Market failure in insurance markets

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Abstract

The health insurance market has always been different from classical product markets through the effects of severe market failures. The degree of government intervention in such insurance markets has been a point of discussion in academic literature and policymaking for a long time. This thesis provides an overview of two relevant academic articles and discusses two insurance models, the Wilson model and the Miyazaki-Spence model. Afterwards, we apply these models on the reform in the Dutch health insurance market in 2006. The aim of this thesis is to assess the most important part of the reform, the universal mandatory basic insurance after 2006 in The Netherlands. Although the used models not precisely correspond with the reform they still give a extensive relevant intuition about the effect of government intervention in the health insurance market. We argue after the analysis that this reform has a positive effect on welfare.

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1 Introduction

Since the 1st of January 2006, the Dutch government requires every resident of the Netherlands to purchase a standard health insurance coverage. Before 2006 this was only mandatory for a certain group of residents. The measure was part of a complete reform of the Dutch health care system with the purpose of enhancing solidarity and efficiency.

Because of information asymmetry insurance markets differ from classical product markets. In their turn, academic theories differ in their views on the optimal structure of a health insurance market. The aim of this thesis is to provide clarity on this optimal structure and to assess the most important measure of the large reform on the Dutch health care market with the help of advanced economic models of insurance markets. The central question this thesis tries to answer is therefore: What are the predictions of the discussed academic insurance theories about the effect of the health insurance reform on welfare?[1]

The theoretical relevance of this thesis contains of the clear distinction between two insurance models. Because the thesis discusses two insurance models and applies those models on the real situation on the Dutch health insurance market it closely connects theory and practice. The aim of the thesis is to improve insights in the complicated insurance market and to provide a better understanding of the Dutch health insurance market.

We discuss two leading models in the insurance theory, the Wilson model and the Miyazaki-Spence model. By analyzing both models, their structures and their implications for welfare we form an idea about the best model/structure for the Dutch health insurance market, the one before 2006 or the one after 2006.

We review these models because of the way in which they are different from each other. This is comparable with the way the situations on the Dutch health insurance market before and after the reform differ.

Both models asses a framework where individuals differ in health risk characteristics. These health risk characteristics in the models are represented by probabilities to sustain a loss as a consequence of an accident. Insurance companies are not able to estimate this individual risks and to distinguish among the individuals. The

[1] Consumersurplus + Producersurplus

insurance companies have the possibility to offer either one or two types of insurances. Dependent of that choice, the situation has two possible outcomes: a pooling equilibrium or a separating equilibrium.

A pooling equilibrium is an equilibrium in which both types send “the same message”. In this case that means both types purchase the same insurance policy. Apparently it is not optimal for one of the two to deviate from that outcome.

A separating equilibrium is an equilibrium in which both types send “a different message”. In this situation two different types end up in different outcomes.

We will explain those equilibriums and exemplify both equilibriums in sections two and five.

Because of different underlying assumptions the discussed models differ in their view concerning the structure of and insurance market

The Wilson model provides a theoretical framework with asymmetric information in which there exist only two types of individuals, low risk types and high risk types. Through the information asymmetry it is not possible for firms to charge the right price for every individual. This information asymmetry is the reason for market failures like adverse selection.

Wilson assumes that firms only offer policies when the policy individually is profitable. On top of that customers can maximize their utility when they buy only one insurance policy. In short, a combination of two policies is not optimal and therefore not a logical option in the Wilson model. The consequences of this model for welfare will be revealed in section five.

Meanwhile the Miyazaki-Spence model provides the same framework . However the most important difference is that Miyazaki and Spence allow firms to make a loss on a offered policy individually as long as all offered policies in aggregate are profitable. In this way customers are still able to purchase two different packages despite of the fact that not both of the offered packages are profitable for the insurance company. So combinations of a pooling and a separating equilibrium are possible in the Miyazaki-Spence model while these are not possible in the Wilson model.

In short, through this different assumptions the equilibrium outcomes of the both models differ.

After the analysis of those models it should be clear which provided structure is more appropriate for an insurance market. It will turn out that in one model the effects of

typical market failures in markets with asymmetric information are more severe than in the other model. The literature review provides more explanation about such market failures.

By applying the Wilson model on the situation before the reform and the Miyazaki-Spence model on the situation after the reform the different structures on the Dutch insurance market can be assessed. The main question of this thesis will be answered by comparing the model outcomes from a welfare perspective. By answering the main question we clarify a difficult policy question: is the reform justified by academic insurance theories?

To explain and answer this question correctly and we have structured the thesis in the following way.

First, we formulate an overview of the relevant academic papers concerning insurance theory. Second we provide a description of the situation on the Dutch health care market with the help of a comparison between the structures before and after the 2006. Afterwards we discuss the two insurance market models which provide clarity concerning the ideal structure of a insurance market. The models are then applied to the most important part of the reform, which was the obligation for all Dutch residents of purchasing the basic health insurance package. In the last two sections we will give some concluding remarks and recommendations.

2 Literature review

While this thesis contains an analysis of the reform on the Dutch health insurance market it is necessary to discuss the most important forms of market failure on insurance market which made this reform necessary.

2.1 Adverse selection

The first acknowledgement of market failures due to information asymmetries in certain markets was given in "The Market for Lemons"(Akerlof 1971). This paper started a new economic debate and a superabundance of academic papers about this subject. Developed insurance theories predicted that also insurance markets suffer these market failures(in particular adverse selection) when there is no intervention. Adverse selection is the phenomenon under which the uninformed side of a deal trades with the people which add the least value to a deal.(Rosen &Gayer,2010).

In health insurance, the insurer is the uninformed party because he has no possibility to gather detailed information about the health status of his customers. While ignorant, the insurers have no other option than asking a premium based on an average expected health risk of the whole population. In principle people who are more risky than an average person are willing to spend a larger amount than the premium they pay(Rothschild & Stiglitz,1976;Wilson 1977). However low risk people do not purchase this on average expected risk based insurance policy because the premium is too high with respect to their health risks. Contrary, high risk people all purchase the offered policy because the offered policy is advantageous concerning their health risks. Consequently the customer base of the insurer consists mainly of high risk people and a raise in the requested premium is necessary to compensate for the large amount of indemnity payments. In reaction to this increased premium customers with a relative low risk profile will leave. This process will proceed until the insurer is broke and nobody is insured. The described situation is of course extreme, but without intervention this is possible.

The problem of adverse selection resulted in academic papers about informational equilibriums. These are equilibriums of incomplete markets in which observed actions of better-informed agents and the resulting equilibrium prices yield valuable information for worse-informed agents(Riley,1979). Rothschild and Stiglitz(1976) and Wilson(1977) both constructed a similar insurance market model.

The most important assumption of these models is that they restrict individuals and firms for holding/offering only one private policy. In their papers they show the options for both pooling and separating equilibriums.

