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How Adverse Selection Affects the Health Insurance Market

Paolo Belli

There may be a price to pay (in terms of inefficient coverage) if competition among health insurers is encouraged as a way to give patients greater choice and to achieve better control over insurance providers

Summary findings

Adverse selection can be defined as strategic behavior by the more informed partner in a contract against the interest of the less informed partner(s). In the health insurance field, this manifests itself through healthy people choosing managed care and less healthy people choosing more generous plans.

Drawing on theoretical literature on the problem of adverse selection in the health insurance market, Belli synthesizes concepts developed piecemeal over more than 20 years, using two examples and revisiting the classical contributions of Rothschild and Stiglitz. He highlights key insights, especially from the literature on "equilibrium refinements" and on the theory of "second best."

The government can correct spontaneous market dynamics in the health insurance market by directly subsidizing insurance or through regulation; the two forms of intervention provide different results. Providing partial public insurance, even supplemented by the possibility of opting out, can lead to second-best equilibria. The same result holds as long as the government can subsidize contracts with higher-than-average premium-benefit ratios and can tax contracts with lower-than-average premium-benefit ratios. Belli

analyzes the following policy options relating to the public provision of insurance:
• Full public insurance.
• Partial public insurance with or without the possibility of acquiring supplementary insurance and with or without the possibility of opting out.

In recent plans implemented in Germany and the Netherlands, where competition among several health funds and insurance companies was promoted, a public fund was created to discourage risk screening practices by providing the necessary compensation across risk groups. But only "objective" risk adjusters (such as age, gender, and region) were used to decide which contracts to subsidize. Those criteria alone cannot correct the effects of adverse selection.

Regulation can exacerbate the problem of adverse selection and lead to chronic market instability, so certain steps must be taken to prevent risk screening and preserve competition for the market.

Belli considers the following three policy options for regulating the private insurance market:
• A standard contract with full coverage.
• Imposition of a minimum insurance requirement.
• Imposition of premium rate restrictions.

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1. Introduction

Adverse selection can be defined as strategic behavior by the more informed partner in a contract, against the interest of the less informed partner(s). In the health insurance market it is relevant because each individual chooses among the set of contracts offered by insurance companies according to his/her expected probability of using health services. In brief, those who foresee an intense use of health services will tend to choose more generous plans than those who expect a more limited use of them. In the extreme, for each premium and degree of coverage, those who will decide to purchase that particular health insurance contract are those who expect to have health expenditure greater or equal to the premium paid. Then, whatever the premium, the insurance company may end up with a loss on each customer.

Insurance companies anticipate this purchasing behavior and devise contract offers in order to screen individuals. This "screening" strategy is even more critical to success in the market whenever there is regulation in place that does not allow health premiums to reflect individual risk (premium rate restrictions) or does not permit to acquire information on potential customers' health conditions before making contract offers (such as an open enrolment requirement). In any case, the screening practice by insurance companies hinders the achievement of an efficient risk pooling across individuals.

There is a growing body of evidence that suggests that adverse selection is an important phenomenon in health insurance markets. Cutler writes (1996, p.30): "Almost all health insurance systems where individuals are allowed choice of insurance have experienced adverse selection. Medicare enrollees who choose managed care[1] are healthier than...[those] who do not. The Federal Employees Health Benefits Program...has adverse selection between more and less generous policies. The spread in premiums between more and less generous policies is 68 percent greater than benefits alone would dictate...And almost every large firm that has encouraged employee choice has found the cost of the most generous policies increases sufficiently rapidly than these policies are no longer viable" (this last phenomenon is named in the literature "price death spiral" and refers to the increase in the price of more generous insurance plans vis-à-vis moderate plans). It is also expected that in the United States, as the insurance market becomes more competitive and individuals are brought to face the true marginal cost of health insurance, the phenomenon of adverse selection will become more severe.[2]

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[1] Managed care plans impose stricter controls and restrictions over use of health services than traditional indemnity plans.

[2] In the past, employers would pay a large share of the premiums. Increasingly, employees are offered lump-sum transfers for health insurance and they face almost entirely the relative marginal costs of alternative plans.

Adverse selection is often advocated as the main justification for the provision of compulsory universal public health insurance. The claim is that the state would ultimately bear a significant share of the total health costs even if it chose to subsidize health care only for those who are left out of the private insurance market, because adverse selection would lead to insufficient insurance coverage for those who most in need and because health expenditure is highly concentrated within a few segments of the population.[3] Therefore, it would be preferable to force all individuals into the same insurance pool, where cross-subsidies are more transparent.

The existing theoretical literature that we will survey in this work seems to suggest that the main consequence to be expected from screening strategies by insurance companies would be the incomplete coverage of low-risk rather than the exclusion of high-risk groups. So, the above "price death spiral" for generous plans is not really captured by the existing theory. This gap between theory and reality may reflect an insufficiency in the existing analytical framework. Moreover, the theory does not consider that high-risk individuals may be unable to pay a premium adequate to cover their expected health expenditure even in a world of perfect information, nor extends the analysis to a dynamic setting (if it is possible to write only incomplete and short-term contracts, those who end up having a probability of the loss close to one, for example patients who become chronically ill, ex post are not insurable, even if that is ex-ante inefficient).

We will first illustrate the problem of adverse selection in the health insurance market by way of two examples and then present a survey of the existing theoretical literature. In the second part, the paper analyses different policy options to correct spontaneous market dynamics, either by direct public provision of health insurance or by regulation of private insurers. We shall try to provide a unitary representation of a set of concepts that have developed piece-meal over a period of more than twenty years. Given the aim of our survey and the broadness of the literature, our attention is focused on giving an intuitive understanding of the main results, rather than in presenting them rigorously. Whenever possible, we will make use of diagrammatical proofs.

2. Two Examples

The first example builds on a similar case presented by Cutler and Zeckhauser (1997). Consider two health plans offered in a particular market, a generous and a moderate plan, and two types of individuals, high-risk and low-risk, each group making up 50 percent of the entire population.

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[3] International studies agree in showing that a small minority, consisting of about 5-7 per cent of the population, is generally responsible for 60-65 per cent of total health expenditure.

Suppose that the cost of treating individuals under the two plans, and their gains in benefit from the generous plan vis-à-vis the moderate plan, are as follows:

	Resource cost of coverage (moderate)	Resource cost of coverage (generous)	Benefit difference (generous – moderate)
Low-risk	40	60	15
High-risk	70	100	40

Suppose that the insurance market is competitive (in equilibrium premiums are equal to expected costs) and that insurers do not know individuals' risk type, but know that there is an equal probability that each potential customer is either low or high-risk. They can also compute the cost of coverage for both groups and the expected costs of the contract that pools together both groups.

First note that the first best equilibrium, which in this case would see the high-risk individuals enrolled in the generous plan for a price of 100 and the low-risk individuals in the moderate plan for a price of 40, is not an equilibrium with incomplete information. At these prices both groups would buy the moderate plan, which would start making losses and whose price would have to be increased.

Suppose that initially a unique plan, the generous one, is offered in the market. If the market is competitive in equilibrium such plan must break even and it would be offered to everybody for a price of 80. Then, the moderate plan is devised and offered for a price of 64, which is low enough to attract low-risk individuals. All low-risks switch to the new plan (they can save 16 in exchange for a benefit loss of 15). In the new situation, the generous plan becomes unprofitable and its price has to be increased. At the same time, competition drives down the price for the moderate plan. As the price differential between the two plans exceeds 40 (given the above assumptions, it will eventually do so, because in equilibrium premiums must reflect relative costs), all high-risk individuals switch to the moderate plan and the generous plan has to be terminated. Then, the moderate plan also becomes unprofitable, as it has to shoulder all risk types, and its price has to be increased. New opportunities arise to undercut low-risk by offering even less generous and cheaper plans. The market is characterized by chronic instability.

Now, consider the equilibrium that the market would reach by changing the above figures for net benefits as follows:

	Resource cost of coverage (moderate)	Resource cost of coverage (generous)	Benefit difference (generous – moderate)
Low-risk	40	60	25
High-risk	70	100	60

As before, suppose that insurers do not know individuals' risk type. It is evident that the full-information equilibrium, that would in this case see both risk groups

purchasing the generous plan for a price of 60 (low-risk) and 100 (high-risk), can never be an equilibrium with incomplete information for the same reasons as before. Moreover, starting from the same initial situation considered in the first example (generous plan offered for a price of 80), it is profitable for low-risks to switch to the moderate plan as long as it is offered for a price lower than 55 (80-55 = 25 is now equal to the benefit difference between the generous and the moderate plan for low-risk individuals). Then, competition will drive the price of the moderate plan down to 40, while the price of the generous plan, burdened just with high-risk, will rise up to 100. Unlike the previous example, the price differential of 60 is not sufficient to induce high-risk to switch to the moderate plan (in fact, they are just indifferent between switching and maintaining the generous insurance plan). Thus, in this case the situation in which high-risk pay 100 for full insurance and low-risk pay 40 for incomplete insurance is an equilibrium. In this equilibrium low-risk are worse off than in the full information equilibrium, as they obtain only partial insurance, but the market equilibrium is stable. The market "sorts" out low-risk individuals from high-risks in a separating equilibrium, by offering plans with less than optimal coverage.

3. Rothschild-Stiglitz and the Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information

The first article to analytically investigate the problem of adverse selection in the insurance market is that by Rothschild and Stiglitz (1976). We will begin our survey of the theoretical literature by presenting a detailed summary of their model because it provides the basic conceptual framework that is going to be used for presenting also subsequent contributions.

On the demand side of the market, individuals' income without insurance is:

$W_1 = W$, if 'accident' does not occur.

$W_2 = W - d$, if 'accident' occurs.

Insurance companies offer indemnity $\alpha^\wedge_2$ if accident occurs in exchange for a premium α_1. Individuals' income with insurance becomes respectively:

$W_1 = W - \alpha_1$ and

$W_2 = W - \alpha_1 + \alpha^\wedge_2 - d = W + \alpha_2 - d$, where $\alpha_2 = \alpha^\wedge_2 - \alpha_1$

If the probability of accident is p we can apply the expected utility theorem and represent individuals' preferences for income in the two states in the following way:

$$V(p, \alpha_1, \alpha_2) = (1-p)U(W-\alpha_1) + pU(W + \alpha_2 - d) \qquad (1)$$

Given p, each individual maximizes $V(\cdot)$ with respect to $\{\alpha_1, \alpha_2\}$.

