HEDG Working Paper 06/02

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March 2006

ISSN 1751-1976

york.ac.uk/res/herc/hedgwp

Solidarity in competitive markets for supplementary health insurance: an empirical analysis

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Summary

Many countries are considering the option of reducing the share of mandatory health insurance (MHI) and to increasingly rely on voluntary (supplementary) health insurance (VHI) schemes to cover health care expenditures. It is well-known that competitive markets for VHI tend to risk-rated premiums. After discussing the determinants of risk-rating in competitive VHI markets, we provide empirical evidence of the potential reduction of (risk-) solidarity caused by the transfer of benefits from MHI to VHI coverage. For this purpose, we simulate several scenarios in which benefits covered by MHI are transferred to competitive markets for VHI. We use a dataset issued by the largest insurer in the Netherlands, in order to calculate the potential premium range for VHI resulting from this transfer.

Our findings show that, by adding risk-factors, the minimum VHI premium decreases while the maximum increases. Moreover, we observe that risk-rating primarily affects the maximum premium. The reduction of solidarity is especially substantial for benefits such as medical devices and drugs.

Finally we discuss some options to maintain a "socially acceptable" level of solidarity in VHI markets.

Keywords: solidarity, competition, risk-rating, supplementary health insurance, risk-adjustment.

Introduction

The total amount of health care expenditures is growing worldwide while public resources of financing appear to be increasingly scarce. In most OECD (Organisation for Economic Co-operation and Development) countries, policy-makers consider voluntary (supplementary) health insurance (VHI) as one of the primary instruments to limit statutory financing of health care [1]. The main motivation to finance health care through mandatory schemes is to provide a wide range of benefits to most individuals at an affordable price (solidarity) and to avoid free riding. In order to achieve these goals, governments usually implement some cross-subsidisation either implicitly (e.g. through community-rating) and/ or explicitly (e.g. through risk-adjusted premium subsidies and/ or taxation) complemented by an open enrolment requirement. For instance, countries with a NHS (National Health Service) system finance health care mainly via taxation and open access to health care facilities to all nationals [2]. Countries with a competitive market for mandatory health insurance (MHI) adopt a risk-equalisation scheme with premium rate restrictions (e.g. community-rating) and open enrolment [3].

In most voluntary (supplementary) health insurance (VHI) markets these institutional and regulatory arrangements, adopted by governments with the aim of guaranteeing solidarity in MHI markets, are formally absent. In the long run, the absence of these legal constraints may induce insurers to risk-rate premiums in order to attract the better risks and thereby increase their competitiveness and profits in VHI markets. Policy makers, when transferring benefits from MHI to VHI, should be aware of the long-run implications for solidarity.

In this paper, we address the following questions:

- Why and to what extent do insurers risk-rate premiums in VHI markets?

- What is the potential reduction of solidarity caused by transferring benefits from MHI to VHI coverage?
- How can the *solidarity principle* be compatible with the *equivalence principle* within a competitive VHI market where insurers risk-rate in practice?

In order to answer these questions, we provide an empirical illustration of the consequences for solidarity of the transition from community-rated to risk-rated premiums in VHI markets. We hypothesise that this transition would naturally occur in competitive VHI markets, given the (potential) profitability of risk-rating.

This article is organised as follows. First we discuss the equivalence principle and the rationale for risk-rating in competitive VHI markets. Then the methodology and the data used in the econometric analysis are briefly described. In particular, we simulate several scenarios in which benefits covered by MHI (community-rating) are transferred to VHI (risk-rating). And we calculate the potential premium range resulting from this transfer in order to quantify the potential reduction of solidarity produced by the transition from community-rated to risk-rated premiums. Finally, we discuss the conclusions and the policy implications focusing on the available alternatives to maintain a "socially acceptable" level of solidarity, if desired, in VHI markets.

The equivalence principle

The equivalence principle refers to the fact that, without external interventions, a competitive health insurance market may tend to risk-adjusted premiums. In a competitive health insurance market, a system of implicit cross-subsidies (e.g. community-

rated premiums), where insurers would accept predictable losses on the contracts of high-risk individuals and compensate these losses with predictable profits made on the contracts of low-risk individuals, cannot be financially sustainable in the long run, because competition minimises the predictable profits per contract. Consequently, insurers have to break even on each contract and therefore apply the equivalence principle either by adjusting the premium to the consumer′s risk (premium differentiation or risk-rating) or by adjusting the accepted risks to the premiums (risk selection). With risk selection we mean actions by insurers to exploit un-priced risk heterogeneity and break pooling arrangements [4]. Risk selection techniques refer to selective underwriting, benefits package design, selective advertising, denial of coverage, exclusion of pre-existing medical conditions, waiting periods, termination of contract, etc. While for automobile, burglary and fire insurance these consequences appear to be ″socially acceptable″, for health insurance this may not be the case [5].

