Private health insurance and the use of health care services

- a review of the theoretical literature with application to voluntary private health insurance in universal health care systems

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Foreword

This working paper by Astrid Kiil reviews the theoretical literature on private health insurance and the use of health care services and applies the theoretical framework to private health insurance that co-exists with a universal health care system.

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Summary

This paper reviews the theoretical literature on the demand for private health insurance and its effect on the use of health care services and applies the theoretical framework to the type of private health insurance that exists alongside a universal health care system. The predominant share of the theoretical literature on private health insurance is developed to model private health insurance in settings where this provides the primary source of coverage and the choice is between purchasing private health insurance and going uninsured. This type of private health insurance is termed principal private health insurance in the following. Private health insurance that co-exists with a universal health care system may be classified as complementary, supplementary or duplicate in relation to the universal health care system based on its coverage. Duplicate insurance covers treatments at private hospitals for treatments that are also available through the universal health care system. Complementary insurance covers private copayment for treatments that are only partly financed by but delivered within the universal health care system, and supplementary insurance covers treatments that are excluded from the universal health care system.

The individual demand for private health insurance

The individual demand for principal private health insurance is most frequently modelled based on expected utility theory. It is thus assumed that rational utility maximizing individuals compare the expected utility with and without private health insurance, respectively, and choose the alternative that maximizes their expected utility subject to a budget constraint. Assuming symmetric information, economic theory finds that the demand for principal private health insurance increases with the degree of risk aversion and varies with the probability of falling ill.

It is relatively straight forward to adapt the theoretical predictions regarding the individual demand for private health insurance to *complementary* and *supplementary* insurance. Hence, the demand for these insurance types is expected to increase with the degree of risk aversion and vary with the probability of falling ill. The demand for *duplicate* private health insurance is less straight forward to model, given that this type of insurance does not cover forced financial losses in the same sense as principal private hath insurance, but rather treatment at private facilities for treatments that are also available free of charge within the universal health care system. The demand for *duplicate* insurance has been shown to increase with income and decrease with the quality of the universal health care system, typically measured by the waiting time for treatment.

The employers' decision to offer private health insurance

The theoretical literature on the employers' demand for private health insurance on behalf of their employees is sparse and characterised by several different angles of approaches rather than a unified approach. Regardless of which approach is taken, it is expected that companies have a cost advantage over private individuals in the provision of health insurance. The reason for this is that group purchase

has the potential to reduce adverse selection and lower administrative expenses through pooling, just like companies who purchase large numbers of contracts may reasonably be expected to have more negotiation power than private individuals when negotiating the premiums. The benefits from risk pooling and negotiation power imply that larger companies are expected to be relatively more likely to offer employment-based private health insurance to their employees. In addition, the preferential tax-treatment of employment-based private health insurance found in some countries, including Denmark, may imply that employees prefer to receive private health insurance through their workplace rather than purchase it on an individual basis. The theoretical literature on employer provision of private health insurance is developed exclusively within the setting of principal private health insurance. However, the various approaches to thinking about the employers' decision are also, to varying degrees, applicable to the different types of private health insurance that exist alongside a universal health care system.

Effects of private health insurance on health care use

Considering the effects of private health insurance on the use of health care services, economic theory modelling the effect of principal private health insurance shows that this type of private health insurance has the potential to increase the use of health care services through several mechanisms. To the extent that preventive behaviour is not reflected in insurance premiums, the presence of insurance may reduce the incentives to exert preventive behaviour via ex ante moral hazard. This mechanism is, however, not expected to be very strong for health insurance. The most frequently mentioned mechanism, which is also the most important in relation to private health insurance that co-exists with a universal health care system, is ex post moral hazard. Ex post moral hazard occurs because private health insurance lowers the price that patients are facing at the point of use, thereby leading to higher utilization levels of health care services for which the demand is price elastic. In addition, private health insurance may also increase the use of health care services by reducing financial risk, transferring income from the healthy to the ill, and creating favourable conditions for supplier-induced demand. Institutional barriers such as the use of gatekeepers and restrictions in the coverage provided by the private insurers may, however, moderate or eliminate the positive effects.

It is relatively straight forward to adopt the theoretical literature on how private health insurance affects the use of health care services to model the effects of *complementary* and *supplementary* insurance. For these insurance types, ex post moral hazard is expected to be the dominant effect. It is more complicated to model the effect of duplicate insurance covering treatment at private facilities for treatments that are also available free of charge within the universal health care system. Whether *duplicate* insurance increases the use of health care services may be shown to depend on whether it affects the indications for treatment and whether the demand for the covered services is time elastic. It is possible that *duplicate* insurance shifts use from the universal health care system to private hospitals rather than increase total use.

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1 Introduction

This paper reviews the theoretical literature on the demand for private health insurance and its effect on the use of health care services and applies the theoretical framework to the type of private health insurance that exists alongside a universal health care system.

The predominant share of the theoretical literature on private health insurance applies directly to settings where private health insurance provides the primary source of coverage and the choice is between purchasing private health insurance and going uninsured. However, private health insurance that is purchased on a voluntary basis in addition to the coverage provided by a universal tax-financed health care system also exists in some form in most universal health care systems, and it has increased in importance in several European countries over the past decades (Maarse 2006). These private health insurance schemes have largely developed around the universal health care systems and, as a consequence, they are rather heterogeneous across countries. While some private health insurance schemes have as their primary purpose to cover private copayment, other schemes cover treatments that are also available free of charge within the borders of the universal health care system.

Although the institutional setting of principal private health insurance differs considerably from that of private health insurance in universal health care systems, the theoretical framework developed to model the decision to purchase insurance and its effect on the use of health care services may reasonably be argued to be applicable to voluntary private health insurance in universal health care systems.

1.1 Structure of the paper

Section 1.2 outlines the definitions used in the literature to classify private health insurance that provides the primary source of coverage for the entire population or part of the population as well as to distinguish between the alternative functions that voluntary private health insurance may have in relation to a universal health care system. Section 2 accounts for some general models of the individual demand for private health insurance and accounts for their implications in terms of private health insurance in universal health care systems. Section 3 summarises and compares the different angles of approaches taken in the theoretical literature on the employers' decision to offer private health insurance, which is seen to differ fundamentally from the individual demand. Finally, section 4 accounts for the various channels through which private health insurance may affect the use of health care services, and discusses their relevance in relation to the different types of private health insurance that may co-exist with a universal health care system.

1.2 Concepts and definitions

In health care systems where private health insurance provides the primary source of coverage for all health care (i.e. both acute and elective) for the entire population or part of the population, it may be

classified as either principal or substitute, respectively (OECD 2004). While neither of these two types of private health insurance are analysed in this thesis, they are briefly defined in the following in order to place the present thesis in a broader context.

Substitute private health insurance substitutes for coverage that would or could otherwise be available through the statutory health care system. This type of private health insurance is essentially only found in social insurance health care systems, and it is usually only available to clearly defined population groups, who are either not eligible for coverage through the social insurance system or allowed to opt out on a voluntary basis. People with substitutive private health insurance do not make the normal contributions to the statutory health care system (Mossialos and Thomson 2002). Principal private health insurance (PHI) is found in health care systems where private health insurance provides the main source of funding for the entire or the majority of the population.[1]

1.2.1 Functional classification of private health insurance in universal health care systems

This section introduces a functional classification of the various types of private health insurance that may be purchased on a voluntary basis in addition to the coverage provided by a universal tax-financed or social insurance health care system. Voluntary is taken to imply that the insurance schemes are not mandatory by law, but purchased by individuals on a voluntary basis or by employers on behalf of their employees, either voluntarily or in consequence of collective agreements (Mossialos and Thomson 2002; OECD 2004). The focus of the classification is to distinguish the alternative functions that VPHI may have in relation to a universal health care system. Hence, it is a useful tool to structure the analysis of various types of VPHI and their impact on universal health care systems.

Table 1.1 summarizes the existing classifications of VPHI that co-exists with a universal tax-financed or social insurance health care system, distinguishing between the alternative functions that VPHI may have in relation to the universal system. It is evident from Table 1 that there is no general agreement on definitions in the literature – adding some confusion to the literature.

[1] The distinction between highly regulated principal private health insurance and a social insurance health care system is not clear-cut in the literature (White 2009). This thesis takes the approach of Colombo and Tapay (2004) and defines legally compulsory private health insurance in any form as social insurance, while private health insurance that provides the main source of coverage, but is not legally compulsory, is referred to as principal private health insurance. Following this approach, the United States is the only industrialized country with principal private health insurance (usually provided as part of the employment contract), while the insurance arrangements found in e.g. Switzerland and the Netherlands are classified as social insurance health care systems. It is, however, acknowledged that the distinction may also be based on the source of financing, such that principal private health insurance refers to insurance schemes that are financed through private premiums (which are often, but not always, voluntary), while social insurance is financed mainly through social security contributions akin to taxes (OECD 2004). Following this approach, the Swiss health care system may be classified as highly regulated principal private health insurance.

Table 1.1 Existing classifications of VPHI in universal health care systems

Coverage	Co-payment for treatments that are partly covered by the universal system	Treatments that are excluded from the universal system	Treatments at private facilities for treatments that are also available within the universal system
White (2009)	Gap		Parallel
Colombo and Tapay (2004)	Complementary	Supplementary	Duplicate
OECD (2004)	Complementary	Supplementary	Duplicate
Henke and Schreyögg (2005)	Supplementary		Complementary
Mossialos and Thomson (2002)	Complementary		Supplementary

This paper adopts the functional classification proposed by Colombo and Tapay (2004) and OECD (2004). According to this classification, VPHI coverage may be classified as complementary, supplementary or duplicate in relation to the tax-financed health care system. Complementary VPHI covers private copayment for treatments that are only partly financed by but delivered within the universal health care system. This type of private health insurance is commonly referred to as supplemental health insurance or Medigap insurance in the context of the US health care system (Atherly 2001). Supplementary VPHI covers treatments that are excluded from the universal health care system. The scope for complementary and supplementary coverage thus depends on the coverage provided by the universal health care system. Duplicate VPHI covers health care services that are also available free of charge within the universal health care system. More specifically, duplicate VPHI is frequently used to cover diagnostics and elective surgery at private hospitals for procedures that are subject to some waiting time when provided through the universal health care system. Another option is for duplicate VPHI to cover access to specialist care without prior referral from a general practitioner when this is required within the universal health care system. Hence, the main benefits of duplicate coverage are generally perceived to be faster access to treatment, greater freedom of choice, and in some cases also better amenities (Colombo and Tapay 2004; OECD 2004).

The classification by Colombo and Tapay (2004) is preferred over the alternatives in this thesis because it is slightly more detailed, while at the same time sufficiently broad to capture changes over time in the design of private health insurance schemes. It is, however, acknowledged that a large number of studies use the alternative definitions, which are considered equally valid.

A crucial difference between the insurance types outlined in Table 1 and substitute private health insurance is that while individuals with the latter are completely excluded from the tax-financed health care system, those with VPHI that is taken out in addition to the coverage provided by a tax-financed or

social insurance health care system do not lose their entitlement to use the tax-financed system and are still obliged to contribute towards it.

In practice, most insurance policies that co-exist with a tax-financed or social insurance system are difficult to classify accurately because they bundle several types of coverage. The possible overlaps in coverage complicate the use of a functional classification for practical purposes such as data collection and empirical analysis. Moreover, insurance contracts may differ on other important characteristics than coverage, such as whether they are purchased on an individual basis or taken out by employers on behalf of their employees, and the method of premium calculation (OECD 2004). However, the functional classification outlined in this section still provides a useful conceptual framework, provided one recalls the various caveats and ambiguities.