Rothschild and Stiglitz (hereafter, R.-S.) assume that individuals are risk averse, i.e. $U''(\ ) < 0$. So, $V(\cdot)$ being a linear combination of concave functions, is quasi-concave. They also assume that there is no moral hazard. The amount of the loss, as well as the probability p, are not influenced by the presence of insurance coverage.

On the supply side of the market insurance companies are considered risk-neutral and only interested in expected profits. A contract offer C_i consists of a bundle $\{\alpha_1,\alpha_2\}$ containing specific 'amounts of insurance' that the individual can buy and a particular price for that bundle (in the following diagrams we will frequently refer to points C_i as "contracts C_i" rather than as "wealth in the two states generated by the net premium-indemnity pair α_1,α_2"). R-S assume that individuals can buy at most one insurance contract, thus recognizing that insurance companies are able to ration the degree of insurance coverage offered to individuals. On the other hand, the market is assumed perfectly competitive, such as that in equilibrium premiums are equal to expected costs.

Expected profit for a contract offer to an individual who has probability p of incurring in a loss is:

$$\pi\ (p,\ \alpha_1,\alpha_2) = (1\text{-}p)\ \alpha_1 - p\ (\alpha^{\wedge}2 - \alpha_1) = (1\text{-}p)\ \alpha_1 - p\ \alpha_2 \qquad (2)$$

The equilibrium set of contracts is defined as:

- customers maximize expected utility;
- no contract in the equilibrium set entails negative expected profits;
- no contract outside the equilibrium set, if offered, would make a positive profit.

The equilibrium concept adopted is that of Nash-Cournot: each agent maximizes his/her objective function, independently of other agents' reaction.

Finally, R-S make a strong assumption about information: when deciding to sign a contract, agents know the probability of the loss, while insurance companies do not.

3.1 Equilibrium with Identical Customers

Let us first consider the equilibrium with identical customers. In Figure 1 we represent on the horizontal axis income if no loss occurs and on the vertical axis income if the loss occurs. Situations of full insurance correspond to points on the bisetrix, while situations of incomplete insurance lie to the right of the bisetrix (where $W_1 > W_2$).

Point E corresponds to the situation of no insurance. Each point to the northwest of E represents a specific insurance contract uniquely identified by a certain premium α_1 and a certain net indemnity α_2 in case of accident. The segment EF represents the zero profit, or actuarial ("fair") odds line. Trading income in the two states at a rate equal

to the slope of EF ($d\alpha_2/d\alpha_1 = (1-p)/p = -dW_2/dW_1$) leaves the insurance company with exactly zero profit. Starting from point E, any point to the south-west of EF entails positive profits and cannot be an equilibrium contract (as it can always be undercut by a new contract that attracts all customers and still earns positive profits), while any point to the north-east of EF entails negative profits and it is therefore not feasible. So, given free-entry and perfect competition in long-term equilibrium individuals find their preferred contract along the set of contracts belonging to the "zero profit" line, where $\pi(p, \alpha_1, \alpha_2)$ = $(1-p)\ \alpha_1 - p\alpha_2 = 0$. The zero-profit line identifies the "best" budget constraint available to the individual for trading income in the two states.

We can represent individuals' preferences with a map of indifference curves. Given risk-aversion, the indifference curves are convex.[4] Given any indifference curve, all the points to the northeast entail higher utility and all the points to the southwest entail lower utility.

Equilibrium lies in correspondence to the highest indifference curve compatible with the expected budget constraint (point C_5). In C_5 the slope of the indifference curve is equal to the slope of EF.

Figure 1: Equilibrium with Identical Customers
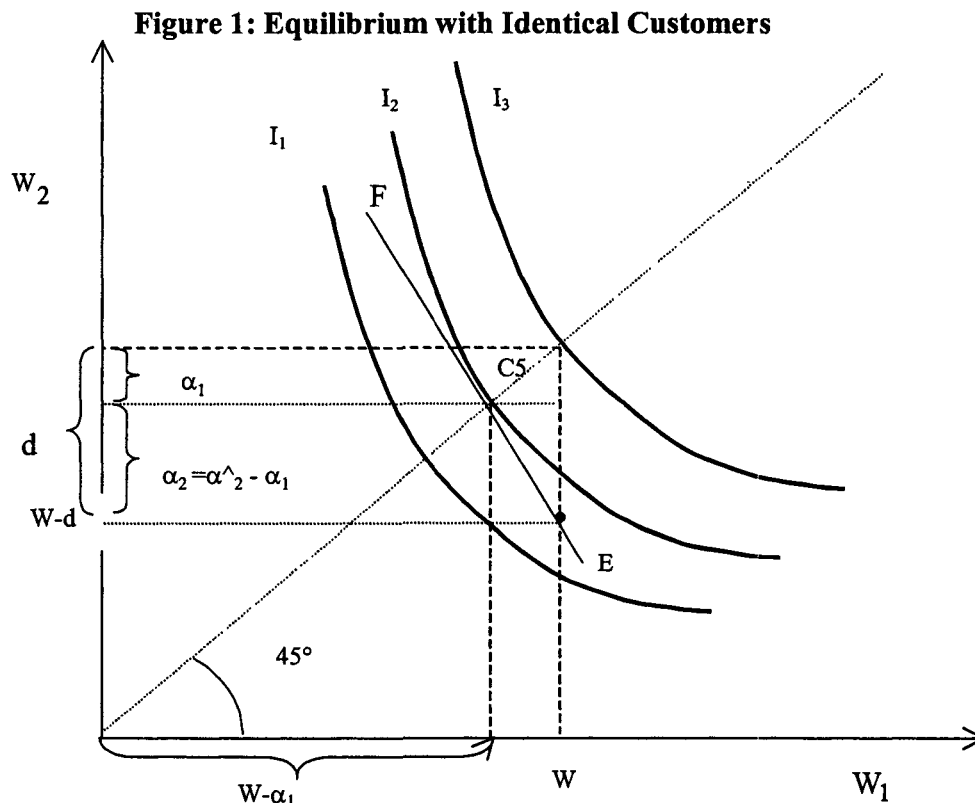
From the equation of the indifference curve:

$(1-p)[dU(\ )/dW_1]dW_1 + p[dU(\ )/dW_2]dW_2 = 0$, if we denote:

$dU(\ )/dW_1 = U'(W_1)$ and $dU(\ )/dW_2 = U'(W_2)$,

the slope of the indifference curve is equal to:

$$dW_2/dW_1 = [U'(W_1)/U'(W_2)][(1-p)/p] \qquad (3)$$

The tangency condition entails:

$[U'(W_1)/U'(W_2)][(1-p)/p] = (1-p)/p \Rightarrow U'(W_1) = U'(W_2) \Rightarrow W_1 = W_2$, given that

$$U''(.) < 0 \qquad (4)$$

Thus, given that individuals are risk averse and insurance companies are risk neutral, the first best is characterized by full insurance. Whenever the premium is set at a higher level than the actuarially fair premium, the degree of insurance coverage chosen by individuals is lower, but under R-S hypothesis of free entry it will then be undercut by competition until the zero-profit equilibrium is reached.

3.2 Equilibrium with Two Classes of Customers

Let us now consider a market consisting of two groups of customers. They are characterized by the same utility function for income in the two states, U(.), but by different accident probabilities.

- high-risk individuals, with probability of accident $= p^h$

- low-risk individuals, with probability of accident $= p^l$, with $p^h > p^l$

Let the percentage of high-risk individuals be equal to λ^{RS}. The average probability of accident is then equal to: $p^{EXP} = \lambda^{RS} p^h + (1 - \lambda^{RS}) p^l$

In this case, it is possible to distinguish between two types of equilibrium:

- **pooling equilibria**, in which both groups buy the same contract.

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[4] A mathematical property states that the level curves of a quasi-concave function are convex.

In any pooling equilibrium, the zero profit condition must hold across all the individual types:

$$(1-p^{EXP})\alpha_1 - p^{EXP}\alpha_2 = 0.$$

• **separating equilibria,** in which different risk-groups choose different contracts.

In any separating equilibrium, both contracts must yield zero expected profits:

$$(1-p^h)\alpha_1 - p^h\alpha_2 = 0 \text{ and } (1-p^l)\alpha_1 - p^l\alpha_2 = 0$$

In Figure 2 we denote with the letter L and H the indifference curves and zero profit lines relative to respectively low-risk and high-risk individuals. Note that the slope of the zero profit line for low-risk individuals (L, with a slope equal to $(1-p^l)/p^l$) is steeper than that relative to high-risk individuals (H, with a slope equal to $(1-p^h)/p^h$). From Figure 2 and equation (3) note also that the slope of the low-risk indifference curve passing through each point $\{W_1; W_2\}$ is higher than that of the high-risk indifference curve through the same point. In other words, each high and low-risk indifference curve can intersect only once ("single-crossing property").

When there are two different groups of individuals first best equilibria are no longer sustainable, as they violate the high-risk group incentive-compatibility constraint. These constraints entail that, whenever two different contracts are offered to the two risk groups, they must be devised so that each group prefers the contract specific to its own risk group to the contract set for the other risk group. No one can be cheated or forced to buy a contract different from the most preferred one available in the market.

Formally, if we denote by α^h the set of contracts meant for the high-risk group and with α^l the set of contracts meant for the low-risk group:

$$V(p^h, \alpha^h) \geq V(p^h, \alpha^l) \text{ and } V(p^l, \alpha^l) \geq V(p^l, \alpha^h) \qquad \text{(I.C. constraints)}$$

First-best equilibria violate the first of these constraints. As Figure 2 shows, if contracts C_1 and C_2 are offered, all individuals would choose C_1. Then C_1 would make losses. As we have shown for the case of identical customers, only contracts on the line EF, such as C_3 and C_4, can be sustained as pooling equilibria.