For instance, consider the case of unregulated competitive health insurance markets dominated by insurers that community-rate their premiums (e.g. the Netherlands). In this context, those insurers that introduce risk-rating (with easily available risk-factors such as age and gender) would immediately gain a competitive advantage *vis à vis* insurers that adopt community-rated premiums. The competitive advantage of risk-rating insurers consists in their increased (decreased) attractiveness for low-risks (high-risks). In fact, low-risks would crowd the cheaper risk-rating insurers. As a result, in the absence of compensation schemes for high-risk individuals community-rating insurers would be forced either to follow risk-rating insurers or to exit the market.

In this paper, we mainly focus on risk-rating and, in particular, on its determinants and consequences for solidarity.

The determinants of the level of risk-rating

In this section we discuss a conceptual framework in order to discern the determinants of the insurers′ incentives for risk-rating in competitive VHI markets. Insurers′ choice regarding whether and to what extent to adopt risk-rated premiums in these markets is influenced by several factors, which may be distinguished in two main categories: 1) exogenous factors, that cannot be influenced by insurers′ actions such as the level of competition, the consumers′ willingness to switch and the regulatory framework; and 2) endogenous factors, that can (to some extent) be affected by insurers′ behaviour such as transaction costs and the predictive power of risk-adjusters in VHI markets.

Level of competition

The degree of competition and contestability in VHI markets is a crucial element in order to assess whether there are incentives for risk-rating. The most common indicators used to measure the degree of competition and contestability in the marketplace are price-elasticities, market shares of the (potential) insurers[a], and consumers′ switching rates.

In general, highly competitive and contestable markets increase the incentives for insurers to risk-rate premiums. If insurers (partially or completely) bear the financial risk, the greater the degree of competition in the market the more risky it is for insurers to survive without risk-rating premiums. In fact, insurers choosing not to compete on premiums may loose consistent market shares to insurers who actually risk-rate, and thereby worsen the average risk-profile of the individuals in their pool. This may lead to excessive and

unsustainable expected costs mainly due to the low-risk individuals′ crowding-out effect of no risk-rating, and thereby it may force insurers to exit the market. In case the degree of competition and contestability are low, insurers may prefer not to risk-rate (nor to invest in efficiency) in the short-term, because it would cause further price-competition in the market either by other incumbent insurers or by new entrants. Nevertheless, in the medium/ long term incentives to undercut (rise) the premiums of low-risks (high-risks) individuals may increase, given the potential profits (losses) insurers may make by attracting them.

Consumers′ willingness to switch

Whether risk-rating is effective for increasing insurers markets share and/ or profits depends also from the consumers′ willingness to switch. In fact, by offering lower premiums insurers would gain market share if and only if consumers are sufficiently sensitive to the price variation (price-sensitivity) and willing to switch. Willingness to switch may depend on several factors other then price such as habit, convenience etc., which also have to be taken into account when considering the potential increase in the percentage of low-risk individuals in the insurers′ portfolios due to a premium decrease. Some empirical studies [6,7] indicate substantial variation in price sensitivity related to expected health care costs. For instance younger, healthier individuals are between two and four times more price-sensitive than individuals who are older and who have been recently hospitalized or diagnosed with cancer. Moreover, premium elasticities are significantly higher for new enrolees (e.g. probably younger), suggesting that habit reduces price sensitivity.

Regulatory framework

Many countries adopt premium rate restrictions such as community-rating, a ban on certain rating factors, or rate-banding (by class), with the scope of reducing the adverse effects of risk-rating [8]. In this paper, we focus on a particular form of rate restrictions that is community-rating per insurer, since it is the most commonly used. Community-rating per insurer implies that an insurer quotes the same premium for everyone in its pool, independent of the individual's risk characteristics. The rate restrictions are assumed to apply to specific health insurance coverage and are often combined with an open enrolment requirement.

Despite the legal obligation to insurers of adopting community-rated premiums within their pool, risk-rating among insurers may still occur indirectly. To the extent that some insurers are successful in attracting the low-risk persons, these selection activities (e.g. product differentiation) result in market segmentation, such that high-risk individuals pay a very high premium - if they are able and willing to do so. That is, market segmentation leads to premium differentiation among insurers (not within the same insurer). An example of market segmentation, caused by legally mandatory open enrolment and community-rating per insurer, is South Africa′s private health insurance market. Given that age profiles differ considerably among insurers, the maximum age-related per capita expected costs per insurer are four times the minimum [9]. In sum, premium rate restrictions (and open enrolment) create incentives for selection, which may threaten solidarity.

