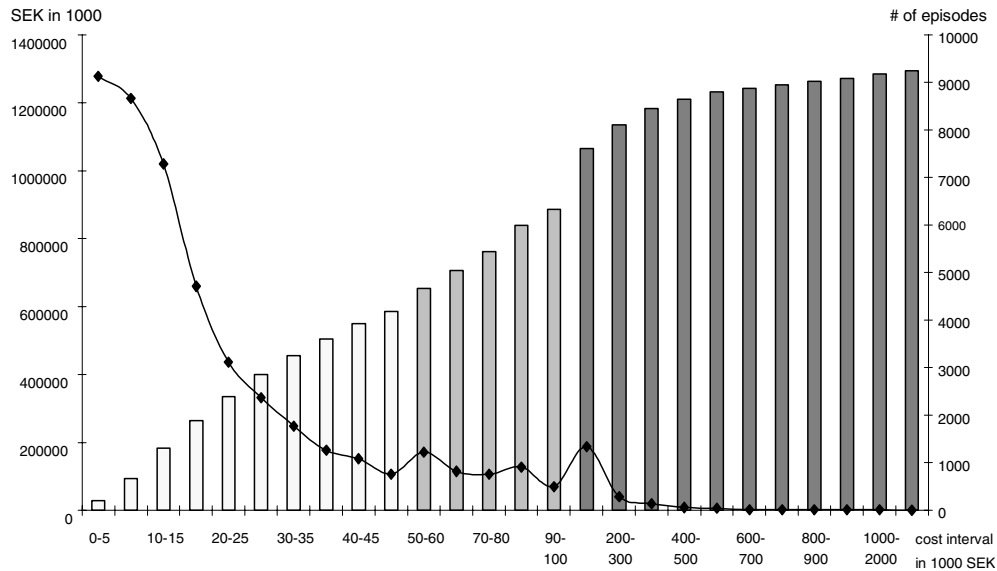
The consumption of medical care differs among people. While some people are in great need of advanced and costly medical care services, others enjoy the fruits of a healthy life with very limited health care need. This pattern is visible in the distribution of medical care costs as well. Data on stationary medical care spending from Sahlgrenska sjukhuset in

Göteborg discloses that about 30 per cent of patients account for over 75 per cent of total spending.¹ Hence, most of the stationary patients are treated with cheap medical technologies and a minority causes the bulk of medical care costs at Sahlgrenska. See the distribution of stationary medical costs in Figure 1. Along the horizontal axis in Figure 1 the medical costs are presented in intervals (recognize that the intervals are of different length). And the vertical axis shows both medical care costs (left side in Figure 1) and the number of episodes at Sahlgrenska (right side). Further, the straight line in Figure 1 shows the distribution of medical care costs in each interval, and the bars the cumulative distribution.

The skewed medical cost distribution in

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Figure 1. Stationary medical cost distribution at Sahlgrenska sjukhuset, Göteborg, Sweden, January - November 1995.²



Source: Sahlgrenska sjukhuset.

Figure 1 illuminates the heterogeneity and variability of health risks. In addition, it shows the possible limits of private insurance solutions. In a distribution with a large tail, the mean of the distribution may not be fixed and variances may be infinite. In this case, no insurance company would be willing to insure for very expensive treatments. Hence, the skewness signifies the level or the threshold of insurability within private insurance can operate.

In this paper we focus on the possibilities for the state to intervene into the health insurance market for the very costly risks only. If the state insures for high medical costs, the rest of the risk distribution begins to take on the shape of a normal distribution. The segmentation of the overall loss distribution into a low- and a high-cost ranges transforms the originally heterogeneous risks to more homogeneous ones. This in turn reduces adverse selection effects. Additionally, public coverage for severe illness interacts with private

coverage for less severe illness, as high-cost protection reduces the variance of average health expenditure in the private market. Due to this design the market for health insurance would be characterized as a mixed system with a governmental high-cost insurer and many private low-cost insurers.

II. High-cost insurance protection

To reduce the effects of adverse selection, many authors advocate compulsory health insurance.³ Although there is no unanimity about the effects of the compulsory insurance, authors generally agree that compulsory protection should not be complete, but only partial.⁴ Partial insurance is a key result for a Pareto-improvement. Despite this clear message, no one gives any serious details about what “partial” means in insurance terms. Often authors refer to a notion of “need”: only medical treatments which belong to the cate-

gory of basic human needs shall be mandatory.⁵ “Luxury” medical services can be privately insured. But what is luxury and what is basic need? Schulenburg gives a hint as to what is meant normally is:

“...a basic compulsory insurance, i.e. a restriction of the social health insurance to the necessary and this is from a social-political standpoint imperative”.⁶

If the terminology “necessary” by Schulenburg is to have any meaning at all, there has to be a way to define groups of treatments which are considered as “necessary” and to determine the amount of care for a typical illness. Thus, one has to categorize different kinds of treatments and to rank them according to a system of need. Even though it is possible to agree on a definition of necessary health care - see, for example, the normative statements of WHO (1946, 1985) - this will not be sufficient to implement an efficient allocation mechanism. The problem is that there are no objective standards about how much care a typical case requires, especially in an environment in which medical technology changes so rapidly. Therefore, health care supply cannot in general be allocated according to the notion of need.⁷ It is almost certain that we end up in a system that takes care of everything, due to the influence of the “socio-political imperative” in health insurance.⁸

From a theoretical standpoint, the economic objective is clear: mandatory partial insurance can be Pareto superior, but no one seems to be capable of formulating what “partial” really means.