In a pooling equilibrium individuals all purchase the same insurance and there is for neither of the two types an incentive to deviate. In a separating equilibrium there is an incentive to deviate and both types purchase a different insurance.
Insurance companies have a high incentive to ask higher prices for a greater coverage. For high risk people additional coverage yields a higher marginal benefit and in this way high and low risk people are separated. By restricting the offered amount of insurance at a low price and offering additional insurance at a higher price it becomes clear which people are of the high risk type and which people are of the low risk type. The separating equilibrium arises when high risk types choose the insurance packages which contain a larger amount of coverage than low risk types choose, because this is more optimal for them.

When both types buy the same amount of insurance for the same price a pooling equilibrium arises. Apparently this is for both types the most optimal option. If the pooling policy is the only policy on a insurance market the outcome in general is not optimal. Because both risk types are purchasing a policy which does not equate marginal rates of substitution with their marginal rates of transformation. In combination with a separating policy though, it is possible that a pooling policy is optimal.

However Rothschild and Stiglitz(1976) an Wilson(1977) identify equilibrium existence, there arises an additional problem with their equilibrium definition. Sometimes the separate equilibrium is also not optimal. When the costs of pooling for low risk people are relatively low, a combination of a pooling and a separate equilibrium is optimal. This occurs when there are relatively few high risk people, and the difference in a pooling equilibrium between their optimal premium and the required pooling premium is small. In this situation a suboptimal result is possible. Finkelstein(2002) recognizes this problem of the Wilson model which does not allow for cross – subsidization in which low risk types purchase additional insurance because the marginal utility from additional insurance is higher than the marginal disutility of the transfer to the high risk combination point. This clearly makes also the high risk type

better off. Recapitulatory, the private market outcome in the Wilson(1977) and Rotschild and Stiglitz(1976) is not always second best Pareto efficient. [2]

Spence(1978) extended the Wilson analysis with the use of Miyazaki's (1977) equilibrium concept which is an modification of the Wilson single policy equilibrium. Miyazaki and Spence relaxed one important assumption of the Wilson model. In their model firms are allowed to offer policies that do not individually break even, as long as the set of polices offered by the firms breaks even in aggregate. In this way they allow firms to offer multiple policies which permits cross-subsidization, therefore the Miyazaki-Spence equilibrium is contrary to the Wilson model, always second best Pareto efficient.

So according to academic literature, adverse selection can be solved by the private market or the government through the allowance of multiple insurance policies. It is now clear how to solve adverse selection. It remains vague which party, the firms or the government, should play the largest role in insurance markets. Spence(1978) suggests some solutions concerning government intervention

- The soft form of government intervention. The government could regulate product and pricing policies. Firms can be restricted to certain contents of offered products and maximum prices. The costs of the insurance can be pooled and equally divided.
- The hard form of government intervention. The introduction of social insurance or the complete replacement of the private market.

Whether the government government can play a welfare enhancing role in solving the adverse selection problem depends on the set of policies being offered by private companies. When private companies offer multiple policies it is unlikely that the government can play a welfare enhancing role and vice versa(Finkelstein,2002).

Finkelstein and Poterba(2002)empirically investigated adverse selection in the UK insurance annuity market. They estimated that the pricing of different types of annuity products is consistent with the idea of adverse selection. In this situation, the selection of products based on their privately know mortality rates.

[2] Private market equilibrium achieves the same utility level as the a combined public and private policy equilibrium

By identifying price variations through inefficient pricing, Finkelstein, Einav and Cullen(2010) tried to identify welfare losses in the employer provided health care market in the United States. Employee data from Alco Inc., a large producer of aluminum and related products was being utilized. The company has 45000 employees in 39 different states They used this data because different sections of the company are faced with different prices for the same coverage due to their business unit affiliation.. They estimated the efficient price for coverage, $264, and the equilibrium price for coverage in this company, $463. This price difference was the result of especially adverse selection. The welfare costs per individual were $12,92 when prices were set differently for each market segment.

Browne and Doerpinghaus(1993) used data from the National Medical Care Expenditure Survey in the USA to test three hypothesis. Whether there is reduced consumption of insurance by low risk individuals, whether it is more likely for a pooling or a separating equilibrium to occur in an insurance market, and whether cross subsidization occurs. They use Probit and Tobit regressions to effectuate their results. The analysis of these results confirm that high risk types receive more indemnity benefits per dollar premium than low risk types. This is a consequence of a pooling equilibrium with cross-subsidization. They conclude that low risk individuals consume less than in a market free of adverse selection.

2.2 Moral Hazard

Besides adverse selection there exists another form of market failure in insurance markets: moral hazard. This is the incentive to increase risky behavior because the adverse outcomes of that behavior are covered by insurance.(Rosen & Gayer,2009). Informational asymmetry is mentioned as the source of moral hazard. A solution to the problem of informational asymmetry is monitoring, in the case of insurance this means the screening of potential customers through insurance companies to draft a risk profile. It becomes complicated when complete observation is impossible or extremely difficult. By setting up imperfect estimators insurance companies try to minimize the problem. Another solution is the introduction of a deductible, which is a fixed amount of expenditures that must be incurred within a year before the insured is eligible to receive insurance compensation(Rosen & Gayer,2009). In this way the incentive to increase risky behavior is weakened.

Zeckhauser(1970) recognizes another problem, different preferences with respect to health care. It is possible that a certain individual consumes a larger amount of health care than another individual with the same risk profile because he simply enjoys it more. So even when the health risk of a customer is perfectly estimated by the insurance company, this preference difference can cause unobserved differences in the expected costs of a insurer.

By using a model of plan choice and medical utilization Einav et al. provide evidence of heterogeneous moral hazard. They use employee-level panel data from a single firm in the USA to investigate moral hazard. Cummins and Tennyson(1996) prove the existence of moral hazard by analyzing the frequency of auto-mobile bodily injury liability(BIL) claims. Using cross-sectional regressions of statewide BIL claims they discovered moral hazard. As an indicator of moral hazard they used survey data on consumer attitudes toward various types of dishonest behavior. The results showed a strong support for a relation between the frequency of BIL claims and dishonest behavior.

Beck(1974) examined the effect of the introduction of copayments on physician services like doctor visits in the province of Saskatchewan using data from 1963-1968 from 40,000 individuals. With his before and after analysis he discovered a 6 to 7% drop in all physician services, and an 18% among the poor. Copayments are a wide-used measure to reduce moral hazard and to identify and reduce moral hazard.

3 The Dutch health care market before 2006

In this chapter we compare the health insurance market before and after the large reform in 2006. As the system in 2005 is the most recent form of the “old system” this will be used as a benchmark to compare the situations before and after 2006.