Transaction costs

In a competitive market for VHI transaction costs[b] may inhibit risk-bearing insurers from differentiating their premiums at an individual's expected costs [4]. Transaction costs refer for example to the overall administrative and marketing expenses incurred by VHI providers, or they may simply refer to the costs involved in the risk-rating process, such as the elaboration, distribution, collection and processing of health questionnaires. Questionnaires are useful tools for gaining specific and detailed information on individuals' health status, which is an accurate predictor of individuals' expected costs [10]. The widespread utilisation of health questionnaires and the fact that substantial premium differentiation can be observed in practice suggest that in most unregulated competitive VHI markets the level of transaction costs does not preclude insurers from differentiating premiums. In a competitive individual VHI market, where insurers use sophisticated premium models, in the long run the maximum premium for complete health insurance coverage may exceed the minimum premium for the same product by more than a factor 100 [11]. The limited level of risk-rating in some competitive VHI markets may be then attributed to the absence of a sufficient degree of price competition among risk-bearing insurers at the level of the individual consumer. The increasing willingness in several countries (e.g. the Netherlands) to apply premium rate restrictions, even in the form of self-regulation, supports the idea that if competing risk-bearing insurers are free to set their premiums for individual health insurance, the premium for high-risks will be so high as to jeopardise their access to health insurance coverage.

Predictive power of risk-adjusters

Insurers′ decision concerning whether to implement risk-rated premiums in VHI markets depends considerably on the availability of risk-adjusters that effectively represent good predictors of future individuals′ health care expenditures.

An essential pre-condition to risk-rating is that the relevant information about individuals′ risk-profiles is routinely available at reasonable costs. The required data necessary to construct risk-adjusters usually comes from health questionnaires.[c] A second important element, that insurers consider when deciding whether or not using a certain risk-factor for risk-rating the VHI premium, is related to its stability. Insurers may tend to give priority to the use of risk-factors that are stable in time. Using very volatile risk-adjusters may cause dramatic and unstable differences in the premium structure, which may be very difficult for consumers to accept.[d] For instance, the use of 1-year DCGs (Diagnostic Cost Groups) as a risk-factor result in a premium variation reflecting the information relative to hospitalisations occurred exclusively in the previous year. Therefore, the premium relative to period t would increase dramatically in case of hospitalisation in period t-1. Whereas, at t+1 the premium would decrease to the t-1 level assuming that no hospitalisation occurred in period t. The use of 3-year or 5-year DCGs mitigates the volatility of this health status indicator by increasing the predictability of the risk-adjustment models [12]. Nevertheless, the use of this adjuster may be very costly since it may require frequent repetitions of the risk-classification process. All in all, the use of risk-adjusters that reflect chronic conditions (such as PCGs, Pharmaceuticals Cost Groups) may

[c] The predictive power of risk-adjusters is considered as an endogenous determinant of the level of risk-rating, since health questionnaires are designed by the insurers (under certain regulatory constraints such as privacy law). Consequently, insurers may influence, at least to a certain extent, the quality of the questions proposed and thereby the quality, in terms of predictive power, of the resulting risk-adjusters.

[d] In unregulated competitive insurance markets the use of health status indicators as risk-adjusters by insurers is very likely to happen in the long run. Nonetheless, large and sudden fluctuations in the premiums may be difficult to accept for enrollees if these variations are due to a change in health status.

be preferable for insurers given that their effect on the premium variation is in principle less volatile, at least in the short-term.

Another important dimension that insurers consider is the profitability of (further) risk-rating. In order to establish whether or not a risk-adjuster produces financial gains, rational insurers consider two elements: 1) the specific risk-adjuster′s contribution to the variation in the premium range; 2) the variation in the percentages of individuals (frequency) in each risk-group produced by the introduction of new risk-adjusters. The more substantial is the risk-adjuster′s contribution to the variation of the premium range and to the variation in the percentage of individuals′ identified in each risk cell, the greater would be the effect of risk-rating on insurers′ potential profits. Frequent and large variations in the premiums and in the cells′ composition may also cause problems in terms of insurers′ reputation *vis à vis* consumers, competitors and governments. Therefore, insurers have to weigh the profitability of risk-adjusters with the returns/ losses in terms of reputation. Particularly for countries with a mandatory health insurance (MHI) market where a wide variety of benefits are provided by sickness funds or mutualités, solidarity in terms of affordability and accessibility of insurance coverage is a very sensitive issue. Moreover, not-for profit entities operating in the MHI market are often linked to VHI providers, which increases the (potential) spillover effects in terms of reputation. MHI providers linked to a VHI provider may deteriorate their reputation *vis à vis* the government, consumers and other insurers, which may lead to important losses both in terms of volumes and finances. On the other hand, MHI/ VHI providers may exploit risk-rating in VHI markets also as a tool for risk-selection in the MHI market (with community-rated premiums) [13]. Whether the losses in terms of reputation for MHI providers due to risk-rating by linked VHI entities outweigh the profits produced by both risk-rating (in the