We argue that a compulsory health insurance should only cover the most expensive health care services, acting as a high-cost protection. This would imply a mixed market with a public insurer for high-cost policies and a private market for low-cost policies. Private health insurance is thus supplemented by a limited social insurance scheme which only provides coverage for the most expensive

health services. We apply the so called Arrow-Lind theorem which means that the state should evaluate public projects by their certainty equivalent.⁹ As the state has an easier access to capital markets and can share the risk among all its citizens, it has superior diversification possibilities over private health insurers. A direct consequence of this is that the need of a safety loading on premium pricing for high-cost policies is negligible. In this respect, the state has a comparative advantage vis-à-vis the private sector regarding safety and is therefore a superior risk bearer for severe risks.

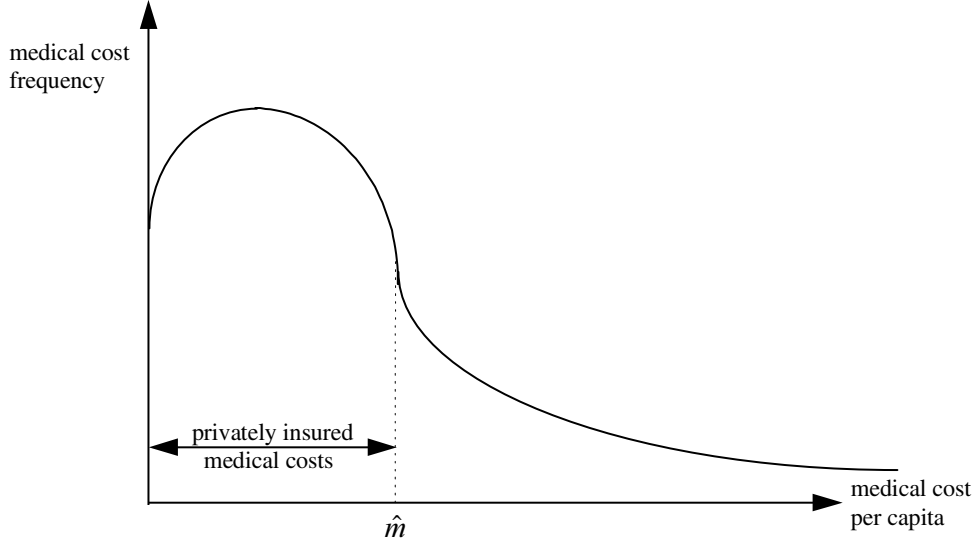
III. A Mixed Health Insurance System

With a compulsory high-cost insurance scheme, the most severe risks are removed from the market and are covered by the state. It implies that the private market only insures for minor and frequent health services. Obviously, this mixed health insurance system has two advantages.

First, with a high-cost scheme the tail of the loss distribution is cut off. This cut off transforms the original very skewed loss distribution into a more normal distributed probability function. If the number of risks in the insurance pool is large enough, the law of large numbers can work effectively. Under this setting, average medical costs exhibit a negligible variance and could be regarded as almost constant. It follows that private insurers now need only small safety loading and, hence, the insurance premiums would become practically actuarially fair.

Second, since severe risks are removed from the market, the high-cost protection “transforms” the original heterogeneous risk distribution into a more homogeneous risk distribution. This reduces adverse selection effects where individuals with low risk expo-

Figure 2. Split medical cost distribution



sure have to pay for individuals with a higher risk profile.

To illustrate the functioning of a mixed market under a high-cost protection, assume that the medical cost distribution goes from health state $j = 0$, which indicates healthiness and requires zero medical costs, to $j = m$, which is the maximum medical care expenditure that can be insured. With a governmental high-cost protection scheme the state takes over financial responsibility above the ceiling \hat{m} . The limit for \hat{m} is set on the inflexion point where the distribution starts to flatten out. In Figure 1, it is shown how individuals bear the entire responsibility for their health care financing up to \hat{m} . Beyond \hat{m} , the government insures severe and costly treatments. See Figure 2.

The medical cost distribution X_i^j is thus divided in two parts: one private part ($j = 0, 1, \dots, \hat{m}$) and one high-cost part covered by public insurance ($j = \hat{m} + 1, \dots, m$). Now we can define the following identity:

$$E(X_i^j) \equiv E(X_i^{pr}) + E(X_i^{pub}), \quad (1)$$

where i signifies an individual in the society, ($i = 1, \dots, N$), and

$$E(X_i^{pr}) = \sum_{j=0}^{\hat{m}} \pi_i^j x^j \quad (2)$$

denotes the expected private health care costs (the private part) and

$$E(X_i^{pub}) = \sum_{j=\hat{m}+1}^m \pi_i^j x^j \quad (3)$$

denotes the expected public health care costs (the public part).¹⁰ The public part (the high-cost protection) is financed by a proportional income tax (z) under the restriction that the budget be balanced. We can define the following relationship between compulsory insurance costs and taxation income:

$$\sum_{j=\hat{m}+1}^m x_i^j \equiv y_i z N, \quad (4)$$

where y_i is the individual income without insurance, z denotes the proportional income

tax and N is the total number of individuals. The identity in (4) says that the sum of the medical costs above the ceiling must equal the total revenue from the income tax. The compulsory premium will then be $y_i z$ and the net income $y_i(1 - z)$ for each individual. As the expected health care costs differ among individuals, the taxation smoothes out the differences in expected income between risk groups.