Figure 2: Equilibrium with Two Classes of Customers
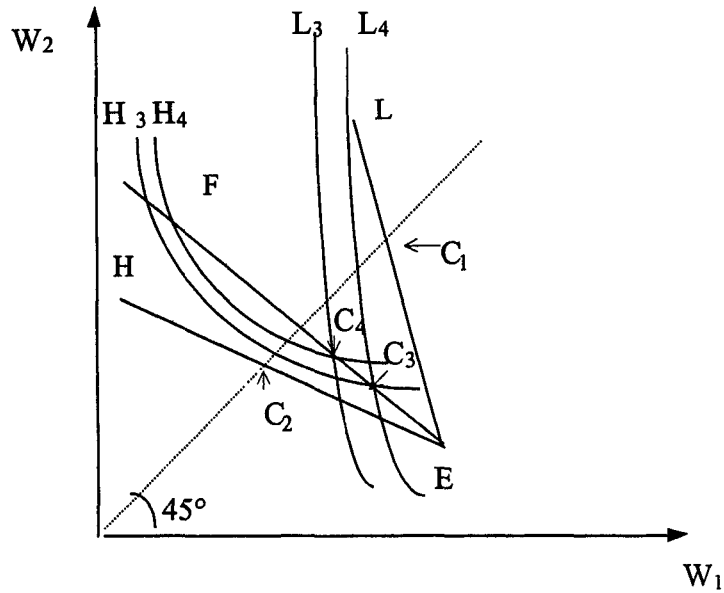
The second, important result that R-S graphically prove is that there cannot be a pooling equilibrium.

Figure 3: Impossibility of a Pooling Equilibrium
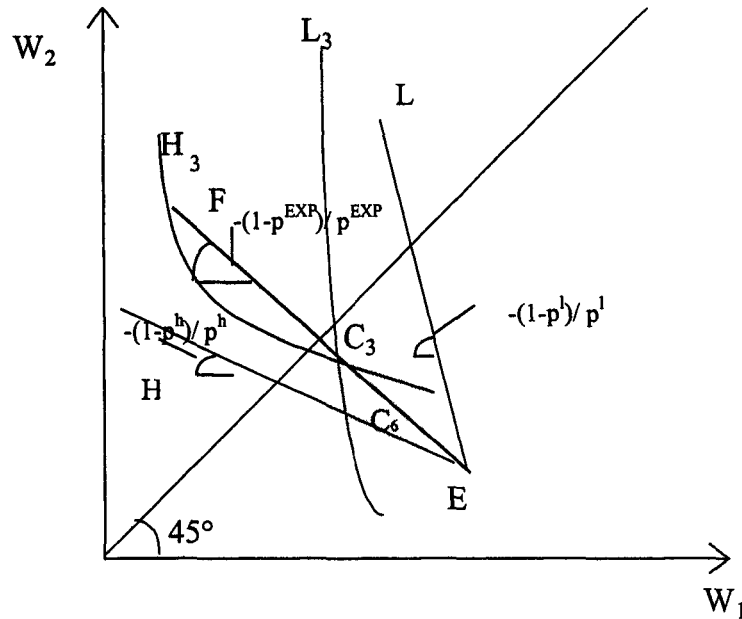
As Figure 3 shows, contract C_3 can always be upset by a contract offer in the full area, such as contract C_6. All low-risk individuals are induced to purchase the new contract when it is offered alongside C_3. Contract C_3 thus becomes unprofitable and cannot be sustained as an equilibrium. The impossibility of pooling contracts derives from the "single-crossing" property.

The only possible equilibrium with different risk-types is a separating equilibrium: we can graphically represent the separating equilibrium in the W_1, W_2 space and in the $\alpha_1, \alpha^\wedge_2$ space respectively.

Figure 4: Separating Equilibrium with Two Risk Types

a)
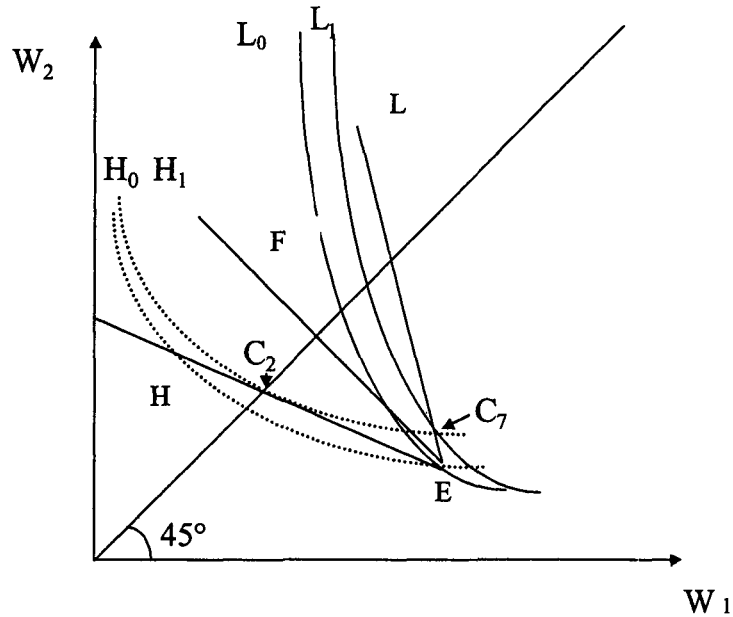
b)

As Figure 4a) shows, contract C_2, characterized by full insurance, is offered to high-risk individuals. To break even it must lie on the high-risk zero profit line. Then, contract C_7 is offered to low-risk. C_7 lies on the zero profit line for low-risks and it is the most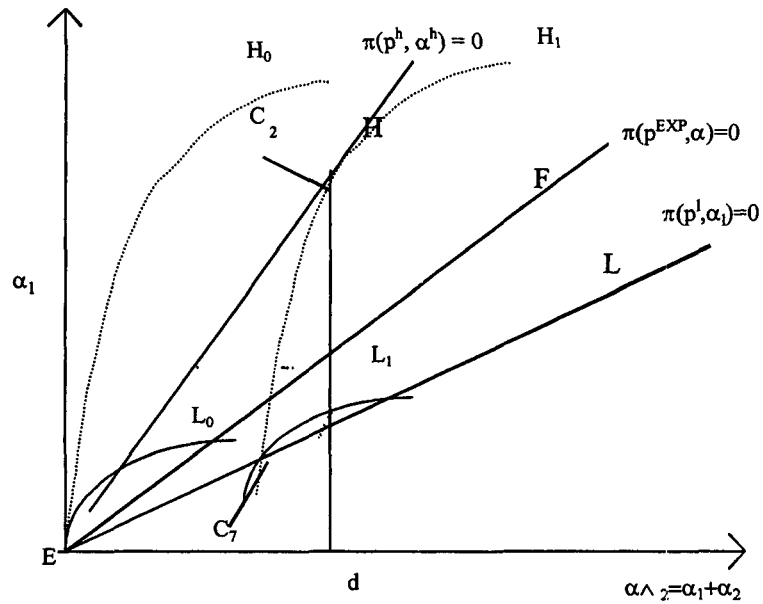 preferred contract by the low-risks among all contracts that respect the high-risk group's incentive-compatibility constraint. Given C_2, any contract along the low-risk group zero profit line above C_7 would be purchased by both groups and would therefore yield negative profits (when both groups purchase the same contract, such contract must lie on segment EF). When the vector of contracts C_2-C_7 is offered, the high-risk incentive compatibility constraint is binding and the two groups of individuals sort themselves out by purchasing two separate insurance plans:

$$H_1 = V(p^h, C_7) = V(p^h, C_2)$$

As Figures 4 shows, in any separating equilibrium the low-risk group gets incomplete insurance (C_7 lays to the right of the bisetrix). Point C_7 is not at the tangency point between any indifference curve for low-risks and their budget constraint.

The same couple of separating equilibrium contracts can be represented in the $\alpha_1, \alpha^{\wedge}_2$ space. Given C_2, the best low-risk types can obtain along segment L is C_7, which is characterized by incomplete insurance ($\alpha^{\wedge}_2 < d$).

Thus, in the R-S model, patients are characterized by private information over their health status and this information influences their decision to buy insurance. Insurance companies, in turn, know that patients' purchasing decision is influenced by their (perceived) health status and offer less than optimal coverage contracts in order to screen low-risk from high-risk individuals.

In specific circumstances, a separating equilibrium may fail to exist; in this case the competitive insurance market has no equilibrium. This occurs when:

- the cost of pooling for low-risk is not substantial while cost of separating, thus accepting incomplete insurance, is high (high degree of risk aversion for low-risk);
- there are few high-risk;
- the probability of the loss occurring to low-risks is not very dissimilar from that of high-risk.

Let us show a situation in which an equilibrium may fail to exist:

Figure 5: Impossibility of a Separating Equilibrium
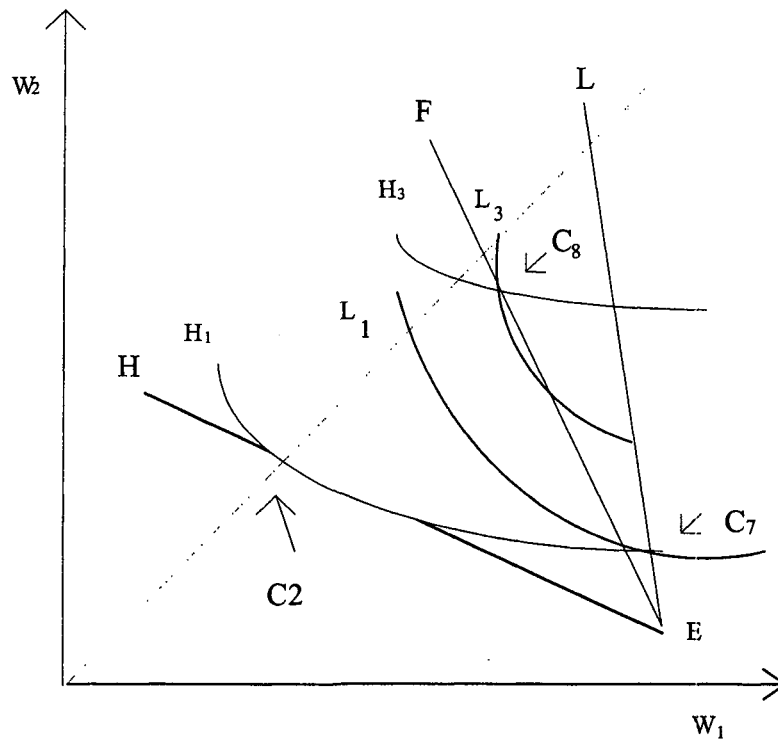
Contracts C_2-C_7 are upset by contract C_8 that attracts both risk groups. Contract C8 lies on segment EF, so it is sustainable when both groups purchase it. The separating equilibrium is unstable whenever at least a segment of EF, the pooling contracts zero profit line, lies above L_1, that represents the low-risk indifference curve in correspondence to the separating equilibrium. In turn, as we showed before, any contract that pools both risk groups together, such as contract C_8, cannot be a stable equilibrium.

