MATHIAS KIFMANN

Insuring Premium Risk in Competitive Health Insurance Markets

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Mohr Siebeck

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To
Claudia, Marianne and Alfons

Preface

Germany is an interesting country for health economists. A public and a private health insurance system exist side by side. The different ways in which these two systems provide insurance against *premium risk*, i.e. increases in premiums when the state of health deteriorates, has been at the center of my research in the previous years. In the public scheme, the uniform premium creates incentives for insurers to select low risks and deter high risks. It is a priori uncertain whether choice between insurance plans in the public system would be to the benefit of everyone. In the private system, individuals are in a lock-in situation because they face financial losses upon switching to another insurer. There have been complaints that insurers exploit this situation. A central issue is therefore how lock-in in the private system can be avoided. In the last years, I have analyzed these questions. The results are summarized in this book which was accepted in February 2001 as a doctoral dissertation by the Department of Economics at the University of Konstanz.

In the course of writing this book, I have received support from colleagues, friends and family. First of all, I would like to thank Professor Friedrich Breyer, the first referee of the dissertation. He provided me with generous advice at the various stages of my work. He was always available when a question appeared on my mind. I have benefited greatly from our discussions. A special thanks goes to Professor Oliver Fabel, the second referee of the dissertation, for his constructive comments and suggestions.

I would also like to thank my colleagues at the Department of Economics at the University of Konstanz. In particular, I am indebted to Laszlo Goerke and Martin Kolmar for many constructive discussions and for comments on earlier versions of this study. The student research assistants, especially Martin Heineck and Normann Lorenz, provided valuable support. Furthermore, I want to express thanks to Stefan Felder from Otto-von-Guericke-Universität in Magdeburg, Alastair Fischer from St. George's Hospital Medical School in London and Achim Wambach from Ludwig-Maximilians-Universität in Munich for their constructive comments on my work.

I have had the opportunity to present parts of this study at the annual meetings of the German Economic Association in Mainz (1999) and Berlin (2000). At the Second International Conference of the International Health Economics Association in Rotterdam (1999), the paper "Community Rating in Health Insurance and Different Benefit Packages" was awarded the first prize of the student competition which was a great encouragement for me to follow this line of research. This paper now forms the basis of Chapter 4 on community rating.

Finally, I am especially grateful to my family, in particular to my wife, Claudia San Cristóbal-Kifmann, for her constant support while I was writing this dissertation, and to my parents Alfons and Marianne Kifmann. Without their encouragement during my years as an undergraduate student, this book could not have been written.

Konstanz, November 2001 Mathias Kifmann

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Abbreviations

CR	community rating
GR	guaranteed renewable
ICPI	incentive-compatible premium insurance
PI	premium insurance
RS	Rothschild-Stiglitz
W	Wilson
□	*quod erat demonstrandum*

Introduction

In private health insurance markets, premiums are risk-based and depend on the health status of an individual. Since the health status can change over time, individuals face the risk of uncertain premiums. This is the *premium risk problem*. It was first discussed by Kenneth Arrow in 1963. In his famous article "Uncertainty and the Welfare Economics of Medical Care" he points out the advantage of equalized premiums when the health status of individuals is uncertain:

> "If a plan guarantees to everybody a premium that corresponds to total experience but not to experience as it might be segregated by smaller subgroups, everybody is, in effect, insured against a change in his basic state of health which would lead to a reclassification." (p. 964)

Arrow doubts that such a plan can be sustained because "insurance plans could arise which charged lower premiums to preferred risks and draw them off, leaving the plan which does not discriminate among risks with only an adverse selection of them." In this case individuals must expect that changes in their health status lead to adaptation of their premiums and there would be no insurance of premium risk.