VHI market) and by induced risk-selection (in the MHI market) is crucial to predict insurers′ behavior. In the short term, in countries where the size of total VHI expenditures (compared to MHI) and the variation in individual expenditures for VHI benefits are limited it may be advantageous for insurers not to risk-rate premiums. For instance, Dutch health insurers committed with the government to provide VHI policies at community-rated premiums and with an open enrolment requirement for the first 6 months of 2004. This may convince the regulator to (further) transfer benefits from MHI to VHI, given the unchanged premium regime. Policy makers, when transferring benefits from MHI to VHI, should be aware of the long-run implications for solidarity because unregulated competitive VHI markets tend to risk-rated premiums.

Method and data

Consistently with the observable trend that sees the percentage of benefits covered through voluntary supplementary health insurance (VHI) increasing at the expense of mandatory health insurance (MHI),[e] we develop a scenario analysis in which we simulate that certain benefits, covered by MHI, are transferred to VHI coverage. Since in MHI markets premiums are community-rated by legislation, the transfer of benefits to an unregulated competitive VHI market may lead insurers to risk-rate premiums.

In our simulations, we calculate the community-rated premium (average premium), and the maximum and the minimum expected premium [E(Y)] that insurers would obtain by adjusting the benefits′ costs to different risk factors (Xs) such as age, gender, DCGs and

[e] Since January 2004, MHI in the Netherlands does not cover the costs of physiotherapists and dentists for adults; of the first in-vitro fertilisation treatments (IVF); of the contraceptive pill for women older than 21 years; and of taxi transport of sick people to the doctor. Psychotherapy will be limited to 30 treatments and the insured will be charged 1.70 euros for every prescription [18].

PCGs. The obtained premium range, that is the absolute difference between the maximum and the minimum risk-based premiums calculated for each of the benefits (packages), is confronted with the community-rated premium. This allows us to quantify the potential reduction of solidarity due to risk-rating.

In order to calculate the expected risk-rated premiums, we apply OLS estimations to health care expenditures (Y) relative to different benefits [14]:

$$E(Y)= \beta X + \varepsilon.$$

1. Y_1 = the total health care expenditures of the "2002 VHI benefits package";
2. Y_2 = the total expenditures (=VHI+MHI expenditures) for dental care;
3. Y_3 = the total expenditures (=VHI+MHI expenditures) for paramedic care;
4. Y_4 = the total expenditures (=VHI+MHI expenditures) for medical devices;
5. Y_5 = the total expenditures (=VHI+MHI expenditures) for pharmaceuticals;
6. Y_6 = the total expenditures for the "complete VHI benefits package" (=Y_2+Y_3+Y_4+Y_5).

We considered these benefits since in several countries policy-makers have already excluded (some of) them from the basic package covered by mandatory health insurance. This is particularly the case for dental and paramedic care and medical devices, whereas pharmaceuticals are (still) covered by MHI in most countries. Since prescription drugs are covered by Medigap (the Medicare supplemental insurance) in the US [15], we decided to include them in the analysis to show the potential implication for risk-solidarity in the Dutch case.

To all dependent variables we apply a simple demographic model (Model 1) characterised by 16 age*gender dummies (independent variables), a demographic model plus a dummy for DCGs (Model 2), a demographic model plus a dummy for PCGs (Model 3) and a demographic model plus two dummies for DCGs and PCGs (Model 4).[f] We consider different risk-adjustment models with the purpose of evaluating whether the gradual introduction of risk-adjusters affects the premium range, and thereby solidarity.

For this analysis, we use a dataset issued by the largest Sickness Fund in the Netherlands (AGIS) concerning a total of about 1.5 million Dutch insured. We concentrate our analysis on a sub-sample of about 0.5 million individuals holding identical coverage for both MHI and VHI. Table 1 presents the dependent and independent variables along with means and standard deviations used in our regressions.