2 The individual demand for private health insurance

The individual demand for health care is highly variable and unpredictable given that illness strikes at random. This necessitates some sort of insurance mechanism in the financing of health care services (Arrow 1963). The theoretical framework for analysing the individual demand for private health insurance is mainly developed within the setting of PHI, i.e. private health insurance that provides the main source of funding for the entire or the majority of the population. This section lays out various models of the individual demand for PHI. The models accounted for in this section are all based on expected utility theory, which is the framework most frequently used to model choice under uncertainty in the literature (Machina 2008).[2] Sections 2.1-2.3 account for the original models of the individual demand for PHI under different informational assumptions. Section 2.4 discusses the implications of the models in terms of the demand for the different types of VPHI that may exist in universal health care systems, and accounts for a theoretical contribution that explicitly models the demand for duplicate VPHI.

2.1 Model with symmetric information

The classical one-period model of PHI demand with symmetric information between the insurer and the insurance taker was developed by Friedman and Savage (1948). Subsequently, some variation of the model has been included in popular health economics textbooks such as Zweifel and Breyer (1997), Santerre and Neun (2010), and Cutler and Zeckhauser (2000). The presentation in this section follows the exposition in Cutler and Zeckhauser (2000).

Individuals are assumed to fall ill with the probability $0 \leq p \leq 1$ and remain in good health with the probability $1 - p$. The probability p is known by both the individuals and the insurer, i.e. there is symmetric information. The cost of medical care if ill is m, and treatment is assumed to restore ill

[2] It is, however, acknowledged that the demand for private health insurance may also be modelled based on alternative models of choice under uncertainty, such as prospect and regret theory (Marquis 1996).

individuals to perfect health (i.e. the non-financial consequences of illness are ignored). Insurance contracts are assumed to provide the fixed amount of money *m* in the event of illness, which is also known as indemnity insurance. The independence between the actual use of medical care and *m* implies that ex post moral hazard is assumed away. Moreover, the contracts are characterized by the risk rated actuarially fair insurance premium $\pi = p \cdot m$. All individuals are assumed to have a stable utility function which is additively separable in the arguments wealth *y* and final health *H*[.]. In other words, the marginal utility of income does not depend on the health state, and the utility function does not change as health or income change. The utility function is assumed to satisfy the properties $U' > 0$ and $U'' < 0$, which is equivalent to the definition of risk aversion under uncertainty. Finally, individuals without insurance are assumed to have sufficient income to pay for care at the point of demand when ill.

The assumption that treatment restores the individual to perfect health is modelled by letting final health be a function initial health and medical care, where $d = 0$ indicates a healthy individual and $d = 1$ indicates an ill individual, so that $H[1,m] = H[0,0]$. The expected utility functions for individuals with and without PHI may then be written as:

$$V_I = (1-p)U(y-\pi, H[0,0]) + pU(y-\pi, H[1,M]) = U(y-\pi) \qquad (2.1)$$

$$V_N = (1-p)U(y, H[0,0]) + pU(y-m, H[1,M]) = (1-p)U(y) + pU(y-m) \qquad (2.2)$$

where the subscripts *I* and *N* denote insured and not insured, respectively.

The expected utility of an individual without PHI may be approximated by Taylor series expansion taken about the level of income net of the insurance premium:[3]

$$V_N \approx U(y-\pi) + U'(U''/2U')\pi(m-\pi) \qquad (2.3)$$

whereafter the value of PHI can be calculated as:

$$(V_I - V_N)/U' \approx (1/2)(-U''/U')\pi(m-\pi) \qquad (2.4)$$

The expression to the left of the equal sign in equation (2.4) is the difference between being uninsured and insured scaled by the marginal utility of payment for risk removal, while the expression to the right is the benefit of risk removal. Evaluating the expression stated in equation (2.4), it is seen that the benefit of PHI is determined by the coefficient of absolute risk aversion ($-U''/U'$) and the variance in the cost of care if

[3] Taylor series expansion about the level of income net of the insurance premium, from eq. (3.2) $V_N \approx (1 - p)\,[U(y - \pi) + U'\pi + (1/2)U''\pi^2] + p[U(y - \pi) - U'(m - \pi) + (1/2)U''(m - \pi)^2]$. Collecting terms, this simplifies to $V_N \approx U(y - \pi) + U'\{(1 - p)\pi - p(m - \pi)\} + (1/2)U''\{(1 - p)\pi^2 + p(m - \pi)^2\}$. The term $(1 - p)\pi - p(m - \pi)$ is zero. The term $(1 - p)\pi^2 + p(m - \pi)^2$ can be expanded as $(1 - p)\pi^2 + pm^2 - 2pm\pi + p\pi^2$. Since $pm = \pi$, this simplifies to $pm^2 - \pi^2 = \pi(m - \pi)$ (Cutler and Zeckhauser 2000).

uninsured. Since both of these terms are positive under the given assumptions, the expected utility with fair insurance is greater than the expected utility without insurance in this model. Moreover, the value of PHI and hence the demand is seen to increase with the degree of risk aversion and the variance of the cost of medical care. This implies that the demand for PHI covering catastrophic losses should be greater than the demand for PHI covering low variance losses.

The intuition behind this result is that having access to fair insurance, risk averse individuals prefer to smooth the marginal utility of income by transferring income from the healthy state, where the marginal utility of income is relatively low, to the ill state, where the marginal utility of income is relatively high. In this way, the demand for PHI has traditionally been interpreted as a demand for certainty, and the purchase of PHI is equivalent to accepting a small certain loss, i.e. the insurance premium, in order to avoid the risk of incurring a larger loss with the same expected utility (Friedman and Savage 1948).

Nyman (2003) suggested an alternative approach to modelling the demand for PHI. Following this approach, the decision to purchase PHI is made by comparing the expected utility gain from the income transfer in the ill state to the expected utility loss from paying the insurance premium in the healthy state rather than comparing the expected utility with and without PHI, respectively.[4] Given that uncertainty occurs both with and without insurance, risk aversion is only expected to play a minor role in the demand for PHI according to the approach. The essence of PHI thus becomes a redistribution of income rather than elimination of risk (Nyman 2003). A central part of this alternative theory concerns a decomposition of increased use of health care services induced by PHI into inefficient ex post moral hazard and use that is due to an efficient transfer of income from the healthy to the ill, as will be accounted for in section 4.4.

2.1.1 Access value

The assumption that individuals without PHI have sufficient income to pay for health care at the point of demand when ill implies that the income elasticity of the demand for health care is zero. This is a rather strong assumption, which is at best questionable. De Meza (1983) has developed an alternative model based on the assumption that health care is a normal good, which implies that more of it will be demanded when PHI is available. This model takes into account that individuals without PHI are not always able to pay for health care at the point of use when ill, and that some health care costs may in fact not occur without insurance.[5] The implications of individuals with and without PHI not necessarily using the same amount of health care when ill for the demand for PHI were further developed by Nyman (1999b). More specifically, Nyman (1999b) argued that in addition to providing protecting against financial risk, PHI is then also valued for giving access to health care that would otherwise be unaffordable, i.e. it has 'access

[4] The alternative approach of Nyman (2003) may be shown to be mathematically equivalent to the classical model of PHI demand when individuals use the same amount of medical care regardless of their health status.

[5] The main point of de Meza (1983) was to show that PHI may have non-trivial effects on the use of health care even in the absence of moral hazard.

value'. The access value is greater for individuals with limited financial resources, since for these individuals, the alternative to purchasing PHI may well be to go without treatment in the ill state, which implies that the financial loss associated with illness is limited. In addition, PHI that covers expensive procedures may reasonably be expected to have greater access value than PHI covering smaller losses.

2.2 Model with one-dimensional private information and adverse selection

The notion that one-dimensional private information may cause adverse selection in various markets was introduced by Akerlof (1970), and the classical model of adverse selection into insurance based on risk was subsequently developed by Rothschild and Stiglitz (1976) and (Wilson 1977).

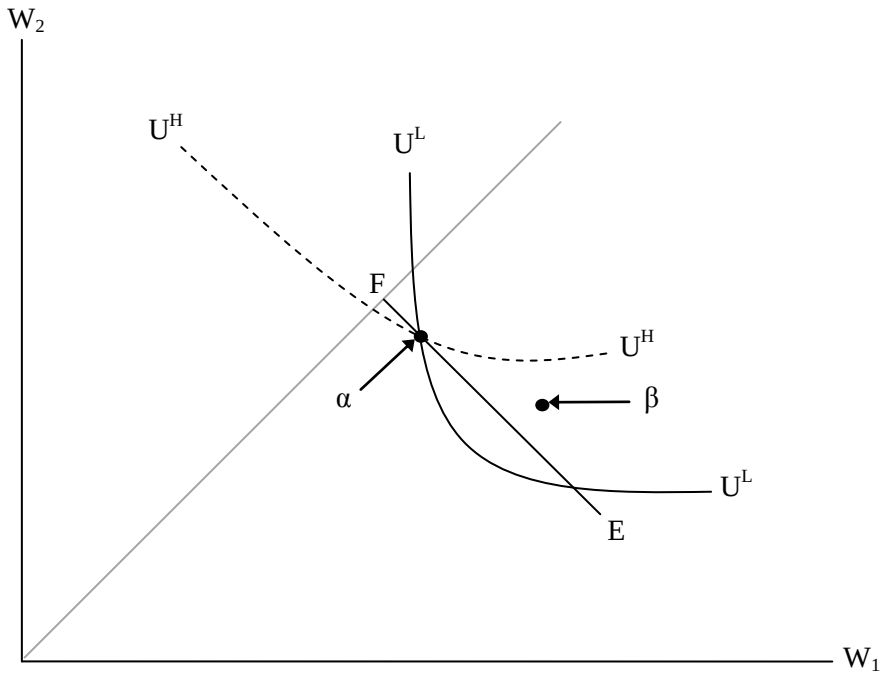
The presence of one-dimensional private information may be incorporated into the framework of the model developed in section 2.1 by replacing the assumption of symmetric information with an assumption that individuals know their probability of falling ill, and hence their expected health care costs, while insurers do not have this information (or alternatively that insurers are not allowed to use this information when setting their premiums). The population is assumed to consist of two different risk types. High-risk individuals who fall ill with the probability $0 \leq p^H \leq 1$ and remain in good health with the probability $1 - p^H$, and low-risk individuals who fall ill with the probability $0 \leq p^L \leq 1$ and remain in good health with the probability $1 - p^L$, where $p^H > p^L$. The cost of medical care remains the fixed amount of money m, but now PHI contracts allow individuals to choose between different coverage levels denoted by $c(m)$ rather than dictate full reimbursement. Each individual can only buy one PHI contract, i.e. there is price and quantity competition.

If there was symmetric information, i.e. the probabilities of falling ill were known by both individuals and insurers, both risk types would be offered to purchase PHI at the risk rated actuarially fair premiums $\pi^H = p^H \cdot c(m)$ and $\pi^L = p^L \cdot c(m)$, and both risk types would chose to purchase full coverage in equilibrium. However, when the insurers cannot discriminate among the individuals based on their probability of falling ill, all individuals would be offered to purchase private health insurance at the premium $\pi = \bar{p} \cdot c(m)$, where $\bar{p} = \lambda \cdot p^H + (1 - \lambda)p^L$ is the average probability of falling ill in the population. Other things equal, high-risk individuals are willing to pay more than low-risk individuals for additional coverage, and they will therefore choose to purchase PHI contracts that provide more extensive coverage. In this way, the presence of asymmetric information leads to adverse selection in a competitive insurance market.

Defining an equilibrium as a situation where, when individuals chose contracts so as to maximize their expected utility, no contract makes negative expected profits and no contract outside the equilibrium set of contracts would make a non-negative profit if offered, it is relatively straight forward to establish that if there is an equilibrium in a competitive insurance market with private information, it must be a separating equilibrium where the low-risk individuals purchase more comprehensive coverage than the high-risks.