3.1 Timeline

The Dutch health insurance market has been sensitive for changes and developments since the foundation of the first health insurance in the Netherlands in 1874. The first initiative for the development of sickness funds was taken by private companies and it

lasted until 1905 before the government tried to intervene with the failure of the Kuyper proposal. [3]

Not a Dutch government but the German occupier succeeded in introducing the first mandatory social health insurance fund in which low-wage workers were obliged to purchase health insurance. This system was replaced in 1964 with the introduction of the Sickness Fund Act, which was roughly the same as the German system except for one important difference. [4] Instead of a individual agreement with a health insurer, a individual was now part of a large group which was legally insured. [5] With the construction of the Exceptional Medical Expenses Act in 1968 which safeguarded the whole population against long term medical cost the most important building blocks for the system as we knew it in 2005 are mentioned(Schoonenveld,2005). [6]

3.2 Description

The Dutch health care market in 2005 was divided on the basis of income and job choice. The vast majority, 65% percent of the Dutch population was eligible for the Sickness Fund Act (Gotze,2010). All employees, pensioners and beneficiaries with an annual income below € 33.000 were legally insured and obliged to buy health insurance from Sickness Funds. The Sickness Funds were executioners of public law regulations because they had the legal obligation to accept every application disregarding age and health characteristics for the group below the threshold.

The offered package consisted of legally described health in kind.[7] The premium for this insurance was mainly independent of income and was approximately €20 per month(Gerritsen, 2012). The package consisted of physician service, prescription drugs, hospitalization(365 days), maternity care, dental care for children, paramedical care and some other services(Van de Ven, 2008). Because insurers where legally forced to accept every applicant disregarding health characteristics and age, an unequal distribution arose between the insurers with respect to the average health risks of their customers. For this reason there existed a risk equalization fund which compensated the insurers

[3] Abraham Kuyper introduced a law proposal in 1903 for a mandatory health insurance. However the parliament ended up in a crisis before the voting round concerning the proposal
[4] Ziekenfondswet(ZFW)
[5] People who earned a yearly income below the benchmark of €33000
[6] Algemene Wet Bijzondere Ziektekosten(AWBZ)
[7] The health insurer determines the providence of your care. (Natura)

with a larger that average health risk customer profile. This fund prevented unfair insurer losses(Douven & Morks, 2004).

When those individuals preferred supplemental insurance as a complement of the basic package they had to enter the private market. On this market they were able to buy from private companies which had the aim to make profit. The required premiums were dependent of age and health characteristics. It could be possible that some people were not able to buy this insurances while they really needed it. Through their high health risks they were forced to pay high premiums.

Government officials had their own health insurance schemes which differed from the ZFW in the sense that the premium was mainly income related and their described health was based on refund.[8] This means that individuals had free choice between all health providers and that they had to purchase their own health in advance. After the treatment they could invoice the bill by their Sickness Fund(Schoonenveld,2005).

The third group consisted of people who had an annual income above the € 33.000 and where no government official. For this people it was not mandatory to buy insurance, they purchased this voluntarily from private insurers who compiled the health insurance packages themselves.[9] For this group, insurers were private institutions with the aim of making maximal profit. The offered premium was independent of income but increasing in age and health characteristics, this was determined by the government to protect this prosperous group. The insured had the choice for a deductible which was inversely proportional with the monthly premium. Most of this people voluntary bought insurance, only 1.5 % of this group did not have any health insurance(Van de Ven, 2008). In short, the population was being divided through this system. For the Exceptional Medical Expenses Act(AWBZ) this was not the case. This provision safeguarded the whole population against long term costs.[10]

3.3 Reasons for reform

What were the problems the government tried to solve with the reforms and what were their objectives with the new system?

[8] Restitutie
[9] These individuals were active in the same market as individuals with an annual income below the €33000 who were searching for supplemental Insurances
[10] Longer than 365 days

3.3.1 Possible problems

The first and most important problem in the old system is the dividing line between social health insurance and private health insurance. As only people with a yearly income smaller than €33.000 were legally obliged to buy health insurance , market failures like adverse selection and to a lesser extent moral hazard(explained in the literature review) arose(Maarse&Ter Meule,2006).

As health is negatively correlated with income(Bierings&Smiths,2008) this suggests a large moral hazard effect in the group which is compulsory insured. Because this people know they will receive compensation payments when they need health it is possible that they will take more risk and "behave unhealthy".

In the group of "rich" people the problem of adverse selection is more relevant. Insurers have "risk selection" opportunities. They can refuse people with large health risks and attract all healthy people. In this way the insurance companies generate income through the premiums but minimize their costs because the expected amount paid to their customers will be low. Victims of the market failure are unhealthy people who earn relatively well, they have the choice to pay an exorbitant high premium or to remain uninsured which is risky.

The second problem is a more general problem. As the costs of medical care were increasing rapidly throughout the years due to an aging population and advanced medical technology the government this lead to health care insurance which was disproportionally expensive. [11] The solution for this problem consisted of the idea that the health care market and the health care insurance market should work more efficient. To achieve this market forces should have more influence and the web of restrictions concerning central pricing and capacity control was prohibitive in that way. [12] Prices would decrease due to the "managed competetition" according the model of Alan Enthoven. [13] This managed competition describes a market situation in which market competition improves efficiency and quality, but with some constraints induced by the government.(Maarse&Ter Meulen, 2006)

The last problem concerns the heterogeneity in choices and options concerning the health insurance for the three different groups. The people in the Sickness Funds for

[11] Balkenende II
[12] As a emergency measure for the rising costs
[13] Constructed a theory/model of managed competition in the health insurance market

example received insurance in kind, had no choice of a deductible and the premium was not dependent of income. The government insurance schemes were based on the refund of health expenses and the premiums were mainly income dependent. The last group which made use of private insurance funds paid premiums which also were not dependent of income. But in contrary to the two other groups they had the choice of a deductible and they were not obliged to buy a health insurance. In addition to these differences these group also differed in the content of their received health packages. In short, in the old system there was no equality and no symmetry between the premium people paid for their product and what they received for this amount.

3.3.2 Objectives for the new system

The new health insurance system aims to solve the shortcomings of the old system and pursues solidarity and efficiency. To achieve this policymakers formulated the following elements which should amplify the system after the reform(Maarse & Bartholomée,2006).

- The destruction of the traditional dividing line between social and private health insurance by the construction one single health insurance policy covering the entire population. This should increase solidarity and reduce complexity.
- The strengthening of market competition. Health insurers are supposed to compete on premiums, quality of care and type of policy. To achieve this, their bargaining power with care providers is reinforced. The insurers are no longer obliged to close contracts with each care provider. This allows them to choose between providers and agree with specific agreements).In addition all consumers have the right to choose their own insurer and type of policy. Risk selection by health insurers should not be possible because every insurer must accept any applicant.
- Enforce equality by a flat premium-setting(community-rated premiums). This means that insurers have to charge the same premium for the same policy disregarding age, gender or specific health risks.
- The use of public restrictions, these are certain government interventions to enhance efficiency and quality which cannot be achieved by the market. An example is the determination of the basic health package by the government.