3.3 Final Remarks on the R-S Model and Introduction to Subsequent Developments in the Literature

R-S show that in a situation of information asymmetry insurance companies can limit the amount of insurance guaranteed in order to improve available information on customers' risk. R-S result is robust to changes in hypotheses as long as individuals with different risk properties differ in some characteristics that can be linked to their purchase of insurance and, somehow, insurance companies can discover that link.

When R-S published their seminal work economic theory still lacked a solid foundation for welfare analysis under conditions of imperfect information. However, R-S had the intuition that the separating equilibrium reached by the insurance market entailed a welfare loss. In the separating equilibrium low-risk obtain less than optimal coverage

while high-risk individuals do not improve their situation with respect to the first best. In other words, high-risk impose a negative externality on low-risk. In fact, R-S show that when each insurance company can offer more than one contract, the separating equilibrium is Pareto inferior to a set of contracts characterized by some positive redistribution from low-risk to high-risk (Rothschild and Stiglitz, 1976, pp.644-645), unless there are enough high-risk people.

Building on R-S contribution, one stream of microeconomic literature, that labeled of "equilibrium refinements", changed the hypotheses underlying firms' or individuals' behavior in order to overcome R-S puzzling result that in certain circumstances no equilibrium may exist in the insurance market. A second stream of literature set the foundation for welfare analysis under conditions of imperfect information by looking at the properties of "second best" equilibria. Such equilibria emerge when the individuals' maximization problem is not only constrained by resource availability but also by agents' incentive-compatibility constraints.

We will provide a brief account of both streams of analysis and then focus our attention on the main policy implications that can be drawn from the comparison of market outcomes and second best equilibria.

4. Equilibrium Refinements

R-S assume myopic (Nash) behavior by insurers and insured: neither firms nor individuals anticipate others' possible reaction when deciding their strategy. Wilson (1976) is the first to remove this hypothesis and to assume that insurance companies behave strategically, in accordance with the analysis of firms' behavior in oligopolistic markets. Wilson gives the following characterization of the equilibrium set of contracts:

- customers maximize expected utility;
- no contract in the equilibrium set entails negative expected profits;
- there does not exist any new contract still profitable even when all loss-making contracts are withdrawn from the market as a result of this entry.

So, unlike R-S, any deviation from the equilibrium must continue to be profitable even after all non-profitable contracts are discontinued.

A second contribution to the literature of "equilibrium refinements" is that by **Grossman (1979)**, who makes the hypothesis of "dissembling" behavior by high-risk individuals. According to Grossman, all potential health insurance customers know that in equilibrium any loss-making contract will be withdrawn from the market. Therefore, when high-risk individuals submit their application for insurance they self-restrain their choice between the set of contracts chosen by low-risk and those which would not entail losses even if chosen only by high-risk individuals. By anticipating insurers' strategy,

high-risk individuals realize that any other strategy would ultimately lead them to be completely excluded from the market.

Under Grossman's as well as Wilson's hypotheses the same set of equilibria is selected. The R-S separating equilibrium continues to hold when the proportion of high-risk λ is greater than a certain threshold λ^{RS}, where λ^{RS} is the percentage of high-risk individuals that guarantees the existence of the separating equilibrium in the R-S model. However, when $\lambda < \lambda^{RS}$ the pooling equilibrium preferred by low-risk becomes a stable equilibrium. When the percentage of high-risk individuals is small enough, low-risk prefer to cross-subsidize contracts for high-risk in the pooling equilibrium rather than accept a lower level of coverage in the separating equilibrium. Thus, the pooling equilibrium preferred by low-risk becomes stable. Let us see why.

Figure 6: Under Wilson's and Grossman's Hypothesis, Pooling Equilibrium Preferred by the Low-Risk Group Becomes Stable when There Are Few High-Risk Groups in the Market
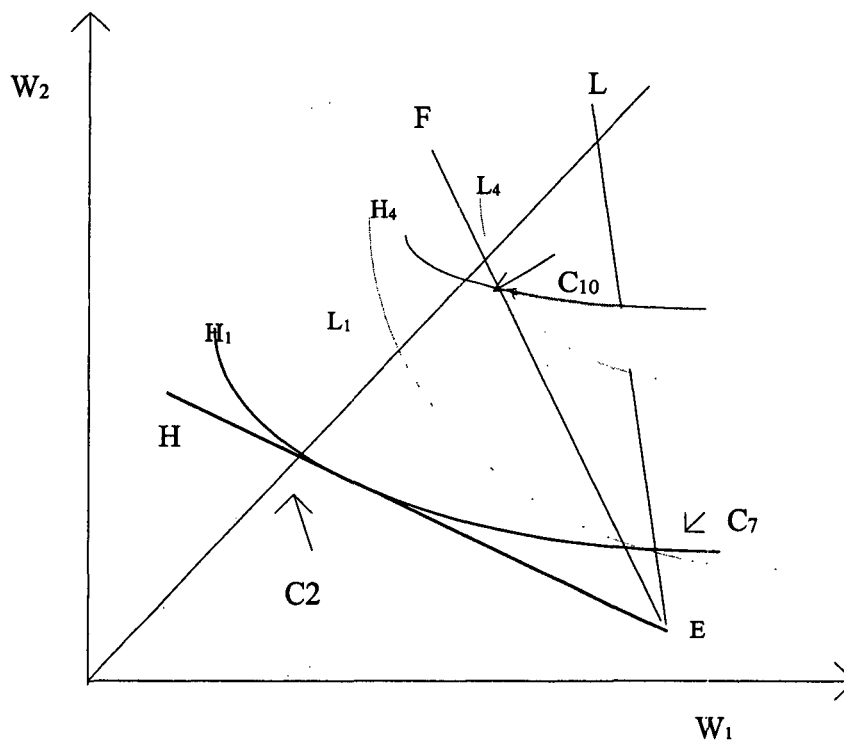
Under the new assumptions about insurance companies' (Wilson) or individuals' (Grossman) behavior, pooling equilibrium C_{10} is stable. Recall that in the R-S model any new contract offer in the full area was able to upset C_{10} by attracting only low-risk individuals. However, the new contract offer would lead to terminate contract C_{10}, burdened by all high-risk and above the high-risk group zero profit line. Once C_{10} is

withdrawn, also the new contract in the full area would become unprofitable. Thus, under Wilson's hypothesis, the new contract is not a profitable deviation from C_{10}. Under Grossman's hypothesis of strategic behavior on the part of individuals, high-risk would immediately "follow" low-risk in any deviation from C_{10} in the full area, thus making any such deviation unprofitable. If they didn't, they would immediately be "recognized" as high-risk and offered a contract on the high-risk zero profit line, which would entail a lower utility level. High-risk "dissemble" as low-risk by choosing the low-risk individuals' preferred contract as long as this entails a level of utility higher than what they can gain in C_2. Note that under Grossman's hypothesis, unlike R-S's, both risk groups are subject to a negative externality because of the asymmetry of information.

A third contribution to the literature of "equilibrium refinements" is that by **Miyazaki and Wilson** (1977): they adopt Wilson's concept of equilibrium, but also make the hypothesis that each insurance company is able to offer a plurality of contracts and to cross-subsidize unprofitable contracts with profitable ones. Under their hypothesis the equilibrium is always characterized by a positive cross-subsidy, unless the percentage of high-risk λ is greater than a certain threshold λ^{MW}, in which case the R-S separating equilibrium prevails. **Riley** (1979) shows that if we extend the R-S model to a continuum of types under the same behavioral hypotheses, the insurance market may fail to have a stable equilibrium under any distribution of risk types. Riley also modifies R-S hypothesis of Nash behavior on the part of the insurers and develops the concept of reactive equilibria: insurers do not offer contracts that they know will become unprofitable after induced entry adjustments are completed. **Stiglitz** (1978) extends the analysis of the equilibria in the insurance market to the case of monopoly, showing that when there are only two risk groups the only possible equilibrium is a separating equilibrium in which high-risk achieve full insurance and low-risk individuals may be only partially insured. In any case, low-risk are always subject to terms that make them indifferent between buying insurance or be uninsured and, if the percentage of high-risk is large enough, they end up buying no insurance. Thus, in case of monopoly, although the distribution of surplus is more favorable to the insurer than in competition, some of the qualitative results that characterize the analysis of competitive markets are reinforced.

Introducing partial market imperfections, however, may lead to better results. **Newhouse** (1996) shows that if there are positive transaction costs, the pooling equilibrium can become stable even under R-S behavioral hypotheses because the net gain from upsetting it can be more than compensated by the additional transaction costs necessary to devise a new contract. **Ercinosa and Sappington** (1997) show that market power and scale economies can facilitate the coincidence between socially preferred and market outcomes. In the spirit of the literature on "contestable markets", they show that if there are positive sunk-costs (costs of entry that cannot be recovered once sustained) there exist market equilibria where the incumbent insurance company cross-subsidizes loss making contracts (those on high-risk) with profitable ones (those on low-risk). The

intuition is that in presence of scale economies a firm that serves only low-risk patients faces higher average costs of production than a firm that serves both risk groups does. So, the potential advantage of screening risks may wither away.