Figure 2.1 shows that a pooling equilibrium where both risk types purchase the same insurance contract is not feasible. The horizontal axis represents net income in the healthy state, W_1, and the vertical axis represents net income in the ill state, W_2. The indifference curves of the high- and low-risk individuals are denoted by U^H and U^L, respectively, and EF is the fair-odds line where insurance contracts break even.

Figure 2.1 Pooling equilibrium in market with one-dimensional private information

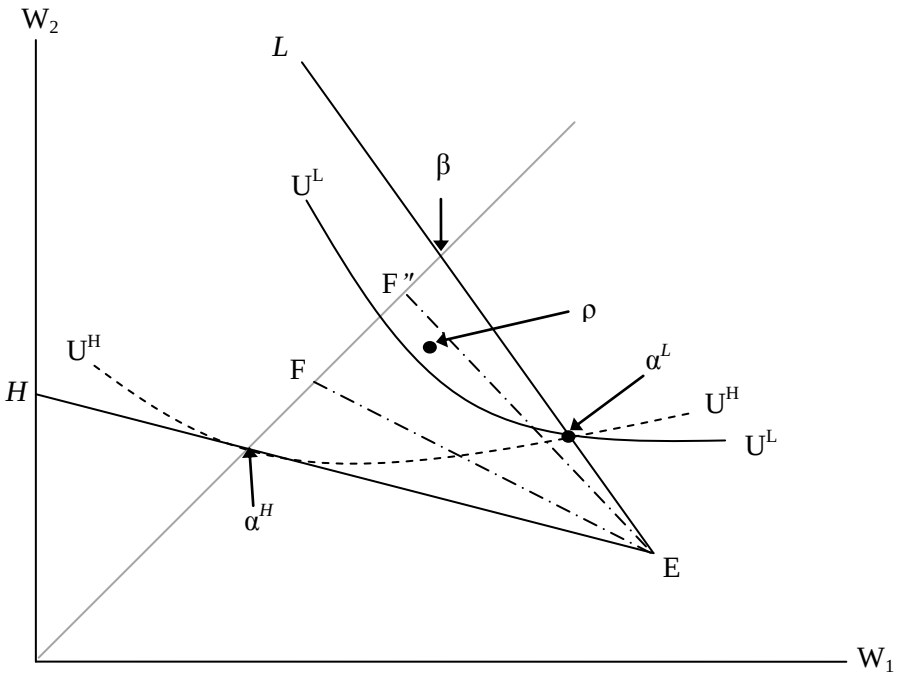


Source: Rothschild and Stiglitz (1976), p. 635.

Suppose that the contract α, which is located where the indifference curves of the high- and low-risk individuals intersect the fair-odds line, is a pooling equilibrium. In this case, the conditions that no contract makes negative expected profits, and no contract outside the equilibrium set of contracts would make a non-negative profit if offered must hold. However, it is seen from Figure 2.1 that the second equilibrium condition does not hold, because there is a contract, β, which is preferred to α by the low-risk individuals and makes a positive profit when purchased only by the low-risk individuals. Hence, there cannot be a pooling equilibrium in a competitive insurance market with one-dimensional private information.

Figure 2.2 shows a separating equilibrium where the different risk types purchase different contracts.

Figure 2.2 Separating equilibrium in market with one-dimensional private information



Source: Rothschild and Stiglitz (1976), p. 636.

The fair-odds line *EF* is replaced by *EH* (with slope $(1 - p^H)/p^H$) and *EL* (with slope $(1 - p^L)/p^L$), which are the fair-odds lines for high- and low-risk individuals respectively. In this model, the high-risk individuals prefer the contract α^H and the low-risk individuals prefer the contract β, both of which provide full insurance. However, high-risk individuals will also purchase the contract β if it is offered, which would cause the profit of this contract to be negative, and it is therefore not an equilibrium. Instead, the contract α^L is the most preferred contract for the low-risk individuals that does not attract the high-risk individuals. Hence, the set of separating contracts (α^H,α^L) makes up the only possible equilibrium in the competitive insurance market with asymmetric information.[6] In this equilibrium, the high-risk individuals end up in their preferred plans with complete insurance coverage, while the low-risks purchase less than complete coverage.

It may also be the case that there is no equilibrium in the competitive insurance market with private information. This may be seen by considering the insurance contract ρ in Figure 2.2. This contract is above the U^L indifference curve through α^L and also above U^H and would hence be purchased in preference to either α^H or α^L if offered. If ρ makes a profit when purchased by both groups, it will upset the potential equilibrium of (α^H,α^L). The profitability of ρ can be shown to depend on the composition of the market. If there are sufficiently many high-risk individuals for *EF* to represent the market odds, then ρ will not make a profit and the separating equilibrium (α^H,α^L) remains. If there are relatively few high-risks so that the market odds are represented by *EF'*, then ρ will make a positive profit. Given that (α^H,α^L) is the only feasible equilibrium, the competitive insurance market will not have any equilibrium in this case.

[6] This point is formalised in Wilson (1977).

In general, a pooling equilibrium is less likely to exist when the costs to the low-risk individuals of pooling are low because there are relatively few high-risks in the population and/or the difference in the probability of falling ill between high- and low-risks is small, or the costs of separating are high because the low-risks are very risk averse (Rothschild and Stiglitz 1976).

The predictions of the simple one-period model developed by Rothschild and Stiglitz (1976) have been shown to extend to more general frameworks in a number of studies. Among others, Chiappori and Salanié (2000) conjecture that the basic intuition of the model remains valid in a dynamic setting, and Chiappori et al. (2006) show that the prediction of adverse selection in competitive insurance markets with one-dimensional private information is robust to removing the restriction on the number of risk types and their distribution, and introducing multiple levels of losses. However, other studies have shown that some of the predictions may change in slightly different settings. Feldman and Dowd (1991) and Cutler and Reber (1998) have developed models with a continuous distribution of risk in the population rather than two risk types and shown that adverse selection may cause the market for generous insurance policies to break down as a consequence of a dynamic process. In this case, the low-risk individuals will end up in their preferred plans, while the high-risk individuals end up in less generous plans than is optimal (i.e. the opposite sorting of adverse selection).

2.2.1 Supply-side restrictions

Insurers and regulators can impose various measures in order to counter adverse selection into PHI (Cutler and Zeckhauser 2000). A common countermeasure to adverse selection is screening, where the insurance company seeks to uncover whether a potential applicant is a high- or low-risk individual in order to risk rate the premium based on the acquired information or enforce eligibility requirements. Likewise, low-risk individuals may signal their risk type to the insurers in various ways, such as agreeing to take on coinsurance or deductible clauses. Another potential supply side response to adverse selection is to exclude existing conditions from coverage, which may make the insurance contract less attractive for individuals who are generally in bad health. Along a similar line, insurance companies may also attempt to make their contracts more attractive to low-risk individuals, e.g. by including discounts on fitness clubs, thereby indirectly discouraging adverse selection into PHI.

In either case, it must be kept in mind that a necessary condition for adverse selection to occur is that premiums are set based on the average probability of illness within the population. If premiums are risk rated or there are eligibility requirements in place preventing high-risk individuals from entering the market, then the relationship between the probability of falling ill and the demand for PHI is ambiguous.

2.3 Model with multi-dimensional private information and advantageous selection

There is general agreement that when individuals have private information on multiple dimensions, the relationship between risk type and the chosen level of insurance coverage can be of any sign (Chiappori et al. 2006; Hemenway 1990; de Meza and Webb 2001; Jullien et al. 2007; Fang et al. 2006; Fang et al.

2008). While the literature on multi-dimensional dimensional private information in insurance markets is still at a developmental stage, several promising contributions within the recent decade implies that it is on the edge of becoming a well-established part of the economic literature on PHI. The model presented in this section follows the simple conceptual framework of Fang et al. (2006; 2008). It is noted to be a partial equilibrium model in the sense that it analyses the purchase decision of the individual assuming a particular equilibrium (i.e. a set menu of insurance contracts) and not a full equilibrium model in which insurers compete by offering different contracts. This is sufficient to capture the idea of advantageous selection into PHI when individuals have private information on multiple dimensions.[7]

Like in the classical model of PHI demand introduced in section 2.1, individuals fall ill with the probability $0 \leq p \leq 1$ and remain in good health with the probability 1 - p. In addition, they are assumed to differ on some other vector, γ, that may also affect their probability of purchasing PHI.[8] The individuals know their probability of falling ill as well as their γ, while the insurers do not have any of this information. Hence, the individuals have private information on multiple dimensions.

The literature generally considers risk preferences to be the main source of advantageous selection into PHI (de Meza and Webb 2001; Finkelstein and McGarry 2006; Hemenway 1990; Jullien et al. 2007). This section therefore starts out by interpreting γ as risk aversion and showing that the probability of insurance purchase $Q(p,\gamma)$ is increasing in p and γ in this case. In order to derive $Q(p,\gamma)$ when γ equals risk aversion, consider an individual with a constant relative risk aversion utility function:

$$U(y) = \frac{y^{1-\gamma}}{1-\gamma} \tag{2.5}$$

where y denotes wealth and γ is the parameter of relative risk aversion. Like in the model introduced in section 2.1, the cost of medical care restoring ill individuals to perfect health amounts to m, and private health insurance covering the fixed amount of money m in the event of illness may be purchased at the price of π.

The expected utility functions for individuals with and without insurance may be written as:

$$V_I(p,\gamma) = U(y-\pi) + e \tag{2.6}$$

$$V_N(p,\gamma) = (1-p)U(y) + pU(y-m) \tag{2.7}$$

[7] Moreover, a full equilibrium model of an insurance market with multi-dimensional private information does not yet exist (Fang et al. 2008).

[8] In the model with one-dimensional private information presented in section 2.2, the risk type p is the only dimension of heterogeneity and γ is implicitly assumed to be constant in the population.

where subscripts *I* and *N* denote insured and not insured, respectively, and *e* is a fixed cost of taking out insurance (e.g. search and administrative costs), which is logistically distributed in the population and independent of p and γ. Fang et al. (2006) showed that the probability that the individual purchases PHI may then be given by the logistic expression:

$$Q(p,\gamma) = \frac{\exp[V_I(p,\gamma)]}{\exp[V_I(p,\gamma)] + \exp[V_N(p,\gamma)]} \tag{2.8}$$

where $Q(p,\gamma)$ is increasing in p and γ.[9] Hence, individuals with a higher probability of falling ill and the more risk averse are more likely to purchase PHI when individuals have private information on these two dimensions. If the degree of risk aversion is negatively correlated with the probability of falling ill, the prediction of the model with one-dimensional private information that the high-risk individuals purchase relatively more comprehensive insurance coverage is thus reversed.

The model is generalised to take into account that advantageous selection into private health insurance may in principle occur on any private information that is positively correlated with insurance coverage and at the same time negatively correlated with risk by modelling the probability of insurance purchase $Q(p,\gamma)$ as a reduced form function of p and γ.[10] One such potential source of advantageous selection is cognitive ability (Fang et al. 2006; Fang et al. 2008; Bolhaar et al. 2008). Assume that (p,γ) is distributed according to a joint cumulative distribution function F in the population, and let $F_{\gamma|p}(\cdot|\cdot)$ denote the CDF of risk aversion γ conditional on risk type p. The marginal probability of purchasing PHI for a given risk type p (after integrating out γ) is given by:

$$\tilde{Q}(p) = \int Q(p,\gamma) dF_{\gamma|p}(\gamma|p) \tag{2.9}$$

Fang et al. (2008) have shown that (2.9) cannot be monotonic in p if at least one element in γ satisfies the following two propositions:

(i) γ is positively correlated with insurance coverage, i.e. $Q(p,\gamma)$ is increasing in γ.

(ii) γ is negatively correlated with risk p.

The model outlined in this section is general in the sense that the assumed negative correlation between γ and p may arise either exogenously or endogenously; this does not matter for the results. Cutler et al. (2008) have developed an alternative model where the more risk averse individuals are assumed to take actions to reduce their risk, thereby endogenously generating a negative correlation between γ and p.

