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Abstract

In Scandinavia, the provision of health care services has been, almost entirely, the responsibility of the public health care system. However, in the last five to seven years there has been remarkable growth in the private health care market. These health care services are obtained normally through insurance contracts. In this paper, I seek explanations for this phenomenon, using data from Norway. First, using available market data, I document that the market for private treatment insurance—often labelled as "jump the treatment queue insurance"—is growing rapidly. Thereafter, I present a theoretical model that identifies primary drivers for individual demand for treatment insurance. The third step is to analyse a unique survey data set that is combined with aggregate county data on treatment queues. The overall results indicate that public waiting lists affect the demand for privately bought insurance, while employer-provided insurance does not seem to be affected. I find strong preference for this type of insurance among smokers and the self-employed. Moreover, income is an important determinant of insurance demand.

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1. Introduction

During the last five to seven years, the growth in private health care provision has been high in all Scandinavian countries and most people acquired the right to private health care services through insurance contracts. This emerging trend is politically disputed. One reason for this is that the Nordic welfare states have typically aimed towards broad public welfare solutions in basic welfare areas such as health, schooling and ageing. Moreover, and even more importantly, the Nordic welfare model is based on a principle of universalism (Eriksson et al. 1987); i.e., that all citizens should be provided the most fundamental welfare services irrespective of income, working sector or family background. Thus, for some, private treatment insurance is considered an "ugly duckling" in the Nordic nest because it creates inequalities in welfare services that depend on income or other socio-economic characteristics. Based on this, more understanding of the current trend in private treatment insurance is required.

In this paper, I utilize information from a representative Norwegian survey data set that is combined with available public data on waiting times. I investigate how the role of queues in the public health care system along with other important socio-economic variables affects the demand for private treatment insurance.[2] The data set has been obtained from one of the largest Nordic suppliers of insurance and it consist of approximately 1800 individuals between 30 to 55 years—the prime target group for private treatment insurance. The survey carries information about SES characteristics and their self-reported insurance coverage. The treatment insurance product that is explored here is often labelled as "jump the queue" cover. A person who possesses this insurance can utilize it in the case of a need for specialist medical services or for basic surgery.[3]

According to Kildal and Kuhnle (2005), the Nordic principle of universalism implies, among other things, that each citizen has the right to free health care services without any form of means testing. For this reason, private health care provision has historically only played a marginal role within the Nordic countries. However, free health care for all comes at a cost; namely, that in some health areas treatment queues appear and this might be one explanation for

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[2] Throughout this paper, the label "treatment insurance" will be used. This insurance gives the holder a right to indemnity if medical treatment is necessary—given that treatment is possible. The broader notion of health insurance may also cover payouts that are not necessarily connected to treatments. For example, a broad health insurance can trigger payouts for an untreatable illness. The latter type of insurance is not analysed in this paper.

[3] Normally a person who incurs a very serious illness (such as cancer or heart attack etc.) will be treated immediately at a public hospital. Therefore, treatment insurance is normally used to fix non-life threatening illnesses and for getting faster access to a medical specialist.

the rapid growth in private treatment. Interestingly, to the best of my knowledge, no such study has been conducted on Scandinavian data;[4] only Besley et al. (1999), using UK survey data, have investigated the relationship between queues in public health care and the demand for treatment insurance. Therefore, this paper fills a void in the literature by focusing on non-UK data.

The main results are as follows: for private ownership of treatment insurance, I find a quite robust association between queues measured at the county level and demand. This result is in accordance with Besley et al. (1999). However, for employer-provided insurance, I cannot find any such association. A possible explanation for the latter observation is that firms typically operate across county borders and are therefore less sensitive to county-specific treatment queues.

I find that smoking status is important in explaining the interest, the intention to buy and possession of treatment insurance. Smokers are more likely to possess both privately bought and employer-provided insurance and they are more likely to express higher interest in buying treatment insurance. This may be considered as a surprising result. It is common knowledge that smoking leads to serious illnesses such as lung cancer, stroke and heart disease. It is also common knowledge that these acute conditions will always be treated immediately at a public hospital, and several studies have also confirmed that smokers are less risk averse than non-smokers (Barsky et al. 1997; Aarbu and Schroyen 2009).