In summary, the contributions to the literature known as "equilibrium refinements" highlight that the final characterization of the equilibrium in the health insurance market will depend on the type of **market structure** (which determine firms' behavior and constraints). It is clear for example that M-W equilibria, characterized by a positive subsidy across risks, will tend to become unstable as competition in the market becomes harsher and so the incentive to terminate unprofitable contracts increases.

5. Second Best Equilibria

Second best analysis represented an important breakthrough in the economics of imperfect information as it provided a benchmark against which market equilibria under conditions of asymmetric information could be evaluated. The core concept, first developed by Harris and Townsend (1981) and then explicitly applied to the insurance market by Crocker and Snow (1985) is that of constrained Pareto-efficiency. A market allocation is constrained-Pareto efficient, or second best, if it is Pareto efficient among all possible allocations satisfying:

- resource constraints;
- incentive compatibility, or self-selection constraints.

In other words, Pareto-constrained equilibria are "the best" (in terms of agents' utility) that can be achieved whenever a self-selection or incentive compatibility constraint (according to which agents must be induced to reveal their private information) is present alongside a resource constraint.

As before, let us define α^h the set of contracts meant for the high-risk group and α^l the set of contracts meant for the low-risk group. The formal structure of the problem to characterize second-best equilibria is the following:

$$\text{Max}_{\alpha l\, \alpha h}\ \mu V(p^h, \alpha^h) + (1-\mu)V(p^l, \alpha^l) \tag{5}$$

S.T.

1. $\lambda \pi(p^h, \alpha^h) + (1-\lambda)\ \pi(p^l, \alpha^l) = \lambda[(1-p^h)\ \alpha^h_1 - p^h\alpha^h_2] + (1-\lambda)[(1-p^l)\ \alpha^l_1 - p^l\alpha^l_2] \geq 0$ (resource constraint).

2. $V(p^h, \alpha^h) \geq V(p^h, \alpha^l)$

3. $V(p^l, \alpha^l) \geq V(p^l, \alpha^h)$ (self-selection or incentive-compatibility constraints).

μ is an arbitrary weight given to high-risk in the welfare function: $\mu \in [0,1]$. Second best contracts are Pareto-efficient contracts among those satisfying constraints 1-2-3.

If we exclude equilibria characterized by over-insurance[5] (where individuals would end up having higher wealth in case the loss occurs), the characterization of second best equilibria is the following (**necessary conditions**):

a) α^h provides full insurance to high-risk.

b) high-risk are indifferent between α^h and α^l

c) eventual losses (gains) on high-risk contracts α^h are exactly compensated by gains (losses) on low-risk contracts α^l.

Graphically:

Figure 7: Second Best Equilibria
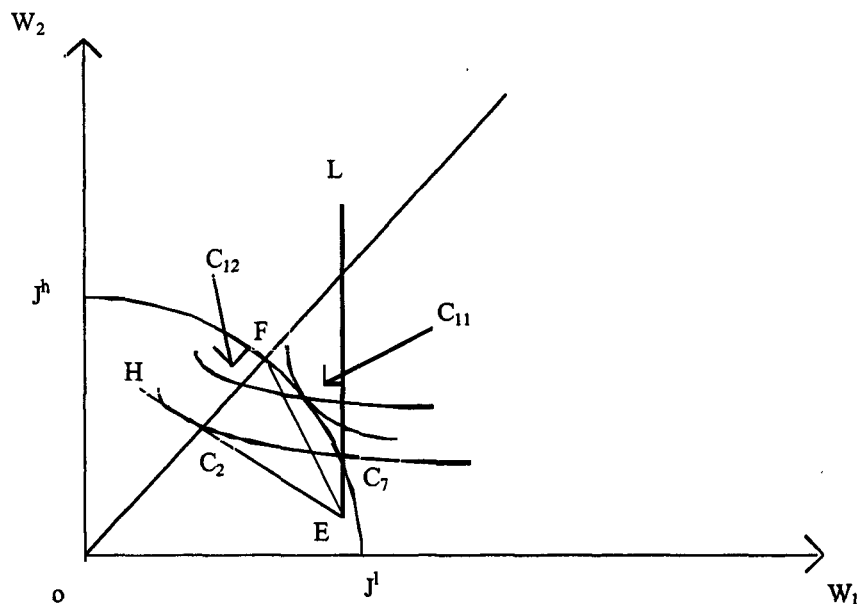
In Figure 7, J^1F represents the set of contracts for low-risk that, in combination with full insurance contracts for high-risk along C_2F, satisfy conditions a), b) and c) above. In C_2-C_7, the separating market equilibrium, there is no cross-subsidy between risk groups. As we move along J^1F starting from C_7 and towards F from C_2, the cross-subsidy from low to high-risk increases: low-risk are paying progressively more than a "fair" premium (shown on the segment EL) for receiving more coverage and this extra-money is transferred to high-risk, who are paying progressively less than in C_2 to obtain full insurance. In Figure 2.7 low-risk initially increase their utility level (up to C_{11})

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moving from C_7 along J^1F. In parallel, high-risks' utility increases moving from C_2 to C_{12}. We are therefore moving from Pareto-dominated to Pareto-superior contracts. In the example considered, from C_7 (the separating equilibrium contract) low-risk are willing to pay more than a fair extra premium in order to receive more coverage. By cross subsidizing high-risk, they are able to relax the high-risks' incentive compatibility constraint and receive more coverage while still separating from high-risk.

C_{11}-C_{12} is the low-risks' preferred equilibrium among second best equilibria. If we further increase the degree of redistribution across risks, moving from C_{11}-C_{12} towards F, high-risks' utility further increases while low-risks' utility decreases. So, the combinations of contracts along FJ^1 from C_{11} to F for low-risk individuals, which corresponds to contracts on segment C_{12} to F for high-risk, are not Pareto comparable and represent the set of (constrained) Pareto-optimal contracts. In general **second best some positive level of redistribution characterizes equilibria across risks**. This is a very important result for the health insurance market.

In health it is possible to justify redistribution across risks on the basis of different principles:

1. First, on **equity grounds,** by pointing out that in a democratic society it ought to be public responsibility to care for the health needs of those, like the old and the chronically ill, who would otherwise be unable to afford to pay directly for services or to buy insurance at a premium that reflects their health risk.

2. Or one can motivate redistribution by appealing to a **life-cycle argument**: the young and healthy (low-risk) accept to pay more than they consume because they know that in the future, when they will become old and sick, they will in turn be able to benefit from subsidized health insurance coverage.

3. The above analysis, though, provides a third argument in favor of redistribution or cross-subsidization **by showing that even in a static context a positive level of cross-subsidization across risks may be welfare improving**. In other words, even without considering the future, it may be in the low-risk group's interest to provide some form of subsidy in favor of the high-risk individuals as a means to achieve a degree of coverage closer to their preferred full coverage contract and still be separated from the high risks.

6. Optimality of Market Equilibria

It is possible to use the conceptual framework sketched above as a benchmark to analyze the optimality of private insurance market equilibria, according to different behavioral hypotheses.

As we showed above, the R-S separating equilibrium may not be second best optimal (in Figure 7, C_2-C_7, the R-S separating equilibrium, is Pareto-dominated by C_{11} C_{12}). That is because the separating equilibrium is characterized by an **excessive degree of market segmentation**: different risk groups are screened through the provision of different contracts and in equilibrium each contract must break even. The market cannot provide both separation of risks and cross-subsidization. Therefore, whenever second best equilibria are characterized by positive cross-subsidization, the market separating equilibrium is sub-optimal. This is not necessarily true. R-S separating equilibrium can be second best optimal when the percentage of high-risk individuals is sufficiently large, as in Figure 8:

Figure 8: R-S Separating Equilibrium May Be Optimal
If The Percentage of High-Risk Is High Enough
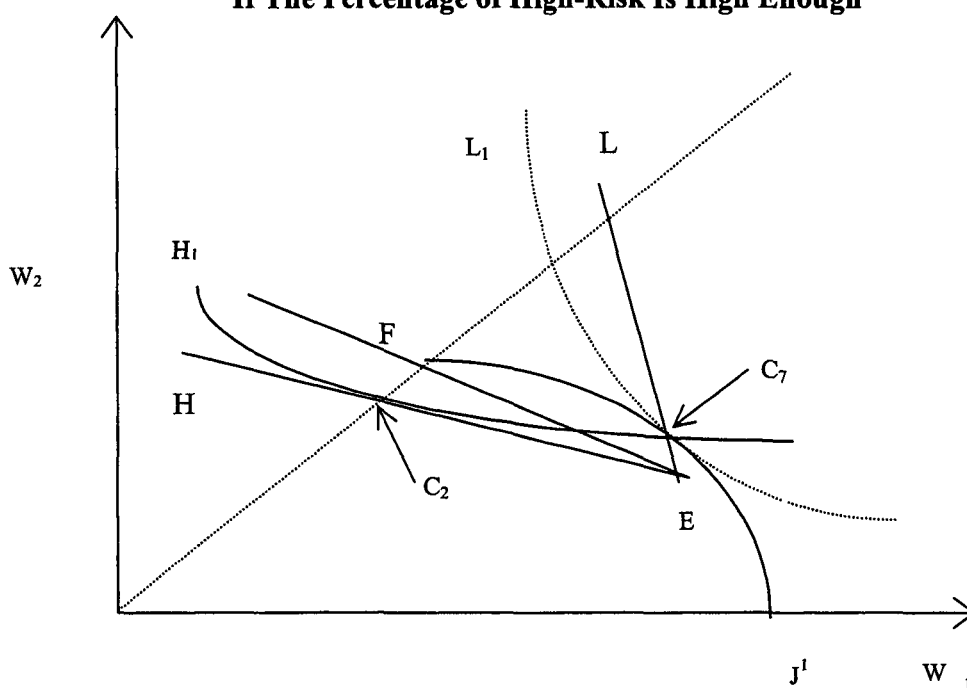
The intuition is that as the percentage of high-risk increases it becomes more and more expensive for low-risk to cross-subsidize them. So, above a certain threshold λ the extra benefit low-risk gain from increasing their insurance coverage relative to the R-S equilibrium level is not sufficient to justify the extra costs they must sustain to cross-subsidize high-risk. They prefer the separating equilibrium contract, with no cross-subsidy. The same result holds if low-risk are not very risk-averse, or if their probability of incurring the loss is low. It turns out that the threshold λ, which we will denote λ^{MW}, is greater than λ^{RS}, the percentage of high-risk above which the R-S separating equilibrium exists and holds under Wilson's as well as Grossman's hypotheses. There is

an interval $\lambda^{RS} < \lambda < \lambda^{MW}$ where the R-S separating equilibrium exists and it is sub-optimal.