The premium risk problem can be viewed as an efficiency as well as an equity problem depending on whether the initial situation is factual or hypothetical. If risk-averse individuals face the actual decision of insuring uncertain premiums, then the insurance of premium risk is an efficiency problem. The system which insures premium risk at the lowest cost will be preferred. However, if different health states are already known, we can regard the equity problem of redistributing between individuals with different congenital health status as a premium risk problem behind a veil of ignorance following Harsanyi (1955) and Rawls (1971). A rational and risk-averse individual would choose to insure premium risk in this hypothetical situation. Since the situation behind the veil of ignorance can be seen as fair, the wish to insure premium risk can be used to justify redistribution from low to high risk individuals.

Whether individuals actually face uncertain premiums depends on the institutional structure of the health insurance market. In particular, premiums need to be risk-based. Evidence from the United States, the only OECD country where a majority of the population is covered by private health insurance, supports the hypothesis that premium risk can be a major problem.[1] In the individual and small group market, long-term health insurance is not available at a guaranteed price.[2] Consumers are exposed to premium risk after their short-term contracts end or when their long-term contracts are renewed.

Premium risk is not an issue in countries without private health insurance markets as pointed out by Drèze (1994). In the United Kingdom, for example, most health care is provided through the tax-financed National Health Service. Individuals obtain services free of charge and contributions do not vary with their health status. However, individuals have limited freedom of choice. They can only choose between different general practitioners. For individuals, there is no competition at a higher level. Such competition can create incentives for cost-effectiveness and for the design of benefits according to the preferences of individuals. For these reasons, private health insurance markets are desirable and it is worth looking for ways to insure premium risk which preserve a competitive health insurance market.

In the literature on private health insurance, the premium risk problem has so far received comparatively little attention. In particular, information asymmetries have been at the center of research.[3] On the one hand, *moral hazard* has been analyzed in detail. This problem arises if insurers cannot observe the health-related behavior or the state of health of the insured. Fully-insured individuals may therefore take too few precautionary health measures and, once ill, exaggerate their state of illness to obtain better treatment. Incentives can be improved by having the insured share part of the bill. Thus, moral hazard creates a trade-off between risk-spreading and providing appropriate incentives for patients. An optimal indemnity contract therefore includes coinsurance.[4] Another

[1] See Chollet and Lewis (1997).

[2] See Diamond (1992) and Dowd and Feldman (1992).

[3] See Besley and Gouveia (1994), Cutler and Zeckhauser (2000) and Zweifel and Breyer (1997).

[4] See Blomqvist (1997) for a formal illustration.

form of avoiding moral hazard is *managed care*, which gives the insurer more control on providers.

On the other hand, *adverse selection* has been a prominent topic in the literature. It arises if insurers cannot observe the risk type of individuals before signing a contract. In its most extreme form when insurers can only set premium rates and cannot control the total quantity of insurance an individual buys, an equilibrium can exist in which essentially no health insurance policies are sold.[5] In health insurance, however, insurers can usually control the total quantity of insurance purchased by an individual. Therefore, screening by premium-quantity contracts is possible. Rothschild and Stiglitz (1976) and Wilson (1977) have analyzed the resulting market equilibrium. They found that a separating equilibrium in which high risks buy full insurance while low risks only obtain partial insurance does not need to be second-best efficient. Crocker and Snow (1985) have furthermore shown that both risk types can be made better off by taxing partial insurance and subsidizing full insurance. The same result can be achieved by requiring that individuals purchase a minimum amount of coverage.[6]

The premium risk problem is different from these market imperfections arising from information asymmetries. It exists because contracts in health insurance are likely to be incomplete. In particular, it is difficult to specify the risk type in contracts and to design long-term contracts which protect the consumer from opportunistic behavior by the health insurer. For these reasons, the two pure market solutions proposed to solve the premium risk problem are unlikely to work perfectly. The first concept has been proposed by Pauly, Kunreuther and Hirth (1995) who argue that premium risk can be insured by *guaranteed renewable* health insurance contracts. These constracts guarantee constant premiums but require a life-time commitment to an insurer. Therefore, individuals want to make sure that the insurer provides the promised services and does not exploit their commitment. However, health insurance contracts which specify these services over long periods of time are hard to design. The second pure market solution has been advanced by Cochrane (1995). According to his

[5] This case was first analyzed by Akerlof (1970). See Mas-Colell, Whinston and Green (1995), chapter 13 for an exposition.