4. The Dutch health insurance market after 2006

On January 1st the Dutch government enacted the Health Insurance Act.

Since January 1st the government changed all Sickness Funds and civil servant schemes into private companies which, together with the existing private companies offer a state defined standard benefit package. The package is described in terms of functions of care and not(as in the old system) in terms of providers. This means that the quality of the offered products and services should be more important than which insurer provides it. This should facilitate the entry of new providers.(Van de Ven, 2008).

Nowadays there are 26 competing health insurers which are all non-profit organizations, they have no shareholders and are part of large cooperation's. However these insurers are allowed to generate profit. This is necessary, according to their directors, to strengthen their capital buffers and to invest in the quality of health care purchases. The four largest insurers; Achmea, Menzis, VGZ and CZ possess approximately 90% of the market share(NZA,2012).

Insurers are supposed to be rational buyers of care. The latter means that they compete in purchasing efficient health care , focusing on price and quality, which is relevant for the objective of enhanced efficiency. Through their reinforced bargaining position with care providers they should be able to purchase health care for a cheap price. On the long term this should result in a decline of the premiums. In short, the health insurance market in the Netherlands consists of three layers; the layer of the care providers and health insurers, the layer of the health insurers and the consumers and the layer of the care providers and the consumers. Through this desired price and quality competition(managed competition)in the three layers, the switching rate of consumers between health insurers in 2006 was 19,1% (NZA, 2011). Consumers have at least one option per year to switch from insurer.

Contrary to the old system every individual who works or lives in the Netherlands is legally obliged to purchase a basic package. Additionally, insurers are allowed to offer supplementary health insurance for which this uniform enrollment does not apply and there are no restrictions through community-rated premiums. [14] The new system features a significant rise of annual nominal premium rates. Before 2006 this

[14] The premium is calculated on the basis of the risk factors applying to all persons in a market, so not on the basis of individual risk factors

amount was between €239 and €455, after 2006 the average paid premium is €1050(Maarsen & Bartholomée,2006). Households receive a care allowance if the average community-rate premium exceeds a certain proportion of their income. Two thirds of all household receive such a allowance.

The offered basic package is comparable to the package of the former Sickness Fund Scheme. The latter supplied care by general practioners and specialists, as well as pharmaceuticals and hospital care up to one year. For everyone who needs long-term coverage and mental the Exceptional Medical Expenses act(AWBZ) provides this coverage. Supplemental insurances cover care which is not included in the mandatory package such as dental care, physical therapy and eyeglasses. Since about 96% had bought supplemental insurance 2006 insurers may have an opportunity to select risks through this supplemental insurances. [15] Another option to select risks is through the possibility of group discounts. Insurers are allowed to give a discount(maximum 10%) to customers which belong to a group which can be any legal entity. In this way insurers can analyze entity related risk profiles and favor customers above others because they are member from different groups. These group contracts are very popular, in 2007 approximately 57% of the Dutch population utilized such a group discount. The majority of these groups are employer groups(Leu et al. ,2009)

The earlier mentioned uniform enrollment can result in significant different risk profile customer files. To solve this problem there exists a risk equalization fund for which all individuals pay an income related contribution(approximately 6% of the first €50.853). When the customers of a certain insurer have a relatively unhealthy risk profile the insurer receives a relatively large subsidy from the REF and vice versa. This risk equalization fund estimates the average expense on the basis of predictive modeling and certain characteristics and compensates companies with a higher than average risk profile. However this system does not work optimally so the incentives for risk selection are only partly removed.

[15] This statistic contains a bias. Almost every resident in the Netherlands has a dental insurance. When we assume that this dental Insurance was part of the basic package, the percentage would be signifantly lower

5. The models

This section introduces the single-policy insurance model of Wilson and the insurance model with multiple insurance policies from Miyazaki and Spence. In section 6 these concepts will be applied on the specific case of the reform in the Dutch health insurance market.

The literature study in the previous chapter provided some clarity concerning the relevant health insurance equilibrium concepts developed in academic literature.

As mentioned before Finkelstein(2002)discusses and compares the two insurance models in her working paper; "When can partial public insurance produce Pareto improvements". However the purpose and aim of Finkelstein's paper is different from this paper. Finkelstein proves that it is not important for the Pareto improvement which party, a private party or the government, introduces a second policy in the Wilson model. After the allowance of a second policy in the Wilson model. The Wilson model and the Miyazaki Spence model are identical. The Pareto improvement is the result of the offering of a second insurance policy.

This thesis only discusses the features of the two models while their applicable respectively on the Dutch insurance market before and after 2006.

Table 1: Assumptions Wilson model and Miyazaki Spence model

- The analysis involves a competitive insurance market
- Firms can change their policy offers without making additional costs
- On this competitive market there exist only two types of individuals, high risk types(H) and low risk types(L)
- The costs of care are denoted by accident probabilities
- The only way the two types differ is in those accident probabilities, π_H for high risk types and π_L for low risk types
- There exists asymmetric information, individuals know their accident probabilities while insurers do not
- An equilibrium is either a separating or a pooling one
- Insurers and individuals try to maximize utility
- Firms can monitor the total amount of insurance an individual has purchased

5.1 The Wilson model

The Wilson model is illustrated in figure 1 and defines an equilibrium in an insurance market as an set of insurance policies in which:

i. Consumers choose a single insurance policy to maximize expected utility
ii. Each policy earns non negative profits individually
iii. There is no set of policies outside of the equilibrium set which, if offered , would earn positive profits in the aggregate and non-negative profits individually

These are the Wilson equilibrium aggregate break-even constraints:

$P_t = \beta_t q_t$ for $t \in \{ H,L\}$(Separating equilibrium)
$P = (\lambda\beta_H + (1-\lambda)\beta_L)^* q$ (Pooling equilibrium)

By λ we signal the proportion of the population that is of high risk. Subsequently β_t denotes the actuarially fair marginal price of insurance from an type of individual (t) traded at the market. Finally q_t indicates the amount of indemnity payment that type t receives in case of an accident.

The above equations show that according to Wilson the pooling and separating equilibrium policies have to break even separately. Which makes it not possible for the model to reach an outcome in which there exists a combination of the two. We will prove this in the next sections.

So firms are not able to make a loss on a policy individually. However when they do, this policy will not be offered. So in equilibrium policies minimally break even.

In this section the establishment of a pooling and a separating equilibrium is described with the help of figures 1 and 2.