[9] It may be seen that $Q(p,\gamma)$ is increasing in p by noting that the sign of $\delta Q/\delta p$ is the same of $\delta(V^I - V^N)/\delta p$, which is given by $\delta(V^I - V^N)/\delta p = U(y) - U(y - m) > 0$. To see that $Q(p,\gamma)$ is increasing in γ, use the fact that for any $\gamma' > \gamma$ there is a strictly concave and increasing utility function $v(\cdot)$ so that $u(y;\gamma') \equiv v(u(y;\gamma))$.

[10] The dependence of Q on c and π is suppressed for simplicity in what follows.

2.4 Application to voluntary private health insurance in universal health care systems

It is relatively straight forward to adapt the models accounted for in sections 2.1 to 2.3 to the demand for complementary and supplementary VPHI in universal health care systems, assuming that the coverage of the universal health care system is fixed and exogenously determined. This assumption may be argued to be plausible in the shorter run, given that it usually requires lengthy political processes to change the coverage of the universal system. However, for duplicate VPHI the situation is more complicated.

More precisely, the various models may be adapted to supplementary VPHI by letting p denote the probability of contracting an illness for which the treatment is excluded from the universal health care system but covered by supplementary VPHI. For complementary VPHI, it is done by letting p denote the probability of needing medical care which is subject to copayment in the universal health care system and m denote copayment rather than the total cost of medical care. Following this line of reasoning, economic theory predicts that the demand for supplementary as well as complementary VPHI is increasing in the degree of risk aversion and the variance of payments and copayments, respectively. For complementary VPHI to have access value, the copayments in the universal health system would have to be greater than the financial resources of the individual. Although this could happen in countries where copayment makes up a large share of the total health expenditures, such as Switzerland, it is most likely not the case very often. Considering the scope for health-based selection, Olivella and Vera-Hernández (2006) have extended the model presented in section 2.2 to consider the demand for complementary VPHI and found that individuals adversely select themselves into complementary VPHI when they have one-dimensional private information on p. Along a similar line, common sense implies that the relationship between p and the chosen level of supplementary and complementary VPHI coverage may be of any sign if individuals have private information on multiple dimensions. However, the type of model with multi-dimensional private information and advantageous selection has not yet been formally adapted to model VPHI in universal health care systems.

The demand for duplicate VPHI is less straight forward to model, given that this type of VPHI does not cover forced financial losses in the same sense as PHI, but rather treatments at private facilities which are also available free of charge within the universal health care system. Hence, it may reasonably be expected that the demand for duplicate VPHI is somehow related to the quality of the (typically) publicly provided health care or strong preferences for private provision. Section 2.4.1 accounts for a theoretical contribution by Besley et al. (1999) and Propper et al. (2001) that explicitly models the demand for duplicate VPHI under symmetric information, emphasizing the link between the quality of the universal health care system and the decision to purchase duplicate VPHI. Considering the scope for health-based selection into duplicate VPHI, Olivella and Vera-Hernández (2006) extended the model presented in section 2.2 and found that one-dimensional private information on health leads to a separating equilibrium where the

healthy individuals choose to rely exclusively on the universal health care system while the individuals in bad health purchase duplicate VPHI.[11]

In terms of access value, it may be argued that some individuals assign access value to duplicate VPHI, interpreted in the sense of access to private sector treatment, given that they are eligible to receive treatment in the universal health care system free of charge (Jones et al. 2007). This would be the case for individuals who would not have the financial resources to pay at the point of demand for treatment at private hospitals in the ill state.

Finally, Propper (1993) has argued that some individuals may not consider duplicate VPHI to be within their choice set for political or ideological reasons. These individuals, who may increase their expected utility by taking out duplicate VPHI for medical or other reasons, but do not consider the option for attitudinal reasons, are said to have preferences that are captive to the universal health care system.[12] The idea that some individuals may be captive to the universal health care system has been extended further by Costa-Font and García-Villar (2009), who argued that the more risk averse individuals are also more likely to be captive to the universal system.

2.4.1 Model of the individual demand for duplicate VPHI with symmetric information

Besley et al. (1999) and Propper et al. (2001) have modelled the demand for duplicate VPHI under symmetric information, emphasizing the link between the quality of the universal health care system which is accessible free of charge at the point of demand and the decision to purchase duplicate VPHI.

While the quality of the universal health care system is thus of central importance in relation to duplicate VPHI, the exact definition of quality within the realm of medical care is not straight forward. One possible and generally accepted approach is to assess quality along the dimensions of organisational structure, process, and the medical results (Donabedian 2005). Another option is to define quality as the waiting time for non-urgent medical care, i.e. in reality quick access, given that this is often mentioned as a chief concern in universal care systems, or as amenities, such as better food and private rooms (Besley et al. 1999). There is no need to be specific about this in the current model.

Like in section 2.1, individuals are assumed to contract an illness which can be treated in the private health care sector with the probability $p \in [0,1]$, which is known both by the individuals and the insurer. Medical care is available in varying qualities, denoted by $q \in [\underline{q}, \bar{q}]$. Ill individuals may receive one unit of

[11] The model developed by Olivella and Vera-Hernández (2006) considers duplicate VPHI as providing more complete coverage than the universal health care system. In this way, it does not differ conceptually from the model with one-dimensional private information and adverse selection presented in section 2.2, and is thus not accounted for in detail in this section.

[12] Although the scenario is less likely, captivity may, however, also occur the other way around, so that individuals holding beliefs that are critical of the universal health care system are inclined to go private.

medical care of quality Q from the universal health care system or alternatively purchase one unit of their preferred quality of medical care in the private sector. Assuming that quality of care is a normal good, the quality of private sector care must be at least as high as that of the care available in the universal health care system, otherwise there would not be a market for it.

The utility function of a healthy individual with income y is denoted by $U(y)$, and the utility function of an ill individual with income y who receives medical care of quality q is denoted by $u(q,y)$. Both are assumed to be concave in income. Moreover, $u_{qy}(\cdot)$ is assumed to be equal to or greater than zero, which implies that quality of care is a normal good. Income is assumed to be continuously distributed with finite support between $[\underline{y}, \bar{y}]$.

The individuals may purchase duplicate VPHI that reimburses the cost of private sector care in the event of illness. Given that the privately insured have already paid the premium before falling ill and thus face a zero-cost of treatment at the margin, it is evident that they will choose to receive medical care of the quality $q = \bar{q}$ in case of illness.[13] The duplicate VPHI contracts are priced according to a risk rated actuarially fair insurance premium, including a multiplicative loading factor β.

The expected utility functions for individuals with and without duplicate VPHI may then be written as:

$$V_I(p, \bar{q}, y, \beta) = (1-p)U(y - \beta p\bar{q}) + pu(\bar{q}, y - \beta p\bar{q}) \tag{2.10}$$

$$V_N(p, Q, y) = (1-p)U(y) + pu(Q, y) \tag{2.11}$$

where the subscripts I and N denote insured and not insured, respectively. Individuals purchase duplicate VPHI if and only if:

$$V_I(p, \bar{q}, y, \beta) \geq V_N(p, Q, y). \tag{2.12}$$

Assuming that there is an income level, $\hat{y} \in [\underline{y}, \bar{y}]$, where individuals are indifferent between taking out duplicate VPHI and relying exclusively on the universal health care system, Besley et al. (1999) have shown that:

(i) All individuals with income above $\hat{y}$ will demand duplicate VPHI.

(ii) $\hat{y}$ is non-decreasing in β and Q.

Where the cut-off income level $\hat{y}$ is defined by:

[13] In this regard, the model differs fundamentally from the classical model of principal private health insurance demand outlined in section 2.1, which assumed away moral hazard by modelling the expenditure level m as independent of insurance status.

$$(1-p)U(\hat{y}-\beta p\bar{q})+pu(\bar{q},\hat{y}-\beta p\bar{q})=(1-p)U(\hat{y})+pu(Q,\hat{y}) \quad (2.13)$$

In order for the result in (i) to hold, it must be the case that the left side of equation (2.13) increases faster than the right side as a function of $\hat{y}$ for a given *p*. Differentiating each side of (2.13), this is found to be true if:

$$(1-p)U_y(\hat{y}-\beta p\bar{q})+pu_y(\bar{q},\hat{y}-\beta p\bar{q})>(1-p)U_y(\hat{y})+pu_y(Q,\hat{y}) \quad (2.14)$$

That this inequality holds follows from the assumptions that $U(\cdot)$ and $u(\cdot)$ are concave in income and that $u(\cdot)$ has a positive cross-derivative. Hence, individuals select themselves into duplicate VPHI based on their incomes because the universal health care system limits the quality of health care available, with the latter being a normal good. The result in (ii) follows by totally differentiating (2.13) and solving for the relevant variables. These results imply that the cut-off income level for individuals to purchase duplicate VPHI may increase with the quality of care available within the universal health care system and the loading factor β. Tax subsidies may be modelled as $\beta < 1$, whereas $\beta > 1$ is the more standard case of administrative costs. Like in the model of the demand for PHI outlined in section 2.1, the effect of *p* on the probability of purchasing duplicate VPHI is ambiguous when symmetric information implies that each individual's probability of falling ill is reflected in their insurance premium.

Finally, it is noted that in reality it is usually also possible to purchase medical care in the private sector at the point of demand if uninsured, which should thus be included in the expected utility without insurance (Propper 1993). However, given that this issue has not yet been addressed in the theoretical literature, and that it is questionable how many individuals actually choose pay out-of-pocket for private care, it is not considered further here.

3 The employers' decision to offer private health insurance

Employer behaviour as regards the provision of private health insurance is surprisingly little explored in economics, and the existing literature is characterised by several different angles of approaches rather than a unified approach (Currie and Madrian 1999). In consequence, this section summarises and compares the different angles of approaches taken in the literature rather than presents each theoretical model in detail. Regardless of which approach is taken, the employers' decision to offer private health insurance differs fundamentally from the individual demand in that, among other things, the one making the decision is not necessarily the one covered by the insurance.

The theoretical literature on the employers' decision to offer private health insurance is developed exclusively within the setting of principal private health insurance (PHI) providing the primary source of coverage, i.e. in the US. However, it may be argued that the reasoning behind the various approaches to thinking about the employers' decision is also applicable to VPHI in universal health care systems,

although to varying degrees, given that the tradeoff between wages and PHI and the employers' cost advantage in the provision of VPHI are universal.