[6] See Zweifel and Breyer (1997) for an illustration.

proposal, premium risk can be insured by *premium insurance*, a separate insurance which pays out an indemnity if the risk type changes. Individuals could then buy short-term health insurance without being exposed to premium risk. Premium insurance, however, faces similar problems as long-term health insurance. The contract needs to specify each possible risk type, which is hardly possible. Again, individuals may not want to buy such contracts because they fear to be classified in the lowest possible category by their premium insurer.

Since an unregulated health insurance market cannot be expected to perfectly insure premium risk, government intervention may be able to yield a better outcome. In particular, *community rating* is an alternative. It requires that insurers set a uniform premium for all applicants. Community rating thus avoids premium differentiation by risk type while preserving competition among health insurers. However, insurers possess incentives to cream-skim or risk-select, i.e. to avoid high risks and attract low risks. This may lead to a waste of resources as well as to distortions in the benefit package.

This study compares the strengths and weaknesses of the two pure market solutions to the premium risk problem and community rating. Several specific problems of the three systems are analyzed in detail. Particular attention is paid to the challenges posed by managed care. Throughout this study, changes in health status are treated as exogenous. Thus, the analysis abstracts from ex ante moral hazard.

Although this book has been motivated by the German health insurance system, its scope is not restricted to Germany. The results are also of interest for countries such as the United States and Chile in which private health insurance covers a considerable part of the population and for countries which rely on community rating. For example, in Belgium, the Netherlands and Switzerland health insurers are not allowed to differentiate premiums by risk type. Finally, the analysis can be useful for researchers and policy makers from countries which consider to switch from a national health service to a system in which health care is provided by competing health insurers.

The study proceeds as follows. In Chapter 1, the three systems are analyzed and compared. Chapter 2 describes the German health insurance system and discusses its problems as well as the challenges posed by managed care.

Chapters 3 and 4 are devoted to a formal analysis. In Chapter 3, premium insurance and guaranteed renewable contracts are compared in a managed care environment with incomplete contracts in which neither system can reach the first-best. It is shown that an alternative contract exists which is able to implement the first-best. Chapter 4 analyzes the consequences of allowing health insurers to offer different benefit packages under community rating such as traditional health insurance and managed care. At the end of the study, the results are summarized and policy implications are discussed.

Chapter 1

Three Ways to Insure Premium Risk

The literature on premium risk in private health insurance market discusses three ways to insure premium risk. Two of these, guaranteed renewable contracts and premium insurance, provide market economy solutions without government intervention in the health insurance market. The third way, community rating, relies on government regulation of insurance premiums.

1.1 Insuring Premium Risk if Premiums are Risk-Based

If premiums are risk-based, premium risk can be insured by guaranteed renewable contracts and by premium insurance. The concept of guaranteed renewable contracts has been analyzed by Pauly, Kunreuther and Hirth (1995). They show that health insurers can provide a premium guarantee to individuals in exchange for a prepayment. Cochrane (1995) proposes to insure premium risk by a separate insurance which pays an indemnity to individuals if they become a high risk. Under this premium insurance, the indemnity would exactly cover the higher health insurance premium which a high risk individual has to pay. A similar proposal has been advanced by Meyer (1992) to reform the German private health insurance system. He recommends to make the savings accumulated by health insurers transferable if an individual switches to another insurer. The transfer should be contingent on the risk type. High risk types should obtain a higher transfer than low risk types to compensate for the higher premium they have to pay for a new health insurance contract.