The 2 types of individuals(t) try to maximize their insurance contract. An insurance contract $X = (Pr_t,q_t)$ is an agreement between insurer and insured, in return for paying a premium the insurer guarantees a certain degree of coverage when the individual needs care(in case of an accident A). An insurance contract can be described by the premium (Pr_t) that type t pays and q_t the amount of the indemnity payment that type t receives in case of an accident. Let π_t represent the probability of an accident for a

type t individual, $t \in \{L,H\}$. Assuming an initial wealth W and utility function $U(\cdot)$, the expected utility function individuals try to maximize is

$$U_t = U_t(Pr,q) = (1-\pi_t)U(W-Pr_t)+\pi_t U(W-A+q_t-Pr_t)$$

This utility function shows that the expected utility is decreasing in the payment of a premium(Pr_t) and the event of an accident(A). Utility is increasing because of received indemnity payments(q_t).

As mentioned above figure 1 illustrates a one policy Wilson equilibrium. The vertical axis indicates a state with an accident, so coverage is desirable in that situation. The horizontal axis represents a state without an accident. Point E is the starting point for individuals with no insurance(as can be seen, in this point an individual experiences a low wealth in state of an accident). The 45 degree line represents points of full insurance, determined by similar welfare levels disregarding the states. Increasing utility is achieved by moving to the northeast. The two indifference curves represents the preferences for respectively low and high risk types.

The slope of the indifference curves is the marginal utility of coverage purchased with additional premium payments. The line EF shows outcomes according to the market and illustrates the population average actuarially fair price. The line HE is the set of policies that earn zero expected profits when high risk individuals buy them. Additionally the line LE is the set of policies that earn zero expected profits when low risk people buy them. The expected profit on a insurance contract $X = (Pr_t,q_t)$is then

$$\prod(X) = (\pi_T * q_T) - Pr_T$$

It is clear that the expected profit depends on the quality of an individual's insurance contract. Expected profit decreases due to an individual's amount of premium payments while it increases in the level of indemnity payments. This indemnity payments are only received in case the accident actually occurs. So when you are healthy,(which is represented by a low chance on a accident in this model) the chance that you make a loss on your insurance contract is high.

As earlier mentioned, an important feature of insurance market is asymmetric information. This asymmetric information problem causes adverse selection. Because

insurers do not know the health characteristics of their customers they will offer one single policy against the market odds price.

5.1.1 A pooling equilibrium(figure 1)

The original position in figure 1 demonstrates a pooling policy while γ is at a higher utility curve than a_L. In this equilibrium, the traded insurance contract depends on the preferences of the low risk type(the tangency of U_L),none of both types should have an incentive to deviate. This statement is correct. In point γ both types end up on a higher indifference curve compared to the separating policy(α_L and α_H).

We assumed that there was no policy outside the equilibrium that earned non-negative profits individually. The low risk type is willing to pay the additional amount of insurance embedded in the pooling contract because the reached indifference curve provides higher utility outcomes than the offered separating equilibrium $\alpha_{L.}$

We show that the pooling equilibrium in this figure is stable. Suppose the point $\alpha_{L,}$ call it α_L*, is at a higher point on the line segment L- $\alpha_{L,}$ the offered policy for low risk people has improved. The offered package now contain more coverage for approximately the same price. When the low risk type indifference curve intersecting this point α_L* is at higher point compared to U_L, the pooling equilibrium policy will disappear.

Noticing the new offered package, low risk people will deviate from the pooling equilibrium point γ and purchase the policy α_L* while they can reach a higher indifference curve compared to U_L. The line EF will rotate to the left and the high risk people end up on indifference curve U_H. The high risk people will also deviate from γ. As we climb the line segment α_L-L all high risk people will also purchase this policy because they also reach a higher indifference point in this point α_L* Because the low and high risk people are now at a higher indifference curve this point looks like an Pareto improvement over point γ. But insurance companies will face a loss on this imaginary point α_L*. As high and low risk people are able to purchase this insurance package they have to pay large indemnity payments to their customers for a relative low price, as the policy is actually created only for low risk people. Wilson assumes that insurers are not able to offer policies which made a loss individually. Because of this assumption the imaginary point α_L* on the line segment L- α_L becomes unreachable in this model and these kind in of policies will never be offered in this model.

The only possible separate equilibrium points are on the line segment E-α_L. This outcomes will not attract high risk people as the indifference curve U_H is at a higher point On those points however the low risk people have no incentive to deviate from γ. In this figure the pooling policy γ is the unique equilibrium.

5.1.2 Adverse selection in the Wilson model (figure 2)

This figure is identical to figure 1. However we introduce an additional option for the low risk types: purchasing a pooling insurance contract γ or purchasing no insurance contract . For low risk types it could be more profitable to have no insurance at all than pay a relative high premium for coverage which they in all probability not need. When this individuals are leaving the market insurers will face a customer base with a higher average risk profile. This will be revealed to them as they have to pay larger indemnity payments. The market odds price increases as the premium must compensate for the higher indemnity payments. The line EF in figure 1 will rotate to the left and become flatter as can be seen by the red line in figure 2 until it covers line segment HE . This is logical, as all low risk types left the market the market odds line is similar to the zero profit line for high risk types as they are the only individuals in the market. So the consequences of adverse selection are, a high risk type which pays $\alpha_{H,}$ and a low risk type which is uninsured. In theory, compared to the pooling policy outcome in figure 1, it should have no influence on welfare. Low risk types leave the market because they are better off without insurance, so for this type the situation is an improvement. The low risk types are worse off because they end up on the lower indifference curve U_H. This is a theoretical argument. In practice people value coverage differently and there are more than two different types. This complicates the situation because every individual could react differently on the offered policies dependent on his own preferences.

5.1.3 A separating equilibrium(figure 1)

A separating equilibrium ($\alpha_{L,}$ α_H) occurs in the Wilson model, when we imagine point γ in figure 1 at a lower utility curve compared to $\alpha_{L,}$. In a separating equilibrium neither of the two types wants to deviate from their different equilibrium points as can be seen in figure 1. When γ is at a lower indifference curve than in the original situation both types are better off in points α_H and α_L because these points are at the higher indifference curve $U_{L.}$

The high risk type is indifferent between α_L and α_H while those point are both on the indifference curve U_H but will buy α_H because this point is on the high risk type zero profit line.

The low risk type will purchase the package offered in point α_L because γ is at a lower indifference curve.

We assumed that the equilibriums are determined in a competitive market. From that perspective it is interesting to analyze what could happen in this competitive market. As a separate equilibrium has occurred the high risk type reached point α_H and the low risk type point α_L. When the difference between the indifference curves from point γ and point α_L is substantial, other insurance companies can offer policies which are at slightly higher indifference curves than point α_L to attract low risk people. In this situation this is not realistic because we only have two types. In a real life situation however, this phenomenon can occur. The final offered low risk policy point be on the intersection point of line LE and the 45 degree line.