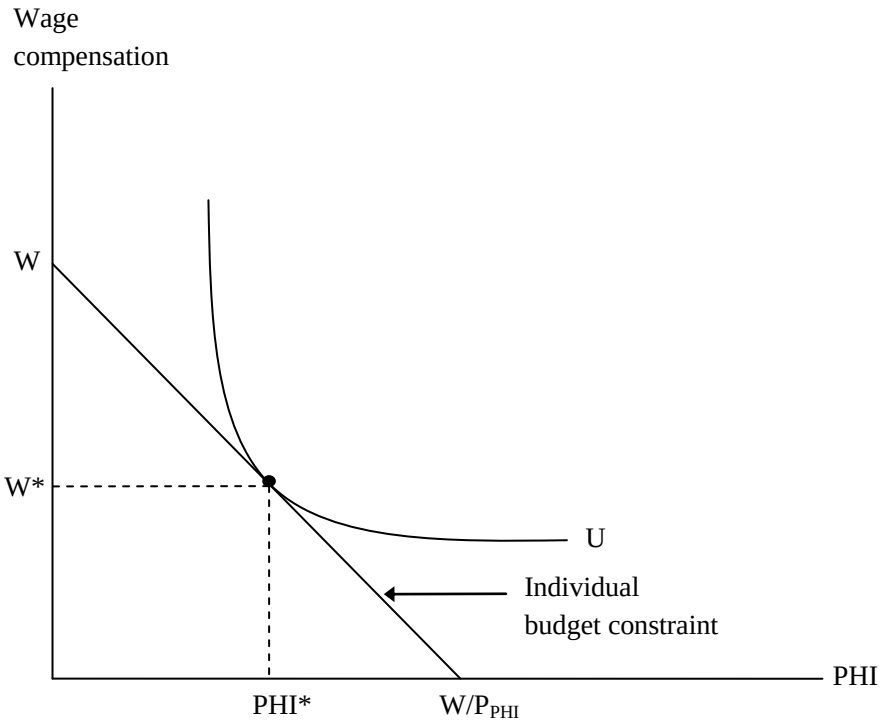
The remainder of the section is organised as follows. Section 3.1 accounts for the reasoning behind the frequently stated argument that one of the main reasons for employers to offer PHI as part of the compensation package is that they may have a cost advantage over employees in the provision of private health insurance. Section 3.2 considers employer provision of PHI within the framework of compensating wage differentials, assuming that the provision of PHI is determined by employers with a view toward minimising their total labour costs subject to maintaining the employees' utility at the level required to keep the firm competitive in the labour market. Section 3.3 discusses how the employers' decision to offer PHI may be modelled by aggregating the preferences of the employees through union bargaining, and accounts for how this approach differs from the theoretical framework of compensating wage differentials. Section 3.4 discusses how employer provision of PHI may also be considered within the health capital framework. Finally, section 3.5 accounts for potential effects of PHI on various labour market outcomes, such as turnover and absenteeism, which may cause employers to include PHI in the compensation package even in the absence of employees' demanding it.

3.1 Employers' cost advantage in the provision of private health insurance

This section follows the exposition of Currie and Madrian (1999) in accounting for how employers having a cost advantage over employees in the provision of PHI may encourage employer provision of PHI. Employers may have a cost advantage in the provision of PHI either because they have a cost advantage over employees in the market for PHI or because employment-based contracts are subject to preferential tax treatment.

Employee preferences for employment-based rather than individually purchased PHI may be analysed within the framework of Figure 3.3, which shows the individual choice of how to allocate the after-tax compensation between PHI and wages when employees and employers face the same price of PHI, denoted by P_{PHI}, and there is no special tax-treatment of employment-based contracts. The shape of the indifference curve reflects the employee's preferences for the tradeoff between wages and PHI. The optimal allocation for the employee depicted in Figure 3.1 is (W*, PHI*), where the indifference curve is tangent to the budget restriction.

Figure 3.1 Allocation of after-tax compensation between PHI and wages when employees and employers face the same price of PHI



Source: Currie and Madrian (1999), p. 3364.

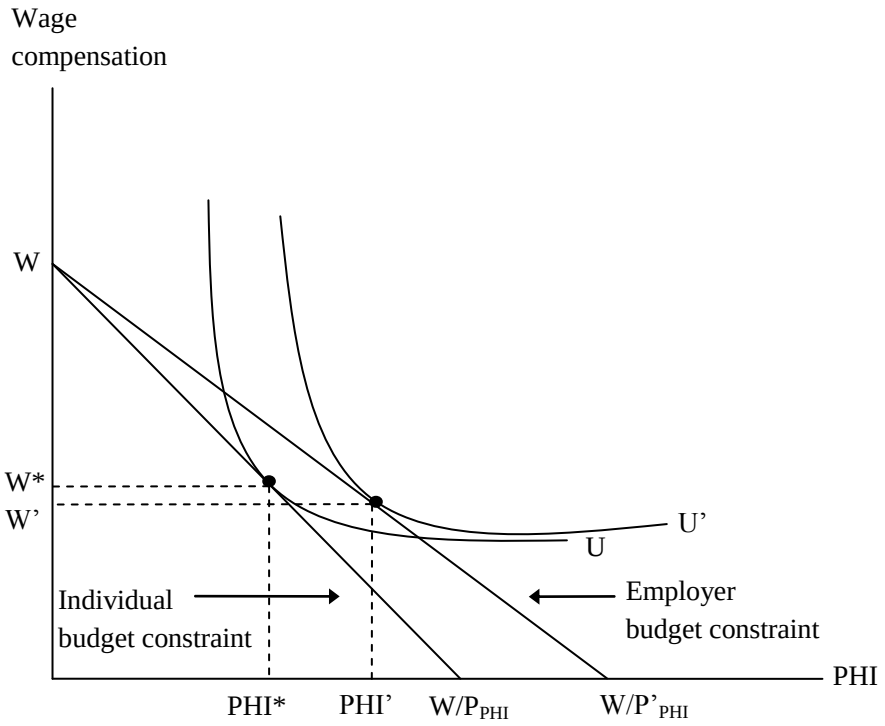
If employees can purchase PHI at the same price as employers, they will be indifferent between receiving (W*, PHI*) and an alternative compensation of W and PHI = 0, because they can replicate their preferred compensation by buying PHI = PHI* at the price of $(W-W^*)/P_{PHI}$ in the private market.[14] Hence, a possible reason for employees to prefer that their employers take out PHI on their behalf rather than having to buy it on an individual basis is that the employers have a cost advantage in the provision of PHI. This situation is shown in Figure 3.2.

In figure 3.2, the employees can use their wage compensation to purchase any combination of PHI and other consumption goods along the individual budget constraint. Given that employers can purchase PHI at the price of $P'_{PHI} < P_{PHI}$, the combinations of insurance and other consumption goods available to the employees expand to those along the employer budget constraint if employers purchase PHI on behalf of their employees. The consumption bundles along the employer budget constraint are only available to employees with employment-based PHI and cannot be replicated by the employees in the private market. Hence, employees may reach a higher level of utility by receiving PHI as part of their compensation package. Moreover, depending on the magnitude of the difference between P_{PHI} and P'_{PHI}, employers have

[14] On the other hand, if the employer provides the wrong level of PHI coverage (this could happen if employers do not know the preferences of their employees, or if non-discrimination laws prohibit employers from taking into account that employees have heterogeneous preferences) and the employee cannot 'sell' excess insurance coverage ($B > B^*$), or if the employee cannot incrementally supplement deficient insurance coverage ($B < B^*$), employer provision of PHI makes the individual worse off.

some leeway for choosing other combinations of wages and PHI than the one which is preferred by an employee and still make that employee better off than had he received the wage compensation W and purchased PHI in the private market.

Figure 3.2 Allocation of after-tax compensation between PHI and wages when employees face a higher price of PHI than employers



Source: Currie and Madrian (1999), p. 3364.

The literature has provided several reasons as to why employers may have a cost advantage over individuals in the provision of PHI (Gruber 2000). For one thing, the preferential tax treatment of employment-based PHI found in some countries may affect composition of the compensation package in favour of PHI by expanding the consumption possibility set disproportionately in this direction, as shown in figure 3.2. Moreover, employers may have a cost advantage in the market for PHI for several reasons. First, some individuals who would increase the average cost of PHI in the market for individually purchased policies when premiums are not risk rated (such as pensioners and long-term ill), are excluded from the risk pool when insurance is offered through the workplace. This may be reflected in lower premiums in the market for employment-based group contracts. Second, group purchase of PHI has the potential to reduce adverse selection and lower administrative costs through pooling. The benefit from risk pooling implies that larger firms are expected to be more likely to insure their employees than smaller firms. Third, employers have more negotiation power than single individuals due to bulk purchasing.

In the context of VPHI that co-exists with a universal health care system, the insurance premiums make up a negligible share of the total compensation package[15], and the employees may reasonably be expected to value this type of insurance less than PHI that provides the primary source of coverage. These differences may be expressed within the framework of figures 3.1 and 3.2 by drawing the budget constraint and the indifference curves flatter, in which case the employees prefer to spend less on VPHI. However, the argument that employees may prefer their employers to purchase insurance on their behalf because the employers have a cost advantage in this respect applies equally well to VPHI in universal health care systems.

3.2 Compensating wage differentials

The employers' decision to offer PHI as part of the compensation package may also be analysed within the theoretical framework of compensating wage differentials for fringe benefit provision (Goldstein and Pauly 1976; Feldman et al. 1997; Currie and Madrian 1999). This framework considers PHI as part of a compensation package which may be used by employers to attract and retain labour, and considers explicitly the tradeoff between wages and PHI.

In a competitive product market, economic theory predicts that firms minimise their total labour costs, subject to maintaining the employees' utility at the level required to keep the firm competitive in the labour market. Firms that offer too little compensation will not be able to attract the desired amount and quality of labour inputs, while firms that offer too much will be driven out of business by other companies with lower labour costs. Hence, employers will offer a combination of PHI and wages which is commensurate to that offered by other firms drawing workers from the same labor pool. In order to stay in business, employers reduce wages with one unit for each one unit increase in PHI costs, i.e. PHI is paid for with foregone wages and explicit employee contributions.

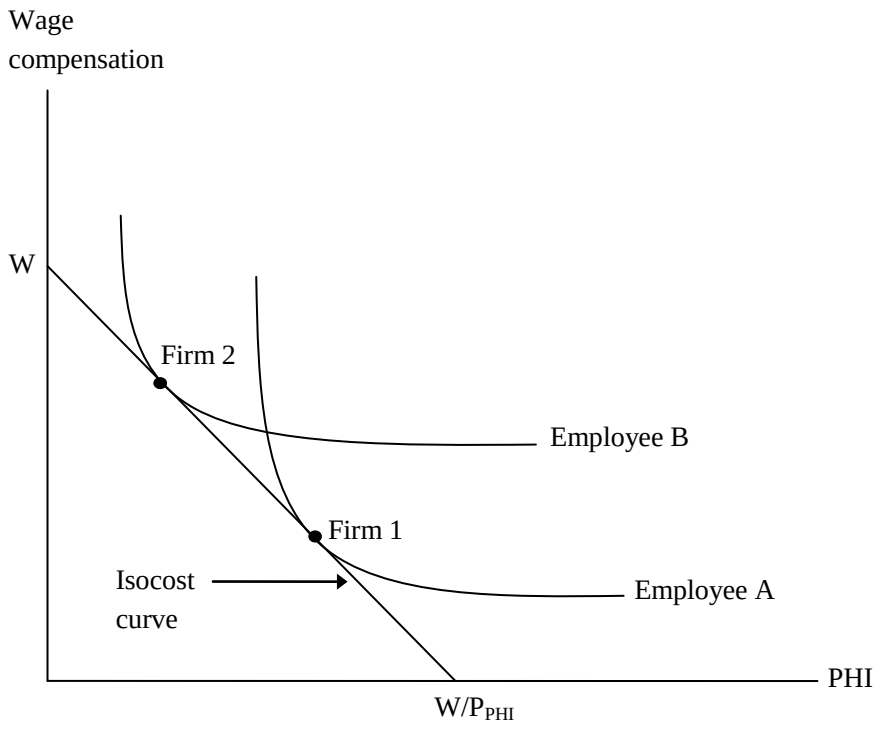
Figure 3.3 shows how employees will sort themselves into firms offering different combinations of wages and PHI based on their preferences within this framework, assuming that the total compensation for employees A and B is the same and that all employers face the same tradeoff between wages and PHI. The shape of the indifference curves reflects the employees' preferences for PHI, which are seen to vary across employees in figure 3.3. The employees' preferences for employment-based PHI may vary across individuals depending on a variety of factors, including risk preferences, health status, and the availability of alternative sources of PHI (discussed in sections 2.1-2.3).

The combinations of wages and PHI offered in the market thus reflect a sorting of employees across companies based on their preferences for PHI. The employers' condition for providing PHI is that the price of a given level of PHI coverage is less than their reservation price for this level. Hence, the

[15] For example, the value of employment-based VPHI makes up less than 0.5 percent of the average money wages for the permanently employed in Denmark (Statistics Denmark 2009c; The Danish Insurance Association 2010).

employers' decision of whether to offer PHI and how much to offer thus depends on the price at which they can purchase it in the market as well as the preferences of current as well as potential employees (Feldman et al. 1997).