1.1.1 The Lock-In and the Commitment Problem

In order to illustrate the advantages and disadvantages of both concepts, it is useful to consider a numerical example. All individuals are initially identical and live for three periods. In each period, they face the risk of becoming ill in which case they need to spend € 10000. In period 1, everybody is a low risk and the probability of becoming ill is 10 % which implies that expected health expenditure is $c_l = €\,1000$. In period 2, individuals may become a high risk type with an exogenous probability of 10 %. In this case, the probability

Period	c_h	c_l	h	l	$\bar{c}$
1	-	€ 1000	0 %	100 %	€ 1000
2	€ 2200	€ 1000	10 %	90 %	€ 1120
3	€ 2200	€ 1000	19 %	81 %	€ 1228

Table 1.1: Example 1.1

of becoming ill is 22 %, so expected expenditure equals $c_h = €\,2200$. These individuals remain high risk types for the rest of their life. In period 3, further 10 % of the remaining low risks turn into high risks. The proportions of high and low risks in each period are thus as in Table 1.1 which also shows average expected costs $\bar{c}$.

Health insurers are assumed to be risk neutral. There are no administrative costs. Furthermore, they can observe the risk type of individuals. In periods 2 and 3, they will therefore charge a premium equal to each risk type's expected cost. Thus, individuals are subject to premium risk: If they sign only one-period contracts, then their premium in periods 2 and 3 would be uncertain. Assuming that individuals are risk-averse, they would like to insure this premium risk. A straightforward solution is to sign a long-term contract for periods 2 and 3 in period 1 already. Since the risk type is not known ex ante, health insurers would sell such insurance at a fair premium equal to average costs. In consequence, individuals would face no premium risk. This solution, however, faces two problems:

1. In periods 2 and 3, individuals who turn out to be low risk types have an incentive to abandon the contract and buy a one-period contract with a premium equal to their expected costs. They would save € 120 in period 2 and € 228 in period 3. Only high risk types would stay and insurers would make losses. Although the insurer could insist on the execution of the long-term contract, courts may not enforce it. In this case, insurers would never offer such long-term contracts.

2. Individuals have to select their health insurer in period 1 already. However, they may wish to wait with their choice. New insurers can enter the market or preferences with respect to health insurers may change. In

addition, insurers may exploit that individuals can only switch to other insurers at a cost. For instance, insurers may be less generous by denying payment in case of a loss when it is not certain that the particular case falls under the terms of the contract. Under managed care, insurers may not contract with certain specialists. In addition, insurers may not be up-to-date with the latest developments in health care.

The first problem can be called the *commitment problem*. To insure premium risk, individuals would like to commit themselves in period 1 and guarantee that they do not defect if they turn out to be low risks. Whether they can do so, depends on the way courts interpret contracts. If courts interpret contracts ex post in favor of consumer claims, then simple long-term contracts cannot insure premium risk.

The second problem can be labelled the *lock-in problem*: To insure premium risk, individuals must take a decision about their health insurer before their type may change. Ex post it is costly to switch if the insurer can insist on the payment. This can be exploited by the insurer. Whether he can do so, depends on how detailed contracts can be drafted. In the context of health insurance, it is doubtful that every possible contingency can be included. Contracts are likely to be incomplete. Nevertheless, the insurer can have an incentive to provide the services which are desired by the insured. This would earn him a reputation for being a high quality insurer. However, this incentive will be weak if it is difficult for new customers to judge if the insurer treats his current customers fair. Note, however, that ex ante the insurer has an interest to guarantee that he will not take advantage of this lock-in situation to attract consumers. The second problem can therefore also be interpreted as a commitment problem, in this case on the part of the insurer.

Guaranteed renewable (GR) contracts and premium insurance (PI) try to overcome these problems. Whereas GR contracts focus on the commitment problem, PI claims to solve both problems.