In the previous chapter we concluded that a pooling policy in the Wilson model is stable but not a optimal outcome. Additionally, the single policy separating equilibrium is also not a Pareto optimal outcome for a reason which is mentioned in the literature review, the lack of cross subsidization. [16] This is a limitation of the single policy Wilson model, as also earlier mentioned in the literature review. It is possible to achieve some cross subsidization in this single policy model but this is never optimal as we shall see in the Miyazaki-Spence model. A more optimal cross-subsidization can be achieved through a combination of the pooling policy and the supplementary separating policies. This combinations were not able in the single policy Wilson model. In the Miyazaki-Spence model though, these combinations are possible.

5.2 The Miyazaki-Spence model

The main difference between this model and the Wilson model is the definition of a policy equilibrium. Miyazaki and Spence relax the 2nd assumption of the Wilson equilibrium definition. Firms are allowed to offer a policy which generates negative profits individually as long as the set of policies offered by the firm breaks even in aggregate. On top that we introduce two additional assumptions. First, the pooling policy

[16] The subsidization of high risk types by low risk types through purchasing some additional Insurance in equilibrium, in this way the price of an insurance contract decreases an the amount of coverage in the contract increases

is provided by the government and the separating policy by the private market. Second, private insurers care about the future.

λ indicates the proportion of the population that is of high risk. By V_T we denote the expected utility of type t.

1. $\lambda p_H + (1-\lambda)P_L = L\pi_H^* q_H + (1-\lambda)\pi_L^* q_L$
2. $V_H(Pr_H, q_H) \geq V_H(Pr_H, q_L)$
3. $V_H(Pr_H, q_H) \geq \max V_H(\pi_H^* q, q)$

Constraint 1 shows that in aggregate a firm must break even across all its policies. Constraint 2 states that the high risk type must prefer his chosen (supplemental) policy compared to the policy of the low risk types in a separating equilibrium. Finally constraint 3 shows that the high risk type must prefer his policy above purchasing insurance at his actuarially fair marginal price.

The Miyazaki Spence equilibrium is actually the same as the Wilson equilibrium with the allowance of multiple policies, a pooling equilibrium policy and a separate equilibrium policy(figure 3).The result of such allowance is a Pareto improvement over the single policy Wilson model. The starting point for the types(low risk and high risk) is now pooling policy γ instead of E, γ is the most preferred point on the market odds line. We assume that the line γL' demonstrates the policy set that earns zero expected profits when low risk types purchase them. The line γH' represents the same for the high risk types. Point β_L is already on the higher utility curve U_H^* than γ in the initial situation. At the point β_L a low risk type buys the pooling policy and his own optimal separating policy. The same holds for the high risk type. Each type is better off in this situation with multiple policies compared to the Wilson model with one policy. This can be seen in the figure 3 by comparing utility point on the indifference curves of each type($U_L^* > U_L$ $U_H^* > U_H$).

In this situation the private companies can make a loss on certain policies. The private companies make a loss on high risk types in point β_H. The high risk types experience a positive expected profit while this point is above the line HE. The private companies compensate this with the low risk people who experience a negative expected profit in point β_L while this point is under the line LE. The same holds for the government with their offered pooling policy γ, they make a loss on the high risk types and a profit on de low risk types. This is the advantage of Miyazaki-Spence compared to

the Wilson model. The only important thing is that the government and the firms in aggregate do not make a loss on their policies which is also show in constraint 1.

Such a combination of a pooling and a separating policy can appear in different forms. The private market can provide both policies. The other option, which is assumed at the start of this section, is that the government provides a public policy γ and the private market the supplemental policies β_L and β_H. The latter is the current situation on the Dutch health insurance market. For this reason we devote extensive attention to this situation.

The government provides a public pooling policy γ and the private market supplemental policies β_L and β_H. There are no other alternatives that remain profitable after all unprofitable policies are ceased. To illustrate this, Finkelstein(2002) mentions three possible cases which must be considered. First, as can be seen in figure 3, there is no other profitable policy from the starting point E that attracts both types. The low risk types prefers β_L over their most preferred point on the market odds line γ. Next, there is also no other point which only attracts high risk people as they receive full insurance in β_H and a lump sum subsidy over the initial situation in the Wilson single policy model. Third, there exist policies which only attract low risk types. All policies in the shaded area in figure 3 attract only low risk types. Since this market is competitive it would be logical that insurers would offer this policies as they can attract all low risk types with it. This however, would be bad short term policy. If the low risk types purchase a policy in this region offered by private insurers instead of a combination of the publicly provided pooling policy and the private supplemental policy, the pooling policy γ only attracts high risk people. This policy becomes unprofitable and will be ceased by the government. When this pooling policy is ceased high risk people also will buy policies in the shaded area. After this, there only exists a privately provided policy and we are back in the situation as illustrated in figure 1 which shows a distribution without government intervention.

As we consider the outcome x which represents the policy in the shaded area with the least insurance, high risk types still prefer this outcome x over α_L. Since high risk types in figure 1 are indifferent between α_L and α_H.

So concluding, the last case provides a profitable deviation for private firms, on the short term. They can attract low risk types without attracting high risk types until the government has found this out, by facing big losses on their pooling policy.

Subsequently the government ceases the pooling policy and all high risk people also purchase the offered policy in the shaded area. Because of this, the offered policy now becomes unprofitable for the private insurers.

The outcomes and behavior of the insurers in this situation depends on the discount rates of the insurers. The question in this situation is which value they assign to the short term profit and long term losses. This remains unclear in the model.

For this reason we assumed before that private companies care about the future. In the remainder of this paper we will recognize the outcome of the Miyazaki-Spence model as an in Pareto improvement over the Wilson model outcome. So the Miyazaki-Spence combination equilibrium stability depends on the discount factor of private companies. But when private companies care enough about the future this situation creates a Pareto improvement over the Wilson market equilibrium γ as illustrated in figure 1.

6 Application

In the previous chapter two insurance models are discussed. These 2 models match respectively with 2 different health insurance structures in Dutch history. The Wilson single policy model will be applied on a part of the health insurance market before 2006. The Miyazaki-Spence multiple policy model will be applied on the other part of the health insurance market. Subsequently the Miyazaki-Spence model is also applied on the whole health insurance market after 2006. Which situation provides the best solution for the problem of adverse selection. With this comparison and the theoretical framework of the two situations we will try to find an answer to our main question ; is the new Dutch health insurance system an improvement for welfare?

6.1 The case: The health insurance market before 2006

We described the situation on the Dutch health insurance market before 2006 extensively in section 3 and in the analysis of the models to give a good intuition of the situation. So the market was divided in three groups; individuals who earned less than €33000, individuals who earned more than €33000 and government officials. The last group is not relevant in this analysis because the situation of the government officials does not meet the assumptions of the models. We distinct the groups on the basis of

choice options for insurance policies, identical to the distinction between the discussed models.