(Table 1 about here)

Results

The potential reduction of solidarity in competitive VHI markets

This section presents the estimations' results providing an indication of the potential reduction of solidarity due to risk-rating in VHI markets. In general, we found that for all benefits (packages) the implementation of a "simple" demographic risk-rating model has an important impact on the premium range. The potential reduction of solidarity is

[f] Notice that PCG/ DCG are yes/ no variables so it is a very simple model. Potentially we could use more complicated models, which take into account in which PCG/ DCG category individuals belong to. The resulting PR could be much higher.

particularly substantial for the "complete VHI benefits package", where the maximum (minimum) risk-rated premium is 1276 (146) euros and the community-rated premium is only 538 euros. That is the highest risk-group pays 700 euros extra per year. The benefits that primarily contribute to this result are pharmaceuticals and medical devices (see Table 2.). If insurers gradually add risk-adjusters in the calculation of VHI premiums, the premium range increases for all benefits (packages),[g] and thereby the potential reduction of solidarity due to further risk-rating becomes more serious. Particularly for the "complete VHI benefits package", where the maximum (minimum) premiums for the risk-rating Models 2-3-4 are respectively 2581 (138), 2302 (132) and 3239 (127) euros, the implementation of additional risk-factors substantially increases the potential reduction of solidarity. For instance, in case insurers risk-rate using the demographic plus the DCGs and PCGs dummies (that is the model with all available risk-factors), the highest risks pay 2701 euros per year more than under community-rating, while the lowest risks save 411 euros. Again, the benefits that primarily contribute to these results are medical devices and pharmaceuticals (see Table 2.).

Considering only medical devices, the premium range of the demographic + DCGs model (16; 608 euros) doubles the premium range resulting from the demographic model (17; 299 euros). Also the premium range resulting from the demographic +PCGs model (12; 483) increases in comparison to that of the less sophisticated demographic model but the effect of DCGs appears to be greater. In case insurers risk-rate by using the complete set of risk-factors (Model 4), the premium range further widens (12; 723), that is the highest risk-

[g] For all benefits (packages), the more insurers risk-rate the higher (lower) is the maximum (minimum) premium paid by the highest (lowest) risk-groups. Moreover, the increase in the maximum premium produced by the use of additional risk-adjusters is much larger than the decrease in the minimum premium.

groups would have to pay about 640 (64) euros more (less) than in case of community-rating (76 euros).

The estimation results regarding pharmaceuticals suggest that the consequences of risk-rating in terms of a potential reduction of risk-solidarity are even more serious. The premium range for the demographic + DCGs (51; 1690) and the demographic + PCGs (40; 1560) models double that of the demographic model (57; 813). The use of the complete set of risk-adjusters produces a further growth in the premium range (38; 2175), which means, in terms of the potential reduction of solidarity, that the highest-risk groups would have to pay 1900 euros more than in case of community-rating. The implications for risk-solidarity have to be carefully taken into account when transferring drugs from MHI to VHI. For instance, the (potential) high premium range due to risk-rating may be a reason for Society to consider which drugs, if any, to transfer to VHI coverage and whether some form of coinsurance may be preferable (which is actually already the case in many countries).

Will insurers risk-rate in practice?

In competitive and unregulated VHI markets, where consumers' are sensitive to price variations and transaction costs are relatively low, insurers' choice regarding whether and to what extent risk-rate premiums depends on the predictive power of the risk-adjusters. In particular, rational insurers decide whether or not (further) risk-rate premiums on the basis of the potential financial gains produced by the introduction of different (new) risk-factors. *Ceteris paribus*, the profitability of (further) risk-rating depends on the specific risk-adjusters' contribution to the variation in the premium range and on the percentage of individuals (frequency) in each risk-group produced by the introduction of (new) risk-adjusters. The more substantial the risk-adjusters' contribution is to the variation of the

premium range and to the variation in the percentage of individuals' identified in each risk cell, the greater the insurers' propensity to risk-rate VHI premiums is in practice. For instance, the rather small effect of different risk-adjustment models on the variations in the premiums range relative to the "2002 VHI benefits package", mainly due to the limited benefits covered, suggests *per se* a small insurers' propensity for risk-rating. This is also reflected by the widespread use of community-rated premiums in countries' unregulated competitive VHI markets where VHI coverage is limited to few (luxury) benefits (e.g. the Netherlands) [16].

In this section, we focus on the "complete VHI benefits package" since it shows the largest premium range variations for the four risk-adjustment models simulated. For this particular benefits package we present the variations in the percentages of individuals in each risk cell produced by the introduction of (additional) risk-adjusters. The purpose is to discern whether and to what extent insurers would risk-rate in a competitive unregulated VHI market, characterised by price-sensitive consumers and by low transaction costs (e.g. risk-adjusters are available routinely at reasonable costs).