Thus, the association between smoking and preference for treatment insurance is not obvious at first sight. However, there may be other milder and more unknown smoking-related sickness conditions (for example, arteriosclerosis) where treatment capacity is low. This may spur demand among smokers. Second, Smith et al. (2001) find that smokers assign a larger risk towards not living until 75 after a smoking-related health shock than non-smokers do. Thus, it might be that smokers on average hold a higher subjective probability for the need of treatment than non-smokers. Third, Viscusi and Hersch (2001) document that smokers select riskier jobs and are injured more often—both at work and at home—than non-smokers. Hence, a higher injury probability among smokers is consistent with an elevated preference for treatment insurance.

Income is an important determinant of demand and the higher the income, the higher the demand for treatment insurance. This finding corresponds closely with the findings in Besley et al. (1999). Moreover, self-employed respondents express significantly higher intention to buy treatment insurance than wage earners, which is consistent with the fact that welfare benefits for

[4] However, Iversen (1997), Hoel and Sæther (2003) and Marchand and Schroyen (2005) provide a theoretical discussion within a context that mirrors the Nordic environment.

the self-employed in Norway are inferior compared with standard employee benefits. For example, an employee in Norway is compensated fully for the first 16 days of a sickness spell. This rule does not apply to the self-employed. They are required to buy additional insurance cover in order to obtain compensation. The bottom line is that the economic loss from a sickness spell for a self-employed person will be considerably larger than for employees under the current welfare system.

The paper is organized as follows. In Section 2, I link the most relevant literature within this field to the findings presented here. Section 3 presents descriptive information about the main characteristics of the Norwegian public health care system. In Section 4, the small and immature treatment insurance market in Norway is described in more detail. Section 5 sets up a theoretical model for the willingness to pay for treatment insurance. Section 6 provides descriptive information about the data set, and in Section 7, empirical results are presented. First, the interest for this particular product is analysed. Thereafter, I apply the theoretical model derived in Section 4 to the data. Finally, the possession of treatment insurance is analysed. Section 8 provides a discussion of the empirical results. Section 9 concludes.

2. Main findings of previous studies

In the model of Barzel (1974), individuals form a queue in order to gain the right to a public good. Those with lower time costs stay longer in the queue and for the marginal person in the queue the value of the good is matched exactly by the time cost used in the queue. In the particular case I am looking into, the queues formed in the health care system can be seen as a rationing device for a free public good. When queues differ across counties—as they do in Norway—there will be different time costs for individuals dependent on their place of residence. This implies that the valuation of substitutes of the free public good differs across counties. Hence, the demand for treatment insurance should be related positively to county-specific queues. In counties with long queues, the time cost will be higher and a greater number of people will search for substitutes if these are available.[5] The composition of the queue is not random. For example, high-income individuals are more likely to opt out of the queue and into private alternatives because of the higher time costs they face.

By linking county-specific waiting-time variables to the survey data set, I am able to show that queues affect individual insurance demand. Moreover, as found in Besley et al. (1999), I find that high-income individuals are more likely to demand this insurance. Contrary to their analysis,

[5] Queues can also differ between counties if there are differences across counties in health conditions. I am not aware of any studies, however, that document this possibility.

however, I find that higher education lowers the demand. I discuss reasons for this difference in Section 8.

As I referred to above, higher demand for this insurance among smokers is not obvious because one can imagine, for example, that risk aversion is lower among smokers, which should actually lead to a lower preference. On the other hand, however, at least three quite recent studies indicate that there are differences between smokers and non-smokers that give support to the finding here. Smith et al. (2001) analyse a panel of respondents in the US Health and Retirement Study. By utilizing a longitudinal data set, the researchers were able to identify respondents who experienced different health shocks.[6] First, they found that smokers overall are more pessimistic than non-smokers of survival until aged 75. Moreover, they also documented that smokers reacted to smoking-related health shocks, while they did not react to health shocks that were caused by more general health problems (that are not particular to smoking). Viscusi and Hersch (2001), find that smokers hurt themselves more—both at home and at work— compared to non-smokers. Thus, these studies suggest that the probability of adverse health outcomes is greater for smokers than for non-smokers. Moreover, in Lundborg (2007)—who utilizes Swedish administrative register data—it is documented that sickness absence for smokers is significantly higher than the average sickness absence. He also uncovers that smokers are more likely to report more chronic diseases and more likely to report poor health. This observation square with a higher preference for treatment insurance, which I find in this paper.

The other main results this study provides are consistent with earlier theoretical literature on this subject. For example, that the desirability of this insurance increases with income is consistent with Besley and Coate (1991) and Marchand and Schroyen (2005).[7]

3. The provision of public health care in Norway

Public health care at zero cost for the user is a mainstay in the Nordic welfare model, and Norway is no exception. Health care is financed through general taxation and nobody asks for your insurance papers if you become sick. Each citizen is linked to a permanent medical doctor

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[6] Smith et al. (2001) defines a health condition as "the onset of new, serious health conditions"; for example, heart attacks and other cardiovascular diseases or cancer.