6.1.1 The Sickness Fund Act group

The individuals who earned less than €33000 were obliged to participate in the Sickness Fund Act. From that point of view they were forced to purchase a policy which was the same for every individual, disregarding risk characteristics. On top of that they had the choice of a voluntary supplemental insurance dependent of risk characteristics. Some individuals purchased one, others not. This situation matches the Miyazaki-Spence model. The Miyazaki-Spence model implicated that in this case, the low risk people purchases their own amount of supplemental insurance against their fair marginal price, the same holds for the high risk people. This situation is illustrated in figure 2 where point γ indicated the obliged insurance policy and β_H and β_L the high and low risk voluntary supplemental policies respectively. We argued that this is positive for welfare as both the low and high risk individuals end up on a higher indifference curve. It is essential to realize that this situation is not possible in a Wilson single policy model because of the underlying assumption. Consumers choose a single policy to maximize their utility.

However, there is a important difference between the Miyazaki-Spence model and this situation for the individuals who earned less than €33000. The pooling policy in the Miyazaki-Spence model is optional while the pooling policy in this situation is mandatory. In general, we could argue if a mandatory policy is the same as a pooling policy. A pooling policy is a policy in which both types have no incentive to deviate to another insurance policy. In a mandatory policy both types have no choice but it is possible that one of the two types or both prefers another policy. So there exists a substantial difference.

The above arguments are relevant to recognize and mention but have no implications for the intuition that an individual is better off with multiple insurance policies, a separate and a pooling one compared to one policy. The insurers are forced to offer a standard package determined by the government, for a price, determined by the government. They are able to do this because they get compensated by the government for bad risk customers through the risk equalization fund. As earlier mentioned, the intuition of multiple policies remains the same, so regardless of the motives for this

structure, the outcomes are optimal and positive for welfare as we have seen in the previous chapter.

6.1.2 The private market group

The individuals who earned more than €33000 were not legally insured through the Sickness Fund Act. These people had to purchase a single policy offered by the private market, the content of this packages were composited by the insurers themselves. Some of these insurance companies where the same ones which were active on the market for the mandatory basic package, and some were not. Although some insurers were the same, their objectives differed, because, in this market they could make profit. The situation for this individuals is illustrated in figure 1 and corresponds with the Wilson single policy model. We already analyzed that both the pooling($\gamma>\alpha_L$) and the separate equilibrium($\gamma< \alpha_L$) were no optimal outcomes. In the pooling equilibrium we concluded that all low risk individuals could leave the market. This model is of course a simplification of reality as there are not only two types of risk profiles in the Netherlands. Not all low risk individuals will leave the market. Individuals who are very healthy will leave because this policy decreases their utility. Other "low risk" individuals will stay because they are not that healthy and risk averse for example. So the situation will not be that extreme as described in the Wilson model. However, a single policy pooling equilibrium is not optimal, because some people will leave the market. Other people will stay through the earlier mentioned individual differing characteristics, but with another insurance structure those people could gain a more optimal insurance contract, a problem which is also referred to as adverse selection.

The separating equilibrium is not optimal either, because of the earlier described lack of cross-subsidization. Low risk people and high risk people pay too much for too less coverage in this situation. Some high risk people experience the difficulty to purchase any form of insurance because of their bad risk profile. Insurers ask exorbitant high premiums or simply not accept them. It is clear, the situation before 2006 for this group was not optimal. Regardless of the established equilibrium.

6.2 The case: The health care market after 2006, uniformity

After the reform all Dutch residents were obliged to purchase a basic package. There was no difference anymore on the basis of income. All residents had the option of a voluntary supplemental insurance. This structure matches with the Miyazaki-Spence model as well.

The mentioned arguments in section 6.1.1 about the differences between the Miyazaki-Spence model and the situation on the Dutch health insurance market also apply on this situation

We discovered that the situation with a mandatory public insurance policy and a voluntary private supplemental insurance policy resulted in a Pareto improvement, relative to the situation when there was only one private policy. Figure 1 and 2 confirm our findings, multiple policies are more optimal compared to a single policy because low and high risk individuals end up on higher indifference curves. So on the basis of the multiple policy theory, the market structure after 2006 seems better. Instead of 68% before 2006, after the reform, the whole population has the choice of a second insurance policy. However, the argument of a Pareto improvement after the universal obligation policy is a theoretical argument. Not everybody has gained from the reform. It is conceivable that some rich healthy individuals did not like the reform. Prior to the reform they could influence the amount of purchased coverage, after the reform they are obliged to purchase a standard composed package. But in general it is fair to say that according to these insurance models the reform has a positive effect on welfare.

7. Conclusion

In the previous sections we discussed two influential insurance models. We applied this models to the situation on the Dutch health insurance market before 2006 and after 2006 with the purpose to answer the main question: What are the predictions of the discussed academic insurance theories about the effect of the health insurance reform on welfare?

To answer this question completely and correctly it is necessary to analyze aspects other than only the obliged basic health insurance. It is for example questionable which effect the enlarged market completion in the new system has on the welfare as the premiums after 2006 only have increased. To assess the complete reform more aspect need to be analyzed.

However, the obligation was a very important part of the reform. With the single policy Wilson model and the Miyazaki-Spence model we discovered that the choice of multiple policies is a Pareto improvement over a situation in which the choice for a consumer is limited. The reasons for this improvement are the weakened adverse selection effect and the increased cross-subsidization effect with multiple policies. After 2006 the whole Dutch population has to deal with this multiple policy structure. From this point of view, it is logical to state that on the basis of the assessment of the most important part of the reform, the new Dutch health insurance market is improving welfare through the increased consumer surplus. However, the formulated arguments are based on a simplified analysis of reality. The models do not describe precisely the same situation. The role of the government in the models differs from the real situation. Also the similarities between a mandatory between a mandatory policy and a pooling equilibrium are questionable.

As we analyzed welfare we should include the effects of this different insurance structure on the producer surplus. Are the insurance companies satisfied with this new structure? In short, we only have discussed one effect which influences welfare. It is highly probable that this effect is correctly analyzed and the new insurance structure is an improvement for welfare. Though it is important to realize that there are more aspects which influence the situation on the Dutch health insurance market.

8. **Recommendations**

A model is a simplification of reality. Models analyze a certain effect while all other factors which influence this effect remain the same. In this way the magnitude of the concerning effect can be measured. In this thesis we have analyzed the obligation of the universal basis health insurances in the Netherlands with the help of two models. To complement this analysis and give a more complete answer on the main question it is necessary to study the effect of all changes due to the reform on consumer and producer surplus. Analyzing these effects with econometric insurance models is a good way to create a extensive intuition of the health insurance market. To precisely measure the impact of the reform however, relevant data is required. The health insurance market is a very complicated but important market in the Dutch economy. The independent Dutch supervisor NSA, could improve their market analysis when they add these kind of

econometric model analyses to their yearly assessment of the market. In this way they could formulate more sensible advises to decision makers.