1.1.2 Guaranteed Renewable Contracts

The basic idea of GR contracts is that health insurers provide a premium guarantee against a prepayment. Individuals are free to switch insurers after their type has been revealed. Yet, nobody will switch because the premium guaran-

tee is at least as low as the premium for the lowest risk types. Since everybody pays the same premium, premium risk is perfectly insured. The resulting ex post losses for the insurer are covered by the prepayment.[7]

If we assuming for simplicity that the interest rate is zero, the GR contract in example 1.1 can be derived as follows:

- In period 3, the premium guarantee cannot exceed € 1000. Otherwise, low risk types would buy a one-period contract from a different health insurer.
- In period 2, low risk types can buy a new GR contract for periods 2 and 3. Their expected expenditure is € 1000 + 0.9·€ 1000 + 0.1·€ 2200 which is equal to € 2120. Since the premium cannot exceed € 1000 in period 3, the lowest price for a new GR contract is therefore € 1120. Thus, the premium guarantee of the GR contract purchased in period 1 cannot be higher than € 1120 in period 2.
- Life-time expected health expenditure equals the sum of average costs and therefore amounts to € 3348. Setting the premium guarantee equal to € 1120 in period 2 and to € 1000 in period 3 implies that the first-period premium must be € 1228. Since expected costs in period 1 are only € 1000, the individuals therefore makes a prepayment of € 228.

The main advantage of GR contracts is that low risks do not have an incentive to opt out. The contracts enforce themselves and low risk types cannot simply abandon the long-term contract by not paying the premium.[8] GR therefore solve the commitment problem. However, the lock-in problem remains. As under simple long-term contracts, individuals have to commit themselves to an insurer before their type can change. If contracts are incomplete, the lock-in situation might be exploited by the insurer.

A further problem may arise if the prepayment required by GR contracts is difficult to finance by individuals. Consider, for example, an individual with

[7] The GR concept has also been applied to group insurance. See Pauly, Nickel and Kunreuther (1998).

[8] However, they may want to go to court to recover their prepayment. If courts are willing to recognize such claims, then GR contracts do not have an advantage compared to simple long-term contracts.

an income of € 5000 in period 1, € 16000 in period 2 and no income in the last period. Her income less expected expenditure on health insurance equals € 17652. If this individual has the same one-period subutility function in all periods, her optimal expenditure on consumption is equal in all periods and amounts to € 5884. Thus, the individual must take a loan to finance first-period consumption. If the individual buys a GR contracts, then she has to borrow € 2112 to finance her optimal consumption. However, if there is a borrowing constraint of € 2000, this is not possible. In this case, the prepayment of € 228 implies a trade-off between intertemporal consumption smoothing and insuring premium risk.

Frick (1998) has examined this trade-off in detail. He shows that borrowing-constrained individuals may buy only partial GR contracts, i.e. contracts with a premium guarantee above the expected costs of low risks but below expected costs of high risks, or no GR contracts at all. The subjective rate of time preference is crucial in this decision. He demonstrates that if it is below a certain threshold value, i.e. if individuals are relatively impatient, then individuals with a borrowing constraint will not buy GR contracts.

GR contracts are used in the German private health insurance system. There, private health insurers are by law required to calculate premiums in such a way that they remain constant over an individual's life-time. Since health expenditure rises with age, the premium is higher than expected costs in the early years and individuals make a prepayment. Insurers accumulate these prepayments to finance the premiums in old age which are below age-specific expected costs.

In the numerical example above, the German regulation would not yield GR contracts. The constant premium would be $\sum \bar{c}_t/3 = € 1116$. Therefore, low risks would opt out in period 3. A different example, however, which assumes that health expenditure is rising for all types with age shows that GR contracts can also be implemented with constant premiums. Table 1.2 shows the parameters of the example. The only difference to the first example is that expected health care costs for low and high risks are increasing over time.

In example 1.2, expected life-time health insurance expenditure equals € 8658. If premiums are constant, then individuals have to pay € 2886 each period. This premium guarantee is sufficiently low to avoid that low risks opt

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