As shown Table 3, insurers risk-rating premiums according to a "simple" demographic model may gain a substantial competitive advantage towards insurers adopting community-rated premiums (538 euros). In fact, the percentage of low-risk consumers attracted by the lower risk-rated premiums is around 55%,[h] whereas consumers with higher than average risk profiles (about 45%) may prefer the lower community-rated premiums. In the long run, the (potentially) substantial crowding-out effect of low-risks from community-rating insurers to risk-rating insurers may seriously endanger the

[h] This represents the percentage of individuals that would pay less than 538 euros (community-rated premium) if they switched to insurers adopting a demographic model to risk-rate premiums. In particular, more than the 15% (25%) of enrolees would have a substantial reduction of 338 (238) euros in their premium contribution.

financial sustainability of community-rating insurers. The high proportion of high-risks due to the 'departure' ('arrival') of low-risks (new high-risks) precludes the implicit cross-subsidisation realised by community-rating premiums (equivalence principle). Therefore, community-rating insurers may be forced 'sooner or later' to risk-rate premiums in order to survive in the market. All in all, the substantial variations in the premium range and in the percentage of (new) low-risk individuals attracted by the lower premiums increase the insurers incentives to shift from community-rating to risk-rating VHI premiums according to age and gender dummies. Risk factors such as age and gender are easily available at reasonably low costs and usually forbidding the collection or the use of this type of information by insurers is practically difficult and potentially very onerous for the regulator. Therefore, risk-rating premiums by means of age and gender dummies appear to be quite feasible.

Insurers may decide to further risk-rate premiums in order to attract new members by adding to the demographical model risk-adjusters such as DCGs and/ or PCGs (models 2, 3, 4). From Table 3, we observe that by adding the DCGs dummy the percentage of (new) low-risk individuals (55%) does not vary from that of the demographic model. That is, insurers do not gain any competitive advantage towards insurers that risk-rate adopting only age and gender dummies. Whereas, the introduction of either the demographic plus PCGs model or the demographic plus DCGs and PCGs makes insurers' premiums more attractive for an extra 5-10% low-risk consumers. Whether the relatively marginal increase in the percentage of new (low-risk) potential costumers is considered sufficient for adopting Models 3 and/or 4 depends in practice on the importance that insurers ascribe to factors such as the availability and the stability of the risk-adjusters and reputation.

Conclusions

A major problem of competitive markets for VHI, although they may stimulate insurers to be more efficient and more responsive to consumer preferences, is the "seeming incompatibility" between the solidarity and equivalence principles. The solidarity principle implies that the high-risk individuals receive a subsidy from the low-risk individuals to increase their access to health insurance coverage. In this paper we restrict the concept of solidarity to so-called "risk-solidarity", that is solidarity between low- and high-risk individuals. Solidarity between high- and low-income individuals, so-called "income solidarity", is not considered here. Conceptually "income-solidarity" can be easily incorporated in a system with "risk-solidarity". The equivalence principle refers to the fact that, without external interventions, a competitive (voluntary) health insurance market tends to risk-adjusted premiums.

A transfer of benefits from MHI to VHI and the transition from community-rated to risk-rated premiums inherent to competitive VHI markets imply a potential reduction of risk-solidarity (in terms of access to insurance coverage), as shown by the variation of the premium range for the different benefits (packages). For some of the transferred benefits (i.e. drugs) and-or for certain risk/ income-groups, the (potential) reduction of solidarity may be considered too large and thereby not "socially acceptable".

From a theoretical perspective, the preferred strategy to restore (some) solidarity in competitive (voluntary) health markets is to introduce a system of risk-equalisation. Many countries have introduced a risk-equalisation scheme within the MHI market combined with community-rated premiums and an open enrollment requirement for solidarity purposes. A system of risk-equalisation corresponds to a scheme of explicit cross-

subsidies, such that the high-risks receive a risk-adjusted premium subsidy from a solidarity fund, which is filled with (mandatory) solidarity contributions from the low-risks. For the determination of the subsidy, several relevant risk groups are discerned. The subsidy for each risk group is based on the average expenses of all insurers within the relevant risk group, is earmarked for the purchase of health insurance with a specified benefits package and is not transferable. High-risk persons pay their risk-adjusted premium partly with the subsidy and partly out of pocket. In the extreme case where the risk-adjusted subsidies and the mandatory solidarity contributions are fully adjusted for all the risk factors that insurers use in practice ("perfect-risk-adjustment system"), the premium minus subsidy plus solidarity contribution is likely to be the same for all persons insured with the same insurer. If the solidarity fund uses fewer or different risk-factors ("imperfect risk-adjustment system"), then the high-risk consumers are not compensated for the higher premium as far as these risk factors are concerned. That is, an imperfect risk-adjustment system may reduce the variations in the consumers' (actual) premium contribution, but it may not suceed in achieving maximum risk-solidarity. In practice the transaction costs involved in gathering the information about the risk-factors adopted by all insurers in the market may be unsustainable for the regulator, since there may be great diversity in the risk-adjusters used by competing insurers in VHI markets. Therefore, a system of risk-adjusted premium subsidies (risk-equalisation scheme) that aims at achieving maximum risk-solidarity may be unsustainable from both an organisational and a financial perspective in competitive unregulated VHI markets.