Figure 3.3 Sorting of employees across firms offering different combinations of PHI and wages



Source: Currie and Madrian (1999), p. 3374.

Finally, it is noted that the budget constraint and the indifference curves are likely to be flatter when considering VPHI that co-exists with a universal health care system for reasons discussed in section 3.1. This implies that the employees prefer to allocate a smaller share of their wages toward this type of private health insurance. Hence, offering VPHI as part of the compensation package most likely does not have the same ability to attract and retain labour as offering PHI in the setting where the choice is between having PHI and going uninsured.

3.3 Union choice model

Goldstein and Pauly (1976) were the first to explicitly link employee preferences for employer provision of PHI and the employers' decision to offer PHI as part of the compensation package. The union choice model developed by Goldstein and Pauly (1976) considers the employers' provision of PHI as determined by aggregating the preferences of employees through union bargaining.

Assuming that the level of PHI coverage is decided upon by majority vote within unions, this model predicts that employees are divided into groups with homogeneous preferences for the level of PHI

coverage in equilibrium.[16] In such homogeneous groups, the optimum for the employee with median preferences is also the optimum for all other group members. Hence, no employee will be motivated to change union group. It may be seen that any equilibrium in which the members of the union groups are heterogeneous in their preferences for PHI is unstable as follows. Assume that there are two types of employees who differ with respect to their preferences for PHI and that the optimal number of union groups is two. If the employees are evenly divided between the groups, the median preferences in both groups will be the same, and so will the level of PHI provided by employers. However, if one of the groups were to provide a slightly higher level of PHI benefits than the other, it would attract one type of employees and reject the other type. This process will continue until a stable equilibrium is established, in which the groups are homogeneous.

Unions as well as employers may benefit from aggregating preferences into single purchasing groups rather than offering multiple plans each enrolling a smaller number of employees for several reasons (Bundorf 2002). For one thing, offering multiple plans lowers the benefits from risk pooling, and it implies that unions may forego economies of scale in administrative costs and incur additional costs from contracting with multiple suppliers and collecting employee premium contributions. Moreover, favourable tax treatment of PHI is often contingent upon satisfying rules intended to guard against discrimination in favour of highly compensated employees.

The framework of the union choice model is applicable to employer provision of VPHI in universal health care systems, although this generalisation of the model is subject to the reservation that the employees' preferences for including VPHI in the compensation package, and thus also the focus of the unions, are most likely less pronounced in such a setting.

The union choice model differs from the framework of compensating wage differential in that unions are assumed to aggregate the preferences of the actual staff of employees only, while the compensating wage differential framework assumes that firms minimize their total labour costs subject to keeping the firm competitive in the labour market, i.e. taking the preferences of potential future employees into account also. Another difference is that the insurance premiums are not passed on to the employees in the form of lower wages in the type of models that consider the employers' provision of PHI as determined as an aggregate of employee preferences (Glied and Zivin 2004). Hence, the two approaches to firm decision making do not necessarily lead to the same outcome. Finally, the union choice model fundamentally

[16] The preferences of some types of employees will be weighted more heavily than others depending on which voting rule is applied. Majority voting implies that the preferences of the median employee determine the provision of PHI. Given that the distribution of wages is bounded below (either by zero or by the minimum wage), the median wage is virtually always below the average wage. Hence, in general, a model that uses majority voting will weight the preferences of lower income employees more heavily than a model that determines on the provision of PHI based on the preferences of the average employee (Glied and Zivin 2004).

differs from decision making based on compensating wage differentials in that the decision of providing PHI as part of the compensation package is assumed to be made by unions rather than employers. In this regard, it is noted that a common critique of the union choice model is that it is debatable how closely the mechanism used to determine the employers' provision of PHI resembles actual decision making processes within companies. In particular, the assumption that unions arbitrarily decide on the employers' provision of PHI has been argued to be unrealistic (Goldman and Pauly 1976).

3.4 The health capital approach

The employers' decision to purchase PHI may also be considered within the framework of the model developed by Bolin et al. (2002). Bolin et al. (2002) extended the health capital approach of Grossman (1972) to include employers and found that they may also have substantial interest in investing in the health of their employees, given that employees who are off work sick are costly in terms of sickness benefits and lost labour. The channels through which employers are expected to invest in the health of their employees were not explicitly considered by Bolin et al. (2002). However, it may reasonably be argued that one option is for employers to purchase PHI on behalf of their employees. The model developed by Bolin et al. (2002) assumes that the employer invests in the health capital of the employee up to the point where the marginal gain in profit from doing so equals the net marginal cost to the employer. The marginal benefit of an investment in health is shown to depend on the technology used in the employer's production, i.e. whether it is labour or capital intensive, as well as government regulation. Hence, governments can encourage employers to invest in the health of their employees e.g. by making this subject to preferential tax-treatment. Moreover, in an uncertain world, risk averse employers are predicted to make larger investments in the health of their employees (e.g. by taking out PHI) than they would in a perfectly certain world (Bolin et al. 2002).

3.5 Effects of employer provision of private health insurance on labour market outcomes

Finally, employers may include PHI in the compensation package even in the absence of employee demand for it, if potential labour market effects of PHI imply that doing so is more profitable than offering wages alone. An important labour market outcome which may be affected by employer provision of PHI is job turnover. In the standard model of job turnover, individuals change job when the value of an alternative job exceeds that of the current job. When PHI is attached to the job, however, turnover involves not only changing jobs, but also changing insurance. Hence, the relative levels of benefits and costs of the PHI available from different employers may reasonably be expected to impact the job choices of employees and to reduce the overall turnover of staff if there are transaction costs associated with shifting insurer (Currie and Madrian 1999). The effect on job choices, and thus also on the turnover of staff, is likely to be much smaller (or even non-existing) for VPHI that co-exists with universal health care systems than for PHI that provides the primary source of coverage. Another reason that it may be profitable for employers to include PHI in the compensation package regardless of whether employees demand it or not is in order to protect themselves against the cost and uncertainty imposed by sickness

absence, assuming that people get back to work quicker with PHI coverage. This argument is central in the employers' decision to offer duplicate VPHI in settings where the main benefit is quicker access to some elective procedures than is available within the universal health care systems (Borchsenius et al. 2010; Pedersen 2011). Following this line of thinking, Grepperud and Iversen (2011) have argued that companies with a large share of employees in bad health and those operating in industries exposed to considerable health risks may be relatively more inclined to purchase duplicate PHI, i.e. adverse selection at the company level. The argument was put forward in the context of duplicate VPHI. As for adverse selection at the individual level, this relationship is based on an assumption of asymmetric information implying that the price at which insurance is offered to a company does not increase proportionally with its expected use of the insurance. Another implication is the possibility that companies using specialised labour, which is usually highly paid and hard to replace in the case of illness, are more likely to invest in the health of their employees by taking out PHI, again assuming that PHI reduces sickness absence. These potential effects of PHI on labour market outcomes are not explicitly taken into account in the framework of compensating wage differentials or the union choice model.

Finally, employers may use PHI to encourage self-selection of attractive employees into the company, if the preferences for employment-based PHI are correlated with other desirable characteristics (Currie and Madrian 1999). For example, it may be the case that employees with children have stronger preferences for PHI and are also less mobile. Thus, employers can attract employees who seek to establish a long-term employment relationship by offering PHI. However, employer provision of generous PHI may also lead to adverse selection of employees in bad health into the company, if the employees who have the strongest preferences for PHI are the ones who need it the most. In this case, it may be worthwhile for employers to provide less extensive PHI coverage than the amount that would minimise labour costs, in order to avoid attracting an extraordinary high share of unhealthy employees.

4 Effects of private health insurance on health care use

This section accounts for how a number of novel theoretical contributions in economics predict that private health insurance may change preventive behaviour and increase the use of covered health care services through various channels.[17] Like most of the literature on private health insurance, the theoretical framework for analysing how private health insurance affects the use of health care services is developed exclusively within the setting of PHI, but is applicable to VPHI in universal health care systems to varying degrees.

[17] In this regard, it is noted that while the standard theoretical approach to modelling the demand for health care services is the Grossman (1972) model, in which individuals are assumed to invest in health capital and demand health care services in a similar way as they invest in human capital, a shortcoming of this approach is that the risk aspect of the demand is not included. Hence, this branch of the theoretical literature is not pursued further hear.

The section is organised as follows. Section 4.1 assumes that individuals can affect their probability of falling ill and discusses how PHI may lead to a reduction in preventive efforts in this case through ex ante moral hazard. Section 4.2 accounts for how PHI may induce ex post moral hazard in the use of health care services for which the demand is price elastic by lowering the price patients are facing at the point of use, which is probably the most cited reason for PHI to lead to higher utilization levels. While ex ante moral hazard refers to the effect of PHI on actions the individual takes before his state of health is known, ex post moral hazard refers to the behaviour of individuals once the health state is known (Zweifel and Breyer 1997). Section 4.3 describes how PHI may increase the use of health care services through financial risk reductions, i.e. because the desired level of utilization is greater under the financial certainty created by insurance than under uncertainty. Along a similar line, section 4.4 accounts for how PHI that provides a fixed amount of money in the event of illness may also increase the use of health care services by transferring income from the healthy to the ill. An important distinction between ex post moral hazard and the effects described in sections 4.3 and 4.4 is that while moral hazard occurs only for PHI that covers actual medical expenditures, thereby reducing the price that patients are facing at the point of use, the latter are shown to also occur for PHI that provides a fixed amount of money in the event of illness, i.e. indemnity insurance. While the emphasis of the section is on consumer incentives, section 4.5 accounts for how PHI has the potential to affect the use of health care services by affecting the behaviour of doctors acting on behalf of their patients, i.e. supplier-induced demand. Finally, section 4.6 discusses the relevance of the various mechanisms through which private health insurance may affect the use of health care services in relation to VPHI that co-exists with a universal health care system. This section also accounts for how institutional barriers and various restrictions in the coverage provided by the private insurers may moderate the effect of VPHI.

Empirically, it is not straight forward to distinguish between the various mechanisms that may cause PHI to affect the use of health care services. Hence, the stringent categorisation of the various effects expressed in this section may reasonably be regarded as a theoretical construction, which is nevertheless interesting, given that the welfare consequences of additional use differ for some of the mechanisms. Which of the effects dominate in practice depends on the particular setting.

4.1 Ex ante moral hazard

Assuming that individuals can influence their probability of falling ill by undertaking various preventive and self-protective efforts, ex ante moral hazard entails the possibility that PHI reduces the incentives for prevention (Pauly 1986). The scope for ex ante moral hazard may be shown to depend crucially on whether insurance premiums reflect preventive activities (Ehrlich and Becker 1972; Zweifel and Breyer 1997). If insurance premiums reflect the effort devoted to prevention and self-protection, the privately insured have the correct incentives to devote resources to prevention, because this reduces the price of insurance. In contrast, if insurance premiums do not reflect the efforts devoted to prevention, the presence of PHI may reduce the extent of prevention undertaken, thereby creating ex ante moral hazard. Hence, ex

ante moral hazard stems from an informational asymmetry that occurs because the insurers cannot observe the actions undertaken by their customers, or are not allowed to use this information in setting their premiums.

In general, it is debatable how well the theoretical prediction of ex ante moral hazard applies to PHI covering adverse events with severe non-monetary consequences (Kenkel 2000). The line of reasoning goes as follows. Even if the individual has full coverage for the monetary components of the loss related to illness (i.e. medical expenditures and foregone earnings), there will most likely still be an uninsurable utility loss in the case of illness. One reason for this is the pain and suffering that is usually associated with illness, which cannot be insured against. Another reason is that medical care cannot always restore an ill individual to perfect health. The presence of these non-monetary consequences of illness, which cannot be insured against, suggest that the scope for ex ante moral hazard, where PHI disturbs the incentives to invest in prevention, is most likely small. Nevertheless, some individuals might still be at the margin where having PHI matters to their prevention decisions.