[7] A third category of literature that is of more direct relevance to this study is the evolving empirical literature on selection problems in insurance. This literature takes advantage of large micro data sets on insurance contracts. The state of the art approach is to use such data in order to search for positive correlation between claims and insurance cover, conditional on the variables used in tariff setting (Finkelstein and Poterba 2006, Finkelstein and McGarry 2006, Finkelstein and Poterba 2004).[7] However, because of the immaturity of the particular market studied here, I do not have access to insurance contracts and this question is therefore left open for future research.

who is authorized to make referrals and the referral is a ticket into the public health care system. While consultations with the permanent doctor are highly accessible (normally within a couple of days), additional services in the health care system can involve weeks or months of waiting.[8] The treatment insurance that is considered in this paper can be invoked from the day the patient is given a referral from his/her permanent doctor. Thus, having treatment insurance cannot circumvent queues in the primary health care system, but rather applies to hospitalization and specialist medical services.

The main problem with this welfare model is that it can take some time before treatment is provided—if a medical expert considers waiting justifiable. Therefore, one has to wait or, alternatively, one can acquire private treatment insurance that guarantees treatment within a given period. As shown in Table 1, waiting times in Norway are not insignificant.

……TABLE 1…….

Table 1 reveals that, on average, people have to wait around three months before treatment is provided. Moreover, note that there is considerable variation between counties and long waiting times is more pronounced in the western and northern parts of Norway.[9]

To prevent the negative tendency towards longer waiting lists, the authorities introduced free hospital choice in May 2003, which implied that each citizen could choose the treatment place regardless of residence. In theory, this change should lead to equal waiting times across counties and thereby neutralize any regional demand effects of treatment insurance. Although the table shows that waiting times on average have fallen considerably from 1998 to 2005, there are still differences in waiting times between health regions. The lack of convergence in waiting times may be explained by home bias; for example, the social discomfort of being away from family and friends when treated is costly both for the treated and for the family. Norway's geography

[8] Cases where people have waited more than a year are not uncommon and one can easily count the number of people on long-term waiting lists using data from the Norwegian Patient Register (www.npr.no).

[9] Public health care is provided by five regional state-owned entities: EastNorway, SouthNorway, WestNorway, MidNorway and NorthNorway. Each region has one major hospital and several smaller specialized hospitals. Typically, intensive care and the most resource-demanding care are located in the major hospital within each region, while milder conditions are treated in the smaller hospitals. One reason for longer waiting times in west and north Norway might be longer travel distances to alternative hospitals. Monstad et.al. (2006) confirms that travel distance is, indeed, significant for hospital choices.

supports this observation because of its length (around 2500 km), and it is costly to travel both in terms of time and money.[10]

4. Private treatment insurance in Norway

As underlined in the introduction, the treatment insurance market analysed here is small and immature but is currently growing at double-digit rates. The growth in the market over the last couple of years stems almost entirely from employer-provided insurance, as shown in the figure below.

……DIAGRAM 1…….

This figure draws on reports provided from insurers to the Financial Services Association (FNH). In addition to the numbers from FNH, I have also added an estimate on the number of insured from the one important insurer that is not a member of FNH. This insurer occasionally reports numbers of insured in interviews in the press. Numbers are available for the fall of 2004, the fall of 2006, the fall of 2007 and at the end of 2008. For the missing periods, the numbers are imputed.[11] The most interesting pattern is the growth in employer-provided insurance. In 2004, employer-provided insurance constituted around 65 per cent of the market; the share today is around 85 per cent.

The traditional providers, who are members of FNH, offer pure private treatment insurance. In this case, the policy-holder is guaranteed a slot in the private health care system within a time limit, usually within 28 days after the treatment decision given by the primary doctor.

The other large insurance player offers a product that utilizes the option of free hospital choice in a rather innovative way. When a claim is reported, this insurance provider first searches the public hospitals for vacant treatment capacity. If there is a vacant slot, the customer is offered that slot, and will be treated at a public hospital free of charge. The contract is designed such that the insured must accept that slot, regardless of where the treatment is provided. The cost to the insurance provider is in this case only the administrative costs connected with the search process.