Each individual is responsible for financing the part up to \hat{m} . Either he buys health insurance on the private market or pays the medical bills on an out-of-pocket basis as they come. This is a normal insurance decision and depends on the individual's attitude towards risk. With the largest losses covered by the state, the standard deviation as well as the insurable amount for an average medical cost that the market faces will decrease. As the variability is diminished - but not the numbers of policy holders - the required safety loading for private contracts is also reduced.¹¹ An important feature of a high-cost protection covered by the state is that the policies issued on the private market do not require as much safety loading per policy to be as safe as before the transition. To be distinct, we believe that safety loading in the mixed system with many competitive low-cost insurers approaches zero, i.e. $\lambda > \lambda^{hcp} > 0$, where λ denotes the safety loading in a completely free market and λ^{hcp} is the safety loading for a low-cost policy in the mixed system.¹²

IV. Summary

In a recent article, the Secretary General of the Geneva Association, Professor Orio Giarini, claims that the notion of insurability will be increasingly adopted as a dividing line between the private and the public activities; everything private should find a private solution, and everything uninsurable should be

taken into consideration as a public entity.¹³ Along these lines this paper gives a justification for a reorganization of health insurance.

In the light of a very skew medical cost distribution, we argued that the public health insurance scheme should be limited to expensive and uninsurable risks. In our proposal, health states in the interval $[\hat{m} + 1, m]$ are to be covered by compulsory insurance. The cost of doing so is the expected value of medical expenditures in this interval at full coverage rate. The expenses for private insurance are reduced by this amount so that the taxes used to finance the public insurance is offset by a reduction in the private insurance premium. In addition, we claim that the high-cost protection is welfare-improving. More specifically, compulsory high-cost insurance creates two advantages: (i) it reduces adverse selection effects by smoothing out the expected loss distributions and (ii) it increases the allocative efficiency by reducing the variability of an insurance unit on the private market for less severe illness.

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- from the United States show that about 10 per cent of recipients account for over 70 per cent of total spending; see further Riley et al. (1986). Hence, this skewed allocation of medical costs signifies that the greatest part of the population consumes limited medical services or none at all.
- ² The abscissa, which shows the cost interval in 1000 Swedish Crones, is broken in three parts: from zero to 50 000 the intervals are divided in units of 5000 SEK; from 50 000 to 100 000 the intervals are measured in units of 10 000 SEK; and from 100 000 and onwards the intervals are calibrated in units of 100 000 SEK each.
- ³ See, for example, Dahlby (1981), Eckstein et al (1985), Eisen (1986), Strassl (1988).
- ⁴ Concerning adverse selection Zweifel and Breyer (1996) argue: "If individuals cannot be discriminated according to their individual health risks, at most a separating equilibrium may exist on a private insurance market provided that the share of 'good risks' is not too large. In this case a compulsory insurance *covering just a part of the costs* and charging uniform contribution leads to a Pareto-improvement" (Zweifel and Breyer 1996, p. 155, our italics).
- ⁵ For a definition and an examination of the term *need* in health care, see Liss (1993).
- ⁶ Original quotation: "...einer Grundsicherung, d.h. einer Beschränkung der sozialen Krankenversicherung auf das Notwendige und als sozialpolitisch unabweisbare", Schulenburg (1994, p. 441)
- ⁷ Compare the discussion by Hayek (1960, pp. 297-300) on the objectivity criterion in health care.
- ⁸ In the initial model by the Dekker Commission in the Netherlands the compulsory insurance package should cover some 85 % of health care spending. After some political consultation the compulsory part has increased to about 95 %.

Notes

¹ The skewed distribution of stationary medical costs in Göteborg is not a singular phenomenon. Data on health care spending

⁹ See further Arrow-Lind (1970).

¹⁰The variable π_i^j is interpreted as the probability of individual i to consume an amount equal to $j = m$, where m is bound on the interval $[0, m]$. $E(X_i^j)$ is an expression for the expected medical costs for individual i during a period, where E denotes the expectation operator.

¹¹According to the law of large numbers, the sample mean will be arbitrarily close to the

distributional mean as the number of policy holders approaches infinity. This does not mean, however, that an insurer can operate without any safety loading. A buffer fund is always required. But the buffer fund *per policy*, i.e. the safety loading considered here, can be arbitrarily close to zero (Cummins 1991, pp. 262-274).

¹²*hcp* = high-cost protection.

¹³See Giarini (1997, pp. 13-14).