Ex ante moral hazard may be interpreted as an externality in the sense that the single insurance taker does not take into account the effect of his or hers preventive efforts on the premiums paid by the other members of the insurance pool (Gravelle 1986).[18] Given that the monetary benefits of prevention are external to the single individuals but impose a negative externality on the insurance company, a market solution to the presence of ex ante moral hazard is for insurance companies to invest directly in prevention. This insight may be used to explain why some employers offer health schemes and insurance policies covering preventive health care. To the extent that employers take on the risk of productivity losses caused by health problems and sickness absence, this provides an incentive to invest in the preventive and self-protective efforts of their employees (Kenkel 2000).

Moreover, if the individuals differ on multiple dimensions that jointly determine the purchase of PHI and preventive efforts, the privately insured may exhibit more prevention. As discussed in section 2.3, one possible source of such advantageous selection into VPHI is risk aversion, with the hypothesis being that the more risk averse individuals are both more likely to purchase PHI and to undertake prevention. In addition, extending the framework to allow for the purchase of PHI that covers preventive health care services, it may reasonably be expected that PHI increases the amount of prevention as a result of the substitution effect described in section 4.2. The theoretical prediction of the relationship between prevention and PHI coverage is thus ambiguous.

[18] While most analyses implicitly assume that PHI reduces the efforts devoted to prevention below what is socially optimal, the externality caused by ex ante moral hazard could in theory be both positive and negative (Kenkel 2000).

Hence, ex ante moral hazard is considered a theoretical option that cannot be ruled out for PHI as well as VPHI in universal health care systems, although not subject to considerable concern, given the severe non-monetary consequences associated with illness, which cannot be insured against.

4.2 Ex post moral hazard

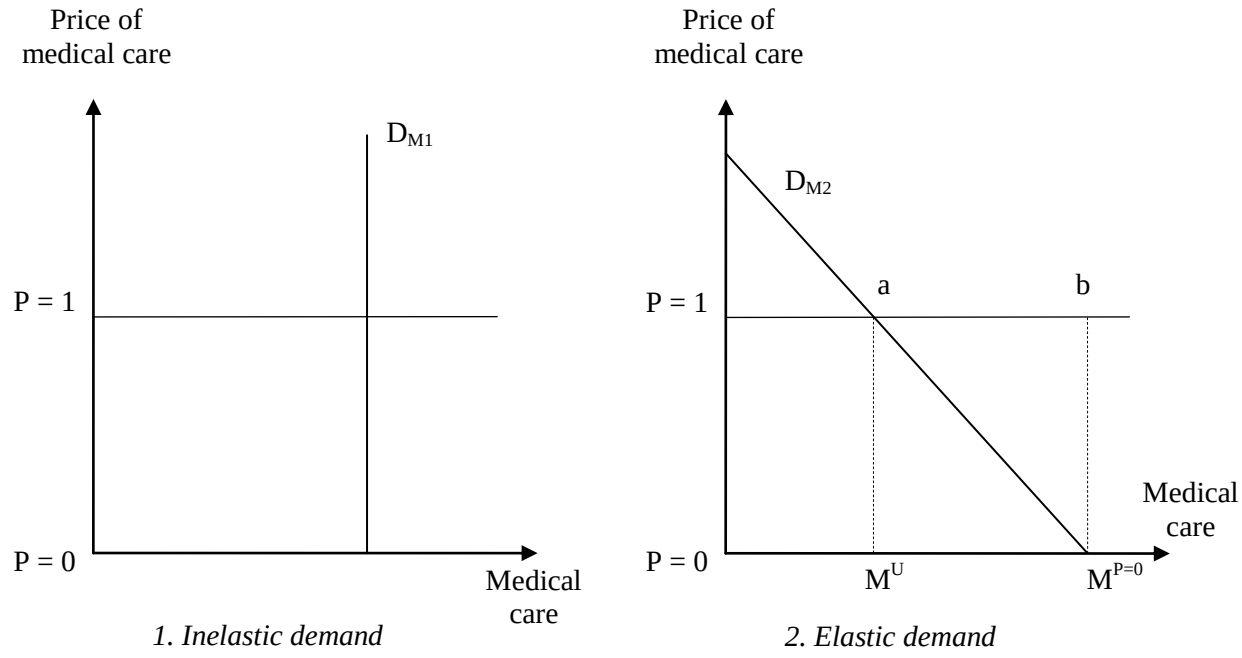
In many cases insurance contracts that provide a fixed amount of money in the event of illness, i.e. indemnity insurance, are not practically feasible. The reason for this is that medical needs are not fully monitorable, and that different individuals with the same illness may have different optimal medical expenditures, at least as far as the insurance company can tell. Instead of indemnity insurance, insurance companies thus tend to offer PHI contracts that cover the actual medical expenditures fully or partly, thereby using medical expenditures as a signal of the true medical needs (Cutler and Zeckhauser 2000). This implies that individuals are not facing the full cost of their use at the point of demand.

Within this setting, economic theory predicts that private health insurance induces ex post moral hazard in the use of health care services for which the demand is price elastic by lowering the price that patients are facing at the point of use, thereby leading to higher utilization levels (Arrow 1963; Pauly 1974). In the terminology of economic demand theory, ex post moral hazard may thus be classified as the substitution effect of people spending more money on health care when its price is reduced by PHI. Hence, despite the somewhat unfortunate terminology, ex post moral hazard is not some sort of moral failure, but rather a rational response to an economic incentive.

Along a similar line, it may be argued that the presence of PHI may also affect the type or quality of medical care that individuals choose to receive, assuming that the demand for quality is price elastic. This effect of PHI on the use of health care services is termed ‘qualitative’ moral hazard (Pauly 1983).

Figure 4.1 shows the effect of the price change caused by PHI on the use of health care services for different price elasticities of the demand. In the left side of Figure 4.1, the demand for medical care is assumed to be perfectly inelastic. This is reflected by a vertical Marshallian demand curve denoted by D_{M1}. In this case, the individual is seen to use M^U medical care regardless of the price, i.e. there is no moral hazard. Examples of health care services for which the demand may reasonably be expected to be price inelastic are bypass operations, chemotherapy, and other major treatments that are necessary in order to survive but constitute considerable health risks themselves. In the right side of Figure 4.1, the demand for medical care is elastic; that is, the quantity demanded varies inversely with price. This is reflected by a Marshallian demand curve denoted by D_{M2}. With elastic demand and PHI that reduces the price of medical care to P = 0, the individual uses additional ($M^{P=0}$- M^U) medical care because the marginal price to the individual is zero. This additional use is ex post moral hazard. Hence, the price elasticity of the demand may be used as an indicator of the potential for moral hazard.

Figure 4.1 Demand for health care services and ex post moral hazard



Source: Folland et al. (2007), p. 165.

Moreover, it is seen from Figure 4.1 that the marginal cost of producing the care exceeds the willingness to pay for all units of care above M^U. Hence, ex post moral hazard may also be defined as additional use which is valued less by the individual than the cost of producing it (Pauly 1983). Considering the welfare consequence of additional health care use that is due to moral hazard by comparing the gain from receiving the care $M^UaM^{P=0}$ to the cost of producing the care $M^UabM^{P=0}$, it is clear that this will always be negative. It may thus be argued that PHI gives rise to a tradeoff between the benefits of risk spreading, as accounted for in section 2.1, and the costs of moral hazard.

However, despite the fact that moral hazard inserts a 'wedge' between the costs associated with medical care and its price, the presence of moral hazard in itself does not necessarily mean that there is some correctable inefficiency. It may well be optimal to have PHI cover the incurred medical costs rather than some exogenous indicator of health in the cases where health is difficult to monitor correctly, and the effect of treatment is uncertain (Pauly 1983). Hence, ex post moral hazard may be regarded as something that reduces real income but cannot always be corrected. In addition, another issue related to the evaluation of the welfare loss caused by ex post moral hazard is that given market solutions are not always considered optimal within the health area, it is not clear that this situation should necessarily be used as a benchmark for efficiency. In particular, the presence of altruism, equity considerations, and fiscal externalities may well imply that the optimal use of health care services for the individual is not necessarily where demand intersects with marginal costs.

4.3 Financial risk reduction

Besides ex post moral hazard, PHI may also be shown to increases the use of health care services through risk reductions, i.e. because the desired level of health care use is greater under the financial certainty created by PHI than under uncertainty (de Meza 1983; Vera-Hernández 1999). This effect has been shown to occur for indemnity insurance that provides a fixed amount of money in the event of illness, i.e. it differs fundamentally from the ex post moral hazard effect of people spending more on health care when its price is reduced.

The intuition behind the mechanism that causes PHI to increase the use of health care services through risk reductions may also be thought of as follows. Consider an uninsured individual. He could be suffering from an illness, but chooses not to seek medical care today in order to avoid feeling worse tomorrow and already having used his income endowment. With PHI, however, the individual would have sought medical care today (Vera-Hernández 1999).

De Meza (1983) formalised the effect of risk reductions in a simple two-period model where individuals have access to a perfect capital market which may provide a substitute, althout imperfect, for PHI. The probability of falling ill is assumed to be exogensouly given and uncorrelated across the two periods. Solving this model for the two periods and comparing the use of medical care with and without PHI, respectively, de Meza (1983) found that in most cases the use of medical care in the ill state was higher with PHI, assuming that medical care is a normal good. However, it is possible to find cases where the expected demand for medical is higher without PHI when the probability of falling ill exceeds 50 percent in the two-period model. To see this, consider an individual who is healthy in the first period. When the probability of falling ill exceeds 50 percent, such an individual is guaranteed to suffer less than an average amount of illness over a lifetime. Hence, if illness strikes in the second period, savings allows for higher health care costs than would be possible if the individual had paid a fair insurance premium in both periods.

Finally, it is noted that Pauly (1983) has showed that assuming a constant propensity to devote income to health care services regardless of health within the population; it is possible that PHI does not have any risk reduction effects on the use of health care services at all on the aggregate level. However, with no empirical evidence suggesting that the demand for health care services takes this form, and knowing that other demand functions (e.g. constant income elasticity) lead to a positive income effect, this argument as to why risk reduction is not important does not appear to be very strong.

4.4 Income transfer

PHI has also be shown to increase the use of health care services by creating an ex post transfer of income from the healthy to the ill (Pauly 1968; Nyman 1999a; Nyman 2003). This income transfer is what causes PHI to have access value, as discussed in section 2.1.1.