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[10] The National Health Service pays the travel costs if one chooses a hospital in a county other than the resident county. Thus, the only cost the patient bears is travel time and possibly uncertainties about the quality of treatment given in another county.

[11] If I only observe z_t and z_{t+3}, then z_{t+1} is imputed as $z_{t+1} = z_t + \frac{1}{3}(z_{t+3} - z_t)$.

However, if the provider does not succeed in finding a vacant slot in the public system within a time limit that is specified in the contract, then the customer is channelled to a private hospital. Thus, the exercise of the private insurance option is conditional upon the lack of public treatment slots. The implication of this business practice is to lower the risk for the insurance provider. When public slots are abundant, the likelihood of exercising the option is low and costs for the provider are low. Therefore, the prices offered to the customers are dependent on the time limit for the search—specified in the contract, which currently can be 10, 20 or 30 days. The longer the search time specified in the contract, the lower the price of the insurance. The most important material difference between this insurer and the other more traditional insurers might be connected to underwriting; it is reasonable to believe that the risk for the untraditional insurance player is lower, and tolerance for possible information problems may therefore be higher. The scarcity of information at hand seems to confirm that the untraditional player requires less health information than the other providers.

5. Demand for private treatment insurance: a waiting time model

One important reason for opting into the private treatment insurance market is to avoid the possibility of waiting. Waiting time is a factor that reduces the quality of the public health care system, but on the other hand, it can also act as a screening device. Besley et al. (1999) show that such screening might imply sorting by income. In their model, high-income individuals choose private insurance while low-income people choose the public system. This result is driven by two main assumptions: a) the quality of health care is a normal good, and b) individuals are risk averse. I maintain these assumptions here.

Using a somewhat different model, Marchand and Schroyen (2005) show a similar sorting result between public and private health care, but with ability instead of income and waiting time instead of quality of treatment.[12]

Below I present a rather simple theoretical model, inspired by the Marchand and Schroyen approach. The aim of this theoretical discussion is to develop guidelines for the empirics that are presented later in the paper.

When people are asked about their possession of treatment insurance or asked about their preference for treatment insurance it makes sense to assume that the preference for this insurance reflects the perceived probability of requiring health care services. Denote this

[12] Ability can here be understood as the income-generating potential. People with high ability will normally receive higher hourly wages, meaning that the income loss per hour if sick is higher for high ability persons than for others.

probability as π_i.[13] Following the idea of Marchand and Schroyen, let T_i be total time available for the individual. To keep things as simple as possible, denote c_i as consumption and e_i as health expenditure paid out of pocket if the person becomes ill.[14] If sick, the time available is $T_i - w_i$, where w_i can be interpreted as waiting time in the public health care system. Moreover, during the sickness period, the person needs to allocate resources towards treatment expenses. This reduces expenditure possibilities for other goods; hence, available consumption on other goods is $c_i - e_i$. Assume that the individual is active in the labour market and that he/she can choose freely between leisure (l_i) and consumption. Furthermore, let a_i denote the hourly wage and m_i financial wealth. The maximization problem for this person can then be set up as follows. If healthy with probability $(1-\pi_i)$:

$$\begin{aligned} &\max \quad u(c_i, l_i) \\ &st \quad c_i + a_i l = a_i T + m_i \\ &FOC: \frac{u_{l_i}}{u_{c_i}} = a \rightarrow \text{Indirect utility} = v_i(a_i, a_i T + m_i). \end{aligned}$$

If ill with probability π_i:

$$\begin{aligned} &\max \quad u(c_i, l_i) \\ &st \quad c_i + a_i l = a_i(T - w_i) + m_i - e_i \\ &FOC: \frac{u_{l_i}}{u_{c_i}} = a_i \rightarrow \text{Indirect utility} = v_i(a_i, a_i(T - w_i) + m_i - e_i). \end{aligned}$$

The expected utility for an uninsured individual is then (I suppress the subscript *i* from here onwards)

(1) $$Ev = \pi v(a, a(T-w) + m - e) + (1-\pi)v(a, aT + m).$$

Using a second-order Taylor expansion around $aT + m$, one obtains (see Appendix 1)

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[13] It is likely that this probability is formed by a subjective assessment that among others includes health status (H_i) and possibly other personal characteristics (A_i), implying that the probability of treatment may be written as $\pi_i(H_i, A_i)$. However, to keep the model as simple as possible, I abstract from this possible extension here.

[14] In this highly stylized setting, e_i can be thought of as co-payments using the public health care system.