Depending on whether the level of risk-solidarity achieved by an "imperfect risk-adjustment system" is not considered as "socially acceptable", in terms of the "allowable" premium variation, the regulator may adopt complementary or alternative measures [17].

In this paper, we mainly refer to premium-compensation schemes which are subsidies that may be related to each enrolee′s premium contribution, income or, in case they are adopted in combination with a risk-equalisation scheme, to the ″premium minus risk-adjusted subsidy″. Premium-compensation schemes are effective in achieving risk- and income-solidarity to whatever extent Society wants. In general, premium-compensation schemes reduce the competitive advantage of the most efficient insurers and thereby overall price-competition. This may lead to premium inflation. Moreover, premium-related subsidies diminish the consumers′ incentives to shop around for the lowest premium and thereby insurers′ incentive for efficiency. They would also stimulate consumers to buy more complete insurance, resulting in more moral hazard, than they would have done in case of no (premium-related) subsidy at the margin. In sum, premium-compensation schemes are effective in guaranteeing risk- and income-solidarity but only at the expense of some efficiency, therefore Society has to weigh the solidarity-gains with the efficiency-losses caused by its adoption.

Policy Implications

Risk-equalisation schemes represent the best regulatory tool to reduce the variation in each consumer′s premium contribution without reducing insurers′ incentives for efficiency. Given the imperfectness of the available risk-adjustment system, the extent of premium differentiation and, thereby, the (potential) reduction of solidarity for some benefits (packages) may still be considered too large by Society. In that case, policy-makers may either not transfer the benefits from MHI (community-rated premiums) to VHI (risk-rated premiums) markets or introduce premium-compensation schemes. Although they

reduce the insurers′ incentives for efficiency, they are effective complementary or alternative tools to risk-compensation schemes in (further) reducing the range of risk-rated premiums. Governments, when transferring benefits from MHI (community-rated premiums) to VHI (risk-rated premiums), have to carefully decide for which benefits (packages) and to what extent (in terms of "allowable" premium variation) solidarity is desired.

NOTES:

[a] If available, the preferable indicator of firms market power are the relevant price-elasticities, since they directly provide information about the shifts in the (incumbent or new entrant) firms′ market shares due to price variations. Market shares as such are more crude proxies of firms′ market power (often adopted by Antitrust Authorities as indirect indicators, when data on price-elasticities lacks). They can be measured at the level of the individual firms on the "relevant market" in order to establish the market dominance of each firm. Alternatively, concentration ratio′s (CR8, CR4 and the Hirschman-Herfindahl index) report the aggregated market share of the largest firms in the market. If market shares are not decisive, the competitive advantage of the dominant firm should be taken into account including entry barriers. Entry barriers are particularly important to determine the degree of contestability of the market.

[b] Transaction costs are considered an endogenous determinant of the level of risk-rating since insurers may take actions to reduce them, for instance by improving the efficiency of the transaction. This depends also on the constraints imposed by the regulatory regime.

[c] The predictive power of risk-adjusters is considered as an endogenous determinant of the level of risk-rating, since health questionnaires are designed by the insurers (under certain regulatory constraints such as privacy law). Consequently, insurers may influence, at least to a certain extent, the quality of the questions proposed and thereby the quality, in terms of predictive power, of the resulting risk-adjusters.

[d] In unregulated competitive insurance markets the use of health status indicators as risk-adjusters by insurers is very likely to happen in the long run. Nonetheless, large and sudden fluctuations in the premiums may be difficult to accept for enrollees if these variations are due to a change in health status.

[e] Since January 2004, MHI in the Netherlands does not cover the costs of physiotherapists and dentists for adults; of the first in-vitro fertilisation treatments (IVF); of the contraceptive pill for women older than 21 years; and of taxi transport of sick people to the doctor. Psychotherapy will be limited to 30 treatments and the insured will be charged 1.70 euros for every prescription [18].

[f] Notice that PCG/ DCG are yes/ no variables so it is a very simple model. Potentially we could use more complicated models, which take into account in which PCG/ DCG category individuals belong to. The resulting PR could be much higher.

[g] For all benefits (packages), the more insurers risk-rate the higher (lower) is the maximum (minimum) premium paid by the highest (lowest) risk-groups. Moreover, the increase in the maximum premium produced by the use of additional risk-adjusters is much larger than the decrease in the minimum premium.

[h] This represents the percentage of individuals that would pay less than 538 euros (community-rated premium) if they switched to insurers adopting a demographic model to risk-rate premiums. In particular, more than the 15% (25%) of enrolees would have a substantial reduction of 338 (238) euros in their premium contribution.

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Table 1. Descriptive Statistics.