When $\lambda < \lambda^{RS}$ we have seen that under Wilson's as well as Grossman's hypotheses the pooling equilibrium preferred by low-risk becomes stable. Such pooling equilibrium is never second best optimal because it violates condition a) for second best equilibria, i.e., it does not provide full insurance to high-risk. The pooling equilibrium, however, may not be Pareto comparable with the second best pair of equilibrium contracts preferred by low-risk (contracts C_{11} and C_{12} in the previous Figure may be characterized by a level of utility for high-risk lower than in the pooling equilibrium) and with the second best equilibrium preferred by high-risk (point F corresponding to full insurance on the pooling line, entails a level of utility for low-risk lower than in the pooling equilibrium). This situation is represented using a Utility Possibility Frontier graph in Figure 9 below. In general, though, from a pooling equilibrium it is possible to reach Pareto-superior points by allowing a restructuring of cross-subsidies that separates the different risk groups. Finally, the Miyazaki-Wilson pooling equilibrium exactly coincides with the second best equilibrium preferred by low-risk whenever $\lambda < \lambda^{MW}$. Otherwise, under the M-W hypothesis, the R-S separating equilibrium is selected. Thus, M-W equilibria coincide with second best equilibria.

Figure 9: Second Best and Pooling Equilibria

F=Full insurance pooling equlibrium

Ut High Risks

Set of 2nd best Pareto optimal equilibria

Market pooling equilibrium

$C_{11}C_{12}$=Second best equilibrium preferred by low risks

Ut Low Risks
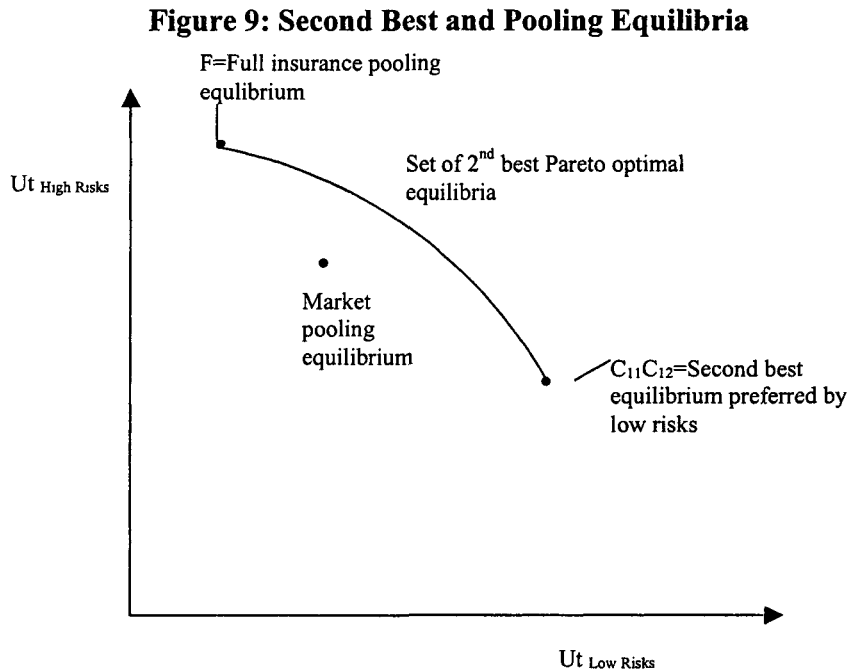
7. Policy Analysis

The previous section showed that private market equilibria do not always lead to Pareto-optimal outcomes, not even in a constrained sense. However, theoretical analysis also suggests that if there are **transaction costs** or **entry costs**, the market can achieve a second best equilibrium characterized by positive cross-subsidies. In other words, phenomena which are normally considered frictions, obstacles to the full display of the "beneficial effects" of competition, in the insurance market may play a positive role by making contracts that imply a cross-subsidization across risk groups sustainable. At the same time, as Newhouse (1984) noted, transaction costs may also exacerbate the effects of the adverse selection problem. If switching individuals across insurance plans is difficult, insurers will be extra-careful before making an offer to a potential high-risk consumer. If it is impossible or too costly for an insurer to risk-rate a new applicant, the insurer may either reject the applicant or ask an extremely high premium.

It is possible to use the conceptual framework developed so far to analyze the effects of different policy options that correct spontaneous health insurance market dynamics. We will build upon the contribution of Neudeck and Podczeck, 1996 (hereafter N-P). N-P adopt Grossman's hypothesis about high-risk individuals' dissembling behavior, according to which insurers eventually turn down non-profitable contracts. So, no cross subsidization of contracts takes place in the separating equilibrium. The set of policy options they consider is the following:

1) Public provision of insurance/subsidies. Four cases are discussed:

a) Full public insurance.
b) Partial compulsory public insurance, without or with possibility of acquiring supplementary insurance from the private sector (topping up).
c) Full public insurance with possibility of opting out.
d) Risk-adjusted premium subsidies.

2) Regulation of the private insurance market. Three cases are discussed:

a) Standard contract with full-coverage.
b) Minimum insurance.
c) Premium rate restrictions.

Let us analyze first the full coverage public insurance and the partial compulsory insurance options, with or without the possibility of acquiring supplementary insurance from the private sector. We will utilize the analytical framework developed in the preceding sections.

Full public insurance leads to the second best equilibrium preferred by high risk individuals, that is the pooling, full insurance equilibrium F. Point F is characterized by

maximum redistribution across risk types and may be not Pareto-comparable with the market separating equilibrium C_2-C_7 (low risk may be better off in C_7 than in F).

Partial public insurance brings both risk groups along the pooling line, EF, say to point D. Figure 10 shows that, starting from point D, it is possible to reach Pareto-superior points by allowing individuals to purchase supplementary insurance from the private sector. By these means, from point D separating contracts C_{11} C_{12} can be reached, which are those preferred by low risk among second best contracts. By varying the degree of public insurance (which is equivalent to moving the initial endowment point along segment EF) and by allowing supplementary private insurance all second best contracts can be obtained as separating market equilibria. The higher is the degree of public insurance coverage, the higher is the degree of redistribution from low to high-risk individuals and the higher is the utility of high risk.

**Figure 10: Full Public Insurance and Partial Public Insurance**
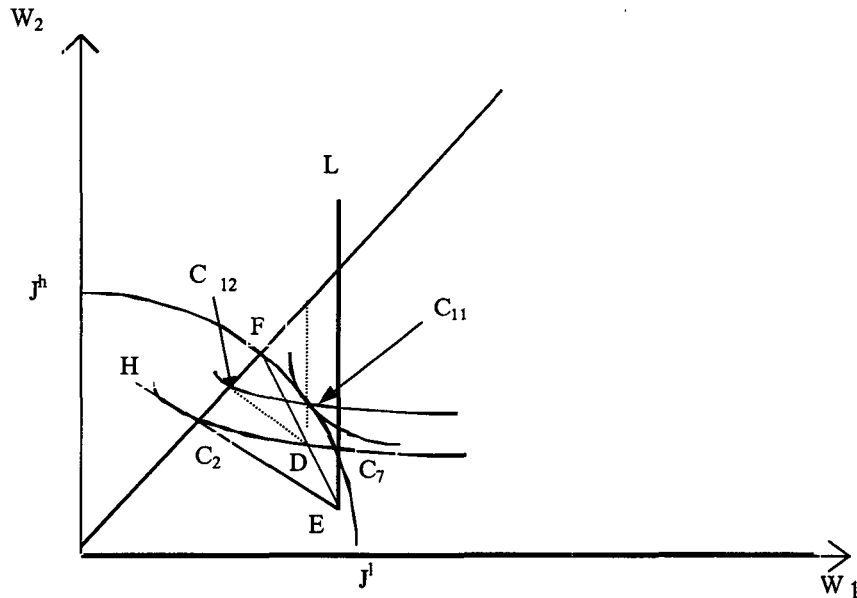
The third type of public intervention N-P consider consists of full public insurance with possibility of opting out. Those who believe in competition as a means to stimulate greater efficiency in the health insurance market often advocate this possibility. The possibility of opting-out would allow private insurers to enter into the market and offer health coverage in competition with the public scheme. Those who oppose such liberalization, however, claim that the public sector would then lose the low risk individuals' contribution and would still be burdened by all the high-risk, which are cream-skimmed by the private sector. In fact, N-P show that this option is able to lead to a second-best outcome, as long as low risks accept to continue subsidizing the provision

of public insurance even when they are not benefiting from it any more. So, in the context of adverse selection models it is not necessarily true that allowing low risk to opt out of the public insurance scheme will inevitably lead to an unbalanced financial situation and to worse high-risk individuals' condition. However, the issue left aside by these models is how to maintain a political consensus for the cross-subsidy provided by the public scheme, once the latter does not serve any more those who are supposed to be its net-contributors.[6]

Figure 11 can be used to illustrate N-P's result:

Figure 11: Full Public Insurance with Possibility of Opting Out
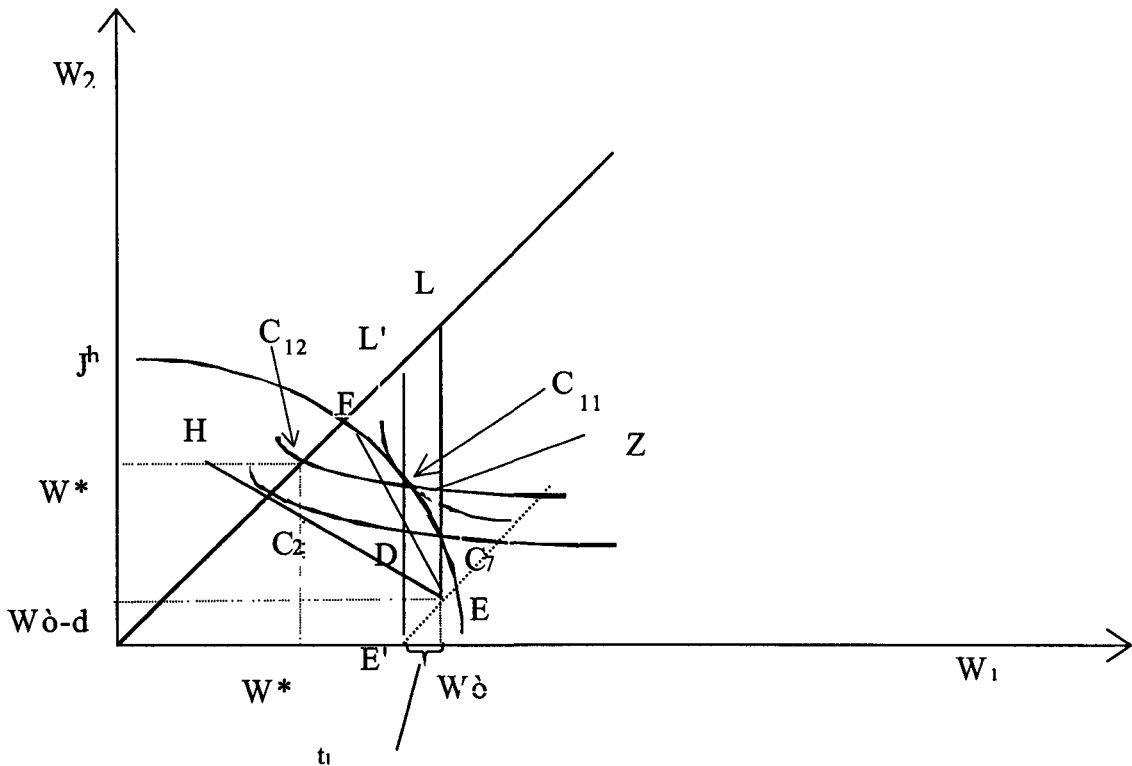
Suppose that the government offers contract C_{12}, characterized by full insurance and preferred to the competitive equilibrium contract C_2 by high risk. Such contract is subsidized and it is above the actuarial or "fair" odds line for high risk. The total per capita loss for the government would be equal to $W^*-W\grave{o}+t+p^h d$ (contract C_{12} gives with certainty wealth W^* from an expected after-tax endowment equal to $W\grave{o}-t-p^h d$).

Let us consider the following policy: the government levies the tax t_1 on all individuals and then opens the possibility of opting out. In figure 11, the tax switches the low risk individuals' initial endowment from E to E' and their fair odds line from segment EL to E'L'. As the figure shows, from C_{12} low risk (unlike high-risk individuals) prefer to deviate and choose contract C_{11} if this contract is offered. Contract C_{11} is the best low risk can achieve along their after tax fair odds line (E'L') among the set of contracts not preferred to C_{12} by high risk (so it is the best contract compatible with separation of risk groups). It is possible to show that C_{11}-C_{12}, is an equilibrium and it is actually the only equilibrium, given the full insurance contract offer C_{12} and the tax on initial endowments. In equilibrium the fraction of beneficiaries to taxpayers would be determined by the fraction of high-risk individuals in the population, λ. Then, the lump sum (capitation) tax on initial endowments necessary to sustain contract C_{12}, if this contract is chosen by high risk only, would be equal to:

$$\lambda t_1 + (1-\lambda)t_1 = \lambda(W^* - W\grave{o} + t_1 + p^h d)$$

$$t_1 = \lambda/(1-\lambda)(W^* - W\grave{o} + p^h d)$$

Note that any attempt at undercutting C_{11} in order to attract low risk (such as contract Z) would lie to the right of E'L' and would be unfeasible given the low risk individuals' after-tax endowment. Moreover, there is no contract offer along the zero profit pooling line able to attract low risk (so there cannot be any pooling equilibrium). Also note that there is no other separating contract that would be able to attract high risk (all the points on segment EH lie below C_{12}).

C_{11}-C_{12} is the second best equilibrium preferred by low risk individuals. With a different full insurance contract offer on segment C_{12}-F along the bisetrix and a different tax on initial endowments any second best equilibrium can be reached. Similar results could also be obtained through an opting-out fee. It is only critical that the government be able to maintain a positive cross-subsidy across risk groups.

We can use Figure 11 to illustrate also the effects of a **risk-related premium subsidy** for the high-risk persons, funded through a mandatory contribution to a solidarity fund from the low risk. The contribution would increase the accessibility and affordability of health insurance for the high-risk, allowing them to purchase contract C_{12} and it would at the same time shift the low-risks' actuarial odds line from EL to E'L'.. Insurers' interest in selectively attracting low risk through contract offers such as Z would be limited and the low-risk would be able to achieve higher coverage in a separating equilibrium. The cross-subsidy would be earmarked for purchasing health insurance with a specified health insurance coverage (in Figure 3.2, full coverage) and it

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"voice", in Hirshman's (1970) terminology, can instead choose to "exit."

would be exclusively based on individuals' relevant risk characteristics (the lower the risk, the higher the contribution, or the lower the subsidy). Unlike a premium tax deduction, it would be unrelated to the premium amount that individuals actually pay.[7] Van de Ven et al. (2000) and Van de Ven and Ellis (2000) provide a detailed analysis of the different ways through which risk-adjusted cross subsidies may be implemented and of the different possible risk-sharing mechanisms among insurees, insurers and the solidarity fund. In the implementation of the risk-adjusted subsidies two main issues arise. The first concerns the criteria according to which the different risk categories are determined. In the above example with just two risk groups and with a residual subsidized public insurance contract, the low risk were self-selecting themselves by opting out of the public scheme. With more than two categories, van de Ven suggests the adoption of a nationwide standard rating model as a basis for determining the subsidy value per risk category, as well as a sharing of information between insurance companies regarding the risk factors of those who decide to switch to another insurer. The second, related issue, is how to determine the subsidy/contribution for the different risk categories. Newhouse (1989) proposes that a combination of prospective risk-adjustment methods and of cost-utilization based payments be used. Purely prospective risk-adjusters are able to capture but a fraction of the variability in individuals' future health expenditure. On the other hand, cost-based payments hinder insurers' incentive in improving efficiency and searching for the more cost-effective care available in the market.

In alternative to direct public provision/subsidization of insurance, the government could try to regulate the private insurance market. This is the alternative advocated by those who consider private insurers much more efficient than public agencies at managing insurance funds and at stimulating greater consumer responsiveness from providers. If the same results obtained through public insurance could be reached through appropriate regulation of the private insurance market, there would be no need for direct public provision of insurance. N-P show that the above argument is actually wrong. The first form of regulation they consider consists in an obligation imposed on all private insurance companies to offer a **standard contract** with full coverage open to any individual. In this case private companies are free to offer any other contract they wish, alongside the standard contract. N-P show that with this form of regulation no equilibrium may exist. Let us consider Figure 12 below. The standard full insurance contract imposed by regulation must lie on segment C_2-F along the bisetrix (contract offers to the south-west of C_2 are ineffective, as nobody would choose them, while

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[7] When the amount of the deduction increases with the total premium individuals, their "fair odds line" (which is their budget constraint, showing the best rate at which they are able to exchange income between the two staes) changes inclination. Then we would observe a subsitution as well as an income effect, and most likely a larger equilibrium level of insurance (unless a large negative income effect compensated the substitution effect).

contract offers to the north-east of F are unfeasible). Let us consider a compulsory full insurance contract offer in C_{12}. As explained before, such contract entails a positive subsidy in favor of high risks from low risk individuals in any separating equilibrium. It was also proved that no pooling equilibrium exists, as it can always be upset by contract offers (such as contract C_{14} in the shaded area comprised within the pooling zero profit line, the high risk indifference curve through C_{12} and the low-risk after tax zero profit line) able to attract low risk and to induce high risk to accept standard contract C_{12}, which is the best they can achieve in any separating equilibrium. From C_{14} Bertrand competition for low risk will eventually bring contract offers for low risk to C_{11}, along segment E'L'. C_{11}-C_{12} is a separating equilibrium and the only possible equilibrium when E'L' is low risk zero profit line. In this case E'L' is the new budget line for low risk when they subsidize standard contract C_{12} and all insurance companies get the same share of high and low risk individuals.

Figure 12: Standard Contract with Full Coverage
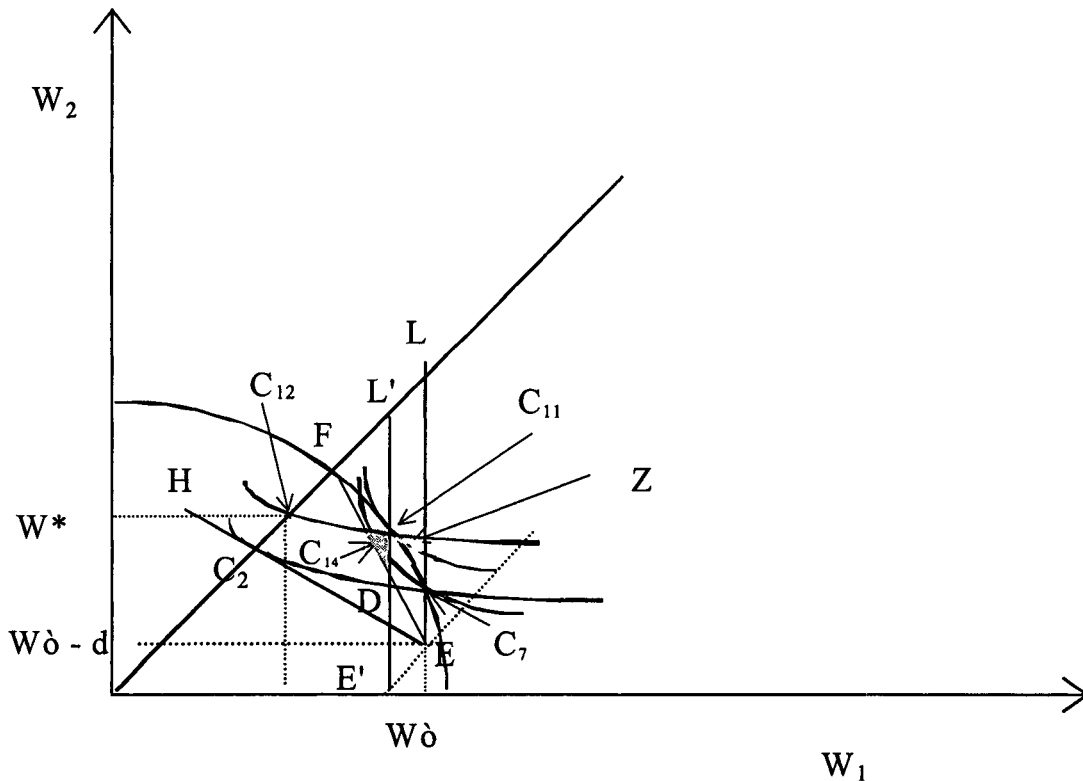
However, the cross-subsidy necessary to sustain C_{11}-C_{12}, which was previously achieved through taxation, cannot be imposed on private insurers: now contract C_{11} can further be undercut by contract offers such as Z. This contract is profitable (being to the left of EL), as long as the deviating insurer is able to attract all low risk and gets an equal share of high risk individuals. Thus, the standard contract policy leads to market instability unless all insurance companies are required to have the same proportion of