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10 Appendix

Figure 1: The single policy Wilson model

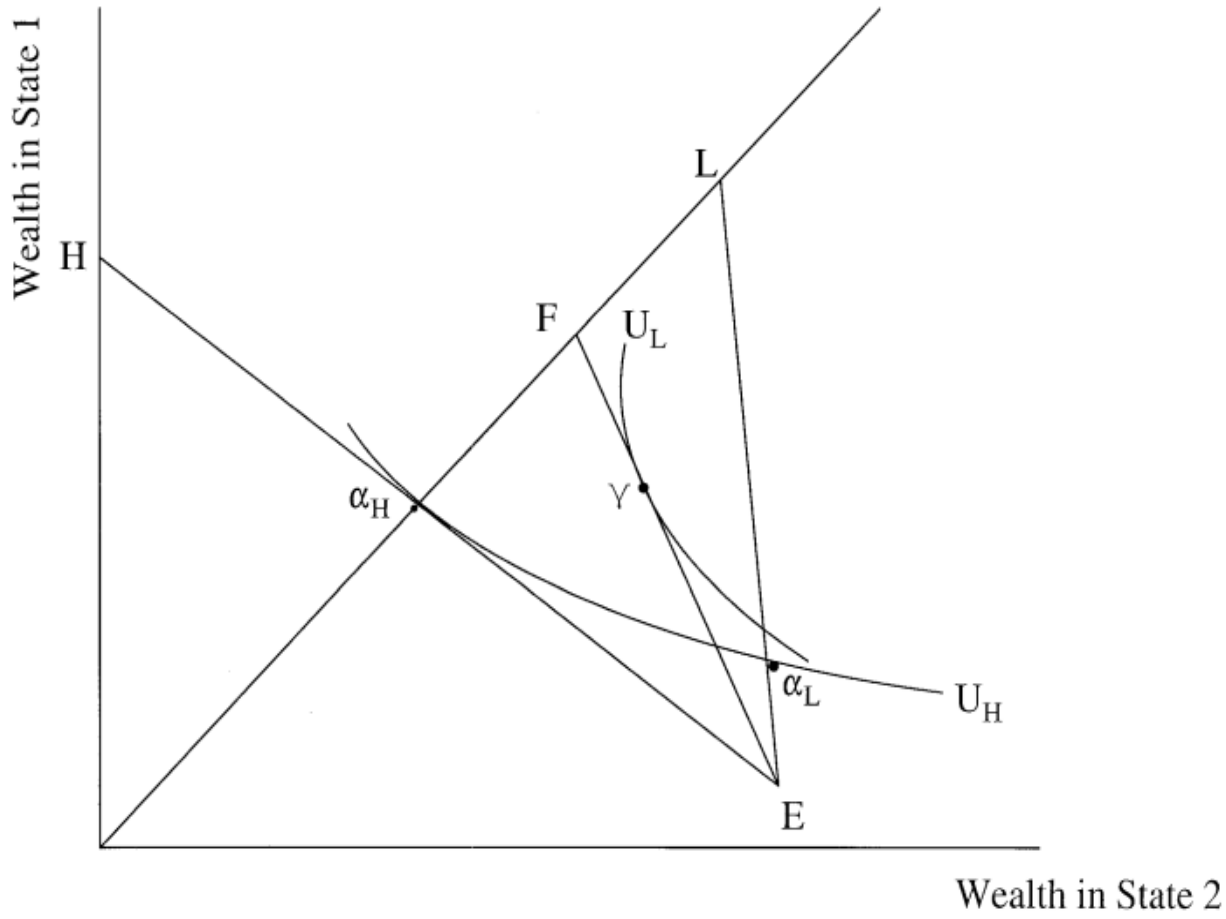

Figure 2: The single policy Wilson model: the effect of adverse selection

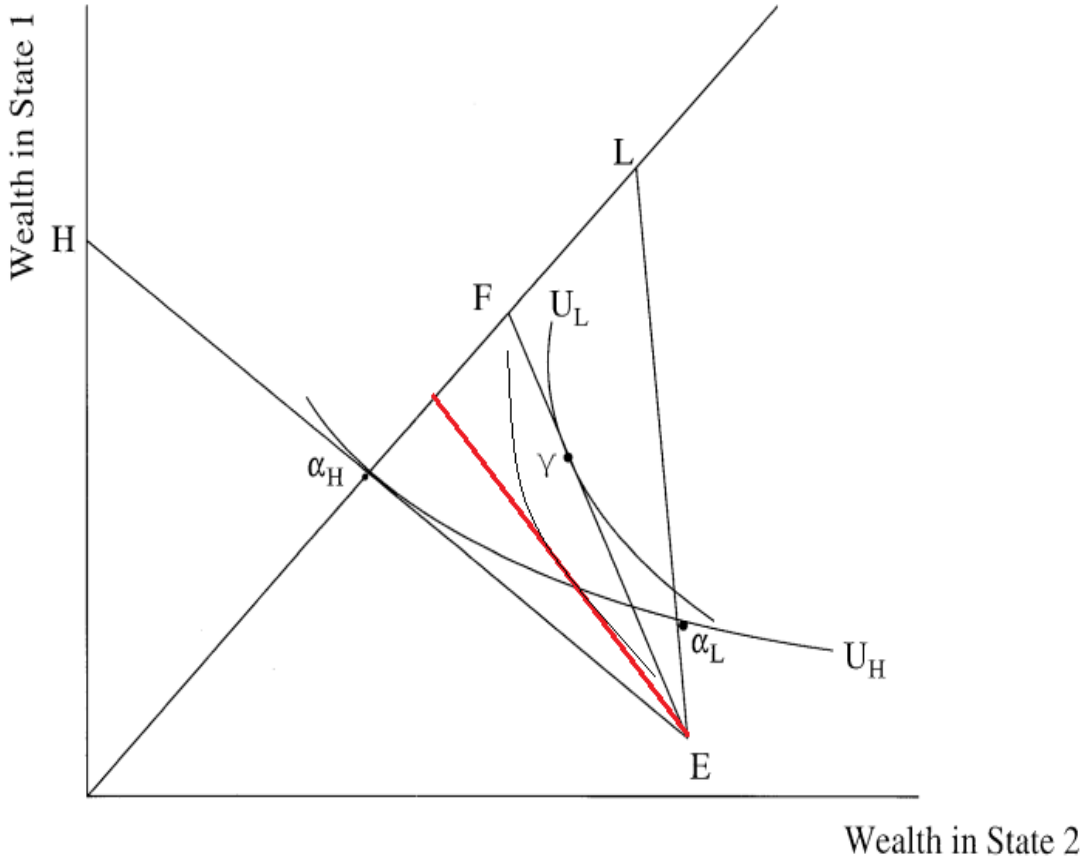

Figure 3: The multiple policy Miyazaki-Spence model