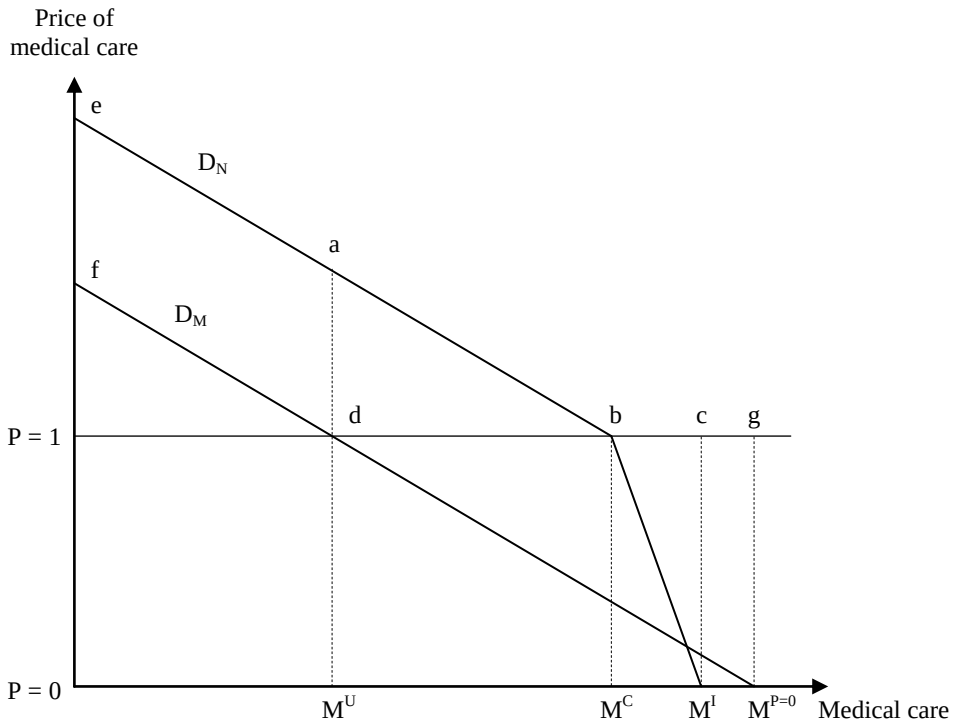
The framework used to illustrate ex post moral hazard in section 4.2 assumed that individuals change their use of health care services by moving along the Marshallian demand curve. No distinction was made between individuals who fell ill and those who remained healthy. The framework outlined in this section assumes that some individuals pay the insurance premium, remain healthy, and do not use any additional health care services.[19] For example, if the probability of falling ill within a given period is 0.25, then for every four individuals with PHI, three would transfer income to the one who fell ill. Assuming that the use of health care services increases with income, which seems plausible, part of the use of medical care among the ill individuals is attributable to the transfer of income from those who pay the insurance premium but do not have any claims.

The conceptual difference between ex post moral hazard and the increase in use due to an income transfer may be thought of as follows. The thought experiment is whether an individual would pay the expected cost of a treatment before knowing his health state. For example, assume that an individual has an income of $25,000 and faces a one percent risk of falling ill. If it was possible to contract for a specific amount of treatment in advance of falling ill, the individual would choose to receive $50,000 worth treatment when ill in return for paying an insurance premium of $500. With PHI that reduces the cost of treatment to zero the same individual would, however, use medical care worth $60,000. The ex post moral hazard in this example is $10,000, which is the additional use over the optimal amount of treatment that the individual would contract for in advance of falling ill. The remaining overuse is due to the income transfer.

Figure 4.2 shows the effect of the income transfer on the use of health care services. D_M is the Marshallian demand curve for an uninsured ill individual, who is seen to use M^U medical care. D_N is the demand curve for an ill individual with PHI that pays off by reducing the price of health care services to zero. For a wide range of health care services, it may reasonably be argued that the willingness to pay when healthy provides an inappropriate measure of their true value, while the willingness to pay when ill and insured most likely provides a better estimate (Nyman 2003). Hence, PHI causes the demand curve to shift out, assuming that the individual has a greater willingness to pay for medical care when ill, and that PHI enables him to pay for it due to the income transfer, as discussed above.

[19] Or more realistically, there is a distribution of health care use where individuals in the upper end of the distribution receive a net transfer and individuals in the lower end of the distribution make a net payment.

Figure 4.2 Demand for health care services and the income transfer



Source: Nyman (2002), p. 117.

It is seen from Figure 4.2 that the income transfer causes the individual to use additional (M^C - M^U) medical care. Moreover, because the insurance contract pays off by reducing the price of PHI, the individual demands additional (M^I - M^C) medical care, but the willingness to pay for this additional care reflects the reduced income from paying the premium. Hence, the new demand curve D_N is kinked at the point b, where the willingness to pay after the income transfer equals the price for medical care without PHI. If the price of medical care had dropped exogenously to zero, it is seen from Figure 4.2 that the individual would demand $M^{P=0}$ medical care. This is more than the individual with PHI, because the payment of the insurance premium which is required to reduce the price to zero reduces the income that is leftover to use on medical care.

It is seen from Figure 4.2 that the willingness to pay when insured exceeds the marginal cost of producing the care for all units of care up until M^C induced by the income transfer, but are less than the marginal cost for the additional (M^I - M^C) units of care that are due to the price effect, i.e. ex post moral hazard. The total welfare effect of the additional use of medical care induced by PHI is assessed by comparing the gain from receiving the care M^UabM^I to the cost of producing the care M^UdcM^I. Which of the two areas is the larger one depends various factors, among others the price and income elasticity of the demand. Hence, while it may be argued that the income transfer is merely a reinterpretation of the increase in use due to ex post moral hazard, it is clear that the welfare consequences of the income transfer are not captured by Figure 4.1.

Finally, it is noted that the analysis of the income transfer in this section takes its point of departure in an ill individual, i.e. there is no uncertainty, expected utility theory, or contingent claims. Hence, the size of the income transfer also depends on the probability of falling ill. In particular, illnesses that occur with a small probability give rise to large income transfers, while illnesses that occur on a more frequent basis are associated with smaller income transfers. There is no income transfer if the probability of falling ill equals one (Nyman 2003). Hence, for health care services which are used on a frequent basis and primarily associated with minor illness, such as medical check-ups, prescriptions, dental care and the like, the effect of the income transfer may reasonably be argued to be small or even negative (Pauly 1983).

4.5 Supplier induced demand

The individual demand for medical care is assumed to be determined by both supply and demand side factors. The effects of PHI on the demand side were considered in sections 4.2 to 4.4. This section considers the supply side, where doctors have the opportunity to induce demand because, as in other markets for credence goods, i.e. goods whose utility impact is difficult or impossible for the buyer to ascertain, there are most likely considerably information asymmetries (Jürges 2007). In particular, doctors are better informed about necessary and appropriate diagnoses and treatments than their patients, which is why the patients come to see them in the first place. In health economic terms, supplier induced demand does not include doctors inducing appropriate tests and treatments, but only tests and treatments that are not medically indicated (including flat-of-the curve medicine) and are only suggested in order to increase profits (Jürges 2007).

Supplier-induced demand is most likely to arise in a payment system with fee-for-service, where doctors can generate additional income by inducing demand (Evans 1974). Inducement may occur after the patients have contacted the doctors, when the doctors inform the patients about their health status and suggest a treatment. At this stage, doctors have the opportunity to generate additional income from inducing demand, although usually at some price in terms of disutility from doing so. In fee-for-service systems where the fees are higher at private hospitals or when treating privately insured patients, doctors are given an additional incentive to induce demand among the privately insured patients (Jürges 2007). Moreover, the scope for inducing demand may be argued to be better among the privately insured patients. The reason for this is that at the next stage, where the patients decide on their compliance with the recommendations of the doctor (also known as the frequency decision), the privately insured patients may have lower opportunity costs because of preferential treatment. Hence, it is possible that part of an observed increase in the use of health care services is attributable to supplier induced demand for PHI as well as VPHI in universal health care systems.

4.6 Application to voluntary private health insurance in universal health care systems

It is relatively straight forward to generalise the various ex ante demand side mechanisms accounted for in sections 4.2 to 4.4 to model the effect of complementary and supplementary VPHI on the use of covered health care service, while the effect of duplicate VPHI is more complicated.

4.6.1 Complementary and supplementary VPHI

Along the lines of section 4.2, complementary and supplementary VPHI may be shown to induce ex post moral hazard in the use of covered health care services by lowering the marginal price that patients are facing at the point of use. The extent to which this occurs depends on the price elasticity of demand. Moreover, the presence of institutional barriers such as gatekeepers and various restrictions in the coverage provided by the private insurers may moderate the effect of VPHI. However, potential for complementary and supplementary VPHI to increase the use of health care services through financial risk reductions and income transfers as described in section 4.3 and 4.4, respectively, is most likely of minor importance. Firstly, for complementary and supplementary VPHI to increase the use of covered health care through an ex post transfer of income from the healthy to the ill, the copayments or the costs of the services excluded from the universal health care system would have to be greater than the financial resources of the individual. Although this could happen in countries where copayments make up a large share of the total health expenditures or the coverage provided by the universal health care system is sparse, it is most likely not the case very often. Secondly, it is noted that the scope for the risk reduction discussed in section 4.3 to increase the use of health care services is decreasing with the probability of contracting an illness for which the treatment is covered by VPHI. Hence, to the extent that complementary and supplementary VPHI covers routine services that are used on a frequent basis and primarily associated with minor illness, such as medical check-ups, prescriptions, dental care and the like, ex post moral hazard may reasonably be expected to be the dominant effect on the demand side.

4.6.2 Duplicate VPHI

Assessing the effect of duplicate VPHI on the use of health care services is less straight forward, given that this type of VPHI does not cover forced financial losses in the same sense as PHI, but rather treatments at private facilities which are also available free of charge within the universal health care system.

Considering first the effect of duplicate VPHI that covers diagnostics and elective surgery at private hospitals for procedures that are subject to some waiting time when provided through the universal health care system, this may be argued to depend on among other things the institutional setting and the conditions of coverage. When the indications for treatment are the same whether treatment is financed through the universal health care system or by duplicate VPHI and the demand for care is time inelastic, i.e. demand for a given treatment does not depend on the waiting time, there is no reason as to why duplicate should VPHI increase the use of health care services. Instead, it is possible that duplicate VPHI

causes substitution by shifting use from the universal health care system to privately paid contacts, while the total use of health care services stays the same. On the contrary, it is clear that duplicate VPHI has the potential to induce moral hazard in the use of health care services if the indications for treatment differ for private insurance patients or the demand for care is time elastic, which is possible for some elective procedures. Like for complementary and supplementary VPHI, institutional barriers and various restrictions in the coverage provided by the private insurers may, however, moderate this effect.

Next, considering duplicate VPHI that covers access to specialist care without prior referral from a general practitioner, its effect on the use of health care services is argued to be ambiguous due to two opposing effects (Vera-Hernández 1999). On the one side, this type of duplicate VPHI may reasonably be expected to increase the use of health care services mainly through ex post moral hazard as described in section 4.2. On the other side, it is also possible to think of situations where the heterogeneity in visits between different types of providers implies that duplicate VPHI reduces the use of health care services as measured by the number of visits. For example, consider the case of a patient without duplicate VPHI who has visited a medical specialist within the universal health care system. If this patient is disappointed about the received treatment, he may decide to also visit a private specialist and pay the full price for this out-of-pocket. On the contrary, patients with duplicate VPHI are more likely to choose their preferred provider the first time around, which implies that they use less health care services as measured by the number of visits in this particular example. It should, however, be emphasised that such behaviour is only possible for health care services for which it makes sense to receive the same service repeatedly. Hence, for elective surgery at private hospitals, heterogeneity in the services provided at public and private hospitals, respectively, is thus not expected to reduce the use of health care services among the privately insured.

4.6.3 Public moral hazard

In addition to generating moral hazard in the use of the covered health care services, VPHI, duplicate as well as supplementary and complementary, may also be argued to increase the use of health care services within the universal health care system. The welfare consequences of VPHI in universal health care systems are thus considerably more complex than those of PHI that provides the primary source of coverage due to the various mechanisms discussed in this section.

In the case of complementary VPHI, the universal health care system pays for part of any additional use induced by the complementary insurer (Folland et al. 2007).[20] Along a similar line, VPHI that duplicates the coverage provided by the universal health care system may place additional strain on general practice

[20] If for example the universal health care system covers 60 percent of a physiotherapy treatment worth EUR 50 and the remaining 40 percent is financed by a copayment which may or may not be covered by complementary VPHI, and complementary VPHI induces three additional visits at EUR 50 over and above what would have been used in its absence, the presence of complementary VPHI leaves the universal health care system with an additional expenditure of EUR 0.6·1,500 = 90.

to the extent that reimbursement by private insurers is contingent on having a documented need for treatment, usually in the form of a referral or prescription from a general practitioner. These channels through which VPHI may increase the use of health care services within the universal system are referred to as public moral hazard in the literature (Folland et al. 2007; Stabile 2001).

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