high-risk individuals. Let us illustrate the point by an example. Suppose each high-risk individual receives $20 over his/her "fair odds" premium in the standard contract C_{12}. There are 10 high-risk individuals and so the total cross-subsidy to high risk is equal to $200. Suppose there are two competing insurers in the market, each of which has to shoulder half of the high-risk individuals. If there are 20 low risk individuals and if low risks are evenly distributed across the competing insurers, each low risk individual would have to pay $10 = $20 (1/3)/(2/3) above her fair-odds premium, regardless the insurer she was insured by. In terms of figure 12, we can imagine that such cross-subsidy shifts the low risk zero profit line to $E'L'$. However, suppose that one of the two insurance companies offers a contract such as Z and attracts all low risk individuals, at the same time maintaining an equal share of high-risk individuals with the mandatory standard contract. As before the total cross-subsidy that each insurance company needs to collect from low risk individuals to sustain the standard contract is equal to 100, half the total subsidy. However, in the new situation the 20 low risk individuals that choose contract Z can pay such cross-subsidy $5 each [$5 = $20(1/5)/(4/5)].

Thus, the imposition of a standard contract may cause chronic instability in the market, as competitors try to undercut each other in order to spread the burden of the standard contract across a relatively larger pool of low risk.

The second form of regulation that N-P consider is that consisting of a **minimum insurance** requirement. In our graphs, a minimum insurance requirement is equivalent to imposing a lower bound on the wealth level in case the accident occurs, measured on the vertical axis. In figure 13, if the starting point is the separating equilibrium, we can distinguish three cases:

- A minimum insurance requirement comprised between M_1 and M_2. In this case the minimum insurance constraint is binding only for low risk and the high risk individuals' indifference curve through C_2 (H_1 in Figure 13) lies above the highest indifference curve for low risk along the pooling line EF (L_4 in Figure 13). In that case the utility that low risk can gain by still separating from high risk (choosing a point along H_1 between C_7 and C_{15}) is higher than the maximum utility they can achieve in any pooling equilibrium. Then, the minimum insurance constraint will be binding for low risk and the latter will choose a separating contract along H_1, such as C_{15}, while high risk will choose the separating equilibrium contract C_2.

- A minimum insurance requirement between M_2 and M_3. In this case the minimum insurance requirement is not binding, as low risk prefer to switch to the pooling equilibrium C_{10}. Given Grossman's hypothesis of dissembling behavior by high risk, this equilibrium will be stable as any deviation able to attract low risk will also attract high risk (who would otherwise be offered the separating contract C_2) and will then become unprofitable.

- A minimum insurance requirement above M_3. In this case the equilibrium will be

found on the pooling line in correspondence to the intersection with the minimum insurance requirement. So, the constraint is binding for low risk and, above C_2, is also binding for high risk. In the extreme, the regulator can impose the full insurance pooling equilibrium in F.

In general, the equilibrium with a minimum insurance requirement is not second best and cannot be compared with the market equilibrium. However, by a minimum insurance requirement the regulator can pose a limit to the practice of underwriting existing contracts in order to attract low risk and can stimulate a positive cross-subsidization across risk types.

Figure 13: Imposition of a Minimum Insurance Requirement
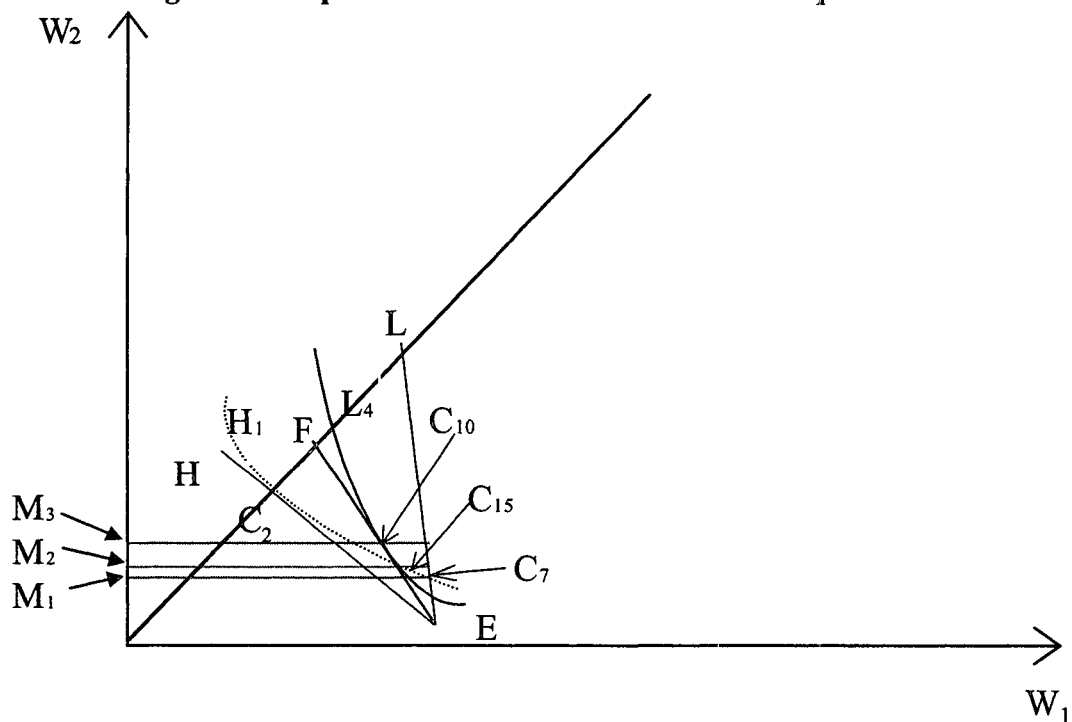
The last form of regulation we consider is premium rate restrictions. Rate restrictions are assumed to apply to a specified health insurance coverage.[8] In terms of the above graphs, such form of regulation entails a restriction on the allowable gap between the rates charged to high-risk vis-à-vis those set for low-risk individuals. That is equivalent to force a cross-subsidy between the two groups, aimed at making health coverage more accessible for the high risk. Similarly to the case of the standard contract regulation, imposing rate-restrictions may actually exacerbate the effects of adverse selection, as

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[8] To prevent the insurers from rejecting new applicants or from cream-skimming high risk individuals, the regulator may complement premium rate restrictions with a periodic open enrolment requirement.

insurance companies struggle to dilute the share of loss-making contracts in their pool, by discouraging subscription of high-risk individuals and by competing for low risk individuals.

8. Conclusion

The paper discussed the consequences of adverse selection on the functioning of insurance markets. To isolate the effects of adverse selection from other confounding factors, the paper considers a benchmark situation with no moral hazard and perfectly competitive market. In those circumstances, the full information equilibrium is characterized by complete insurance coverage. With incomplete information, however, insurance companies underbid each other's contract offers in order to attract low risk. The equilibrium is characterized by less than optimal insurance coverage and, under the hypothesis of myopic behavior by insurers and insurees, no equilibrium may exist. We have also shown that for a relevant range of parameters second best equilibria are characterized by a positive cross-subsidy across risk types and that in these circumstances the market separating equilibrium is in general sub-optimal.

The government can intervene in the health insurance market in two ways: by directly providing subsidizing insurance or by regulation. Following Neudeck and Podczeck (1996), the paper shows that the two forms of intervention do not lead to identical results. Provision of partial public insurance, even supplemented by the possibility of opting out, can lead to second best equilibria. This same result holds as long as the government is able to subsidize contracts with higher than average premium/benefit ratios and to tax contracts with lower than average premium/benefit ratios. This theoretical conclusion seems to be of practical relevance. In recent reform plans implemented in Germany and Holland where competition among several health funds and insurance companies was promoted, to discourage risk screening practices a Public Fund was also created in order to provide the necessary compensation across risk groups. Unfortunately, only "objective" risk adjusters such as age, gender and region, have been used for deciding which contracts were to be subsidized. These criteria alone are not able to completely correct the consequences of adverse selection (Van de Ven and Van Vliet, 1992).

Regulation of the private insurance market by imposition of a standard contract or by restricting premium rates, on the other hand, can exacerbate the problem of adverse selection and lead to chronic market instability. If the government is willing to safeguard competition in the insurance market to tame the consequences of risk screening it is necessary either to: a) impose limits to the possibility of undercutting existing contracts (through a minimum insurance requirement; b) impose limits for insurance companies on the possibility of selecting their insurees' pool. That explains why in Diamonds' original proposal (1992) for regulating the American health insurance market insurance

companies were obliged to serve all members of a Health Alliance. Competition for the market would have been preserved, but competition within each market (the market being identified by the population of each Health Alliance) had to be limited to avoid risk screening. In general, the above analysis has shown that there may be a price to pay in terms of inefficient coverage by enhancing competition among health insurers as a means to achieve greater patients' choice and better control over providers.

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