Variables	Mean	Standard Deviation
*Cost in year 2002 (in €)**		
2002 VHI BP [a]	*74*	*248*
Paramedic	*69*	*226*
Dental	*81*	*188*
Medical devices	*77*	*468*
Pharmaceuticals	*306*	*972*
Other care	*284*	*1073*
VHI BP [b]	*532*	*1248*
Indipendent variables		
Age (years)	*40*	*23*
Female (%)	*56*	*0.5*
In a PCG group year 2001 (%)	*8.5*	*0.3*
In a DCG group year 2001 (%)	*2*	*0.5*
Number of individuals	545366	

* All the cost variables reported in this table represent the sum of MHI and VHI health care expenditures per VHI benefit or benefits package in year 2002.

[a] The "2002 VHI Benefits Package (2002 VHI BP)" comprises only VHI costs relative to the benefits package of year 2002, which included dental care (36% of the total dental care expenditures), paramedic care (10%), medical devices needed for disability (5%), home care for pregnant and elderly people (10%), alternative care (100%), and cross-boarder care obtained for temporary stay (max 60-90 days) (100%). We did not consider home, alternative and cross-boarder care in our estimations given that they are relatively unused on average.

[b] In the "complete VHI Benefits Package (VHI BP)" we included the total expenditures (MHI+VHI) of dental care, paramedic care, medical devices and pharmaceuticals.

Table 2. Community-rated premiums (CRP) vs Risk-rated premiums (RRP).

	Benefits					
Risk-factors	2002 VHI BP	Dental Care	Paramedic Care	Medical devices	Pharmaceuticals	Complete VHI BP
	CRP=75*	CRP=83	CRP=70	CRP=76	CRP=309	CRP=538
Demographic model	Min RRP= 6 Max RRP= 125	Min RRP= 35 Max RRP= 143	Min RRP= 18 Max RRP= 176	Min RRP= 17 Max RRP= 299	Min RRP= 57 Max RRP= 813	Min RRP= 146 Max RRP= 1276
Demographic + DCGs model	Min RRP= 6 Max RRP= 135	Min RRP= 33 Max RRP= 173	Min RRP= 18 Max RRP= 201	Min RRP= 16 Max RRP= 608	Min RRP= 51 Max RRP= 1690	Min RRP= 138 Max RRP=2581
Demographic + PCGs model	Min RRP= 6 Max RRP= 130	Min RRP= 31 Max RRP= 154	Min RRP= 17 Max RRP= 185	Min RRP= 12 Max RRP= 483	Min RRP= 40 Max RRP= 1560	Min RRP= 132 Max RRP= 2302
Demographic + DCGs & PCGs model	Min RRP= 6 Max RRP= 138	Min RRP= 29 Max RRP= 206	Min RRP= 13 Max RRP= 247	Min RRP= 12 Max RRP= 723	Min RRP= 38 Max RRP= 2175	Min RRP= 127 Max RRP= 3239

* Units are in euros per year.

Table 3. Percentages of individuals (Frequency) in each risk group for the 4 risk-adjustment Models.

Risk-rated Premiums	Model 1 (Demographic)	Model 2 (Demographic/DCGs)	Model 3 (Demographic/PCGs)	Model 4 (Demographic/DCGs/PCGs)
0-100	0	0	0	0
100-200	17%	17%	17%	22%
200-300	26%	26%	26%	21%
300-400	10%	10%	9%	9%
400-500	5%	5%	11%	11%
500-600	8%	8%	4%	12%
600-700	4%	10%	14%	7%
700-800	7%	4%	2%	0
800-900	10%	5%	0	6%
900-1000	0	0	6%	0
1000-1100	0	4%	0	0.1%
1100-1200	4%	7%	0	0.2%
1200-1300	9%	0	0	0.1%
1300-1400	0	0	0	0.3%
1400-1500	0	0.2%	0	0.6%
1500-1600	0	0.2%	0.4%	0.6%
1600-1700	0	0.3%	0.6%	1%
1700-1800	0	0.3%	0.6%	0.9%
1800-1900	0	0	0.4%	2%
1900-2000	0	0.4%	2%	2%
2000-2100	0	0.4%	2%	0
2100-2200	0	0.3%	2%	2%
2200-2300	0	0	0	0
2300-2400	0	0.2%	3%	0
2400-2500	0	0.7%	0	0
2500-2600	0	1%	0	0
2600-2700	0	0	0	0.1%
2700-2800	0	0	0	0.3%
2800-2900	0	0	0	0.1%
2900-3000	0	0	0	0.3%
3000-3100	0	0	0	0.4%
3100-3200	0	0	0	0
3200-3300	0	0	0	1%
>3300	0	0	0	0