(2) $$Ev_{NI} \approx v(a, aT + m) - v_m \pi(aw + e) + \frac{1}{2} v_{mm} \pi(aw + e)^2 .$$

Let P be the insurance premium for one unit of treatment insurance. If the person is insured, the utility will be equal across states of the world and one can simply write the expected utility as[15]

(3) $$Ev = v(a, aT + m - P).$$

Taking a first-order Taylor expansion around $(a, aT + m)$, we obtain (see Appendix 1)

(4) $$Ev_I = v(a, aT + m) - v_m P .$$

The individual will demand insurance if and only if the expected utility when insured is greater or equal to the expected utility when not insured. Let P^* be the price that makes the individual indifferent between having insurance versus not having insurance, i.e., $Ev_{NI} \cong Ev_I$. This leads to the following equality:

$$v(a, aT + m) - v_m P^* = v(a, aT + m) - v_m \pi(aw + e) + v_{mm} \pi \frac{1}{2}(aw + e)^2$$

(5) $$\Downarrow$$

$$P^* = \pi(aw + e) - \frac{v_{mm}}{v_m} \pi \frac{1}{2}(aw + e)^2 = \pi(aw + e) + \frac{R_a(a, aT + m)}{2} \pi(aw + e)^2$$

$$R_a = -\frac{v_{mm}}{v_m},$$

where $R_a = -\frac{v_{mm}}{v_m}$ denotes the degree of absolute risk aversion. The first term in (5) reflects the expected cost of sickness. This cost consists of the cost of waiting (aw) and health expenditures (e). The second term represents the variance in earnings and if the person is risk averse (a preference for low variance) – this term is positive.

The derivatives of (5) with respect to the waiting time, financial wealth and wage are

[15] Note that this assumption implies that waiting time is zero if the person is insured. The insurance contracts available today typically restrict the waiting time to a maximum of 28 days before treatment is started. Thus, an insured person will typically expect a non-zero waiting time but this non-zero waiting time is still lower than the waiting time an uninsured person faces.

$$\frac{\partial P^*}{\partial w} = a[\pi + R_a(a, aT + m)\pi(aw + e)] > 0,$$

$$\frac{\partial P^*}{\partial m} = \frac{\partial R_a(a, aT + m)}{\partial m}\pi(aw + e)^2 < 0 \text{ if } \frac{\partial R_a(a, aT + m)}{\partial m} < 0,$$

$$\frac{\partial P^*}{\partial a} = \pi w(1 + R_a(aw + e)) + \frac{1}{2}[R_a(R_a - P_a)L + L_m R_a - L_{mm}]\pi(aw + e)^2,$$

where L is labour supply.

The derivative of the premium with respect to waiting time is greater than zero. Moreover, the higher the wage, the higher the sickness probability, and the higher the risk aversion, the larger is this derivative. Furthermore, the premium a person is willing to pay decreases in wealth if absolute risk aversion decreases in wealth.

The derivative of P^* with respect to wage is derived in Appendix 1. It is shown there that it is most likely positive. The main intuition is that a wage increase leads to both a higher mean loss and higher variance in income if the person needs treatment. The increase in mean loss is πw and the increase in variance is $\pi w(aw + e)$, which is weighted by the risk aversion coefficient. These effects are unanimously positive. The second term, however, is probably negative because risk aversion most likely declines when the hourly wage increases. However, because this is a second-order effect, $\frac{\partial P^*}{\partial a}$ is most likely greater than zero.

The above equations state the demand for treatment insurance increases in risk aversion, waiting lists and – most likely - the wage. Although it is of great interest to look closer into the connection between co-payments (e) and the use of private alternatives to public health, one needs access to time series data to do this. This is left for future research.

6. Data and descriptive statistics

In December 2004, a Nordic insurance company conducted a broad survey on the possession of treatment insurance in Norway. The survey gathered information from a broad national web panel owned by the poll company Synovate. The response rate was 49.2 per cent. The respondents answered the survey by clicking on a link sent to them by email. It was revealed from the start that the survey was conducted for an insurance company. Internet penetration is

especially high in the Nordic countries and this survey is considered nationally representative for respondents between 30–55 years.[16]

The survey was designed in a way that allows for testing consistencies in answers. This is important because survey answers might have biases that occur from random answering and uninterested respondents. Moreover, insurance is regarded normally as a "low-interest product". In particular, this implies that respondents do not always know exactly what type of insurances they have, which enhances the need for consistency testing. The survey started with questions regarding knowledge of the product, together with a question about smoking. Because treatment insurance is quite rare, the respondent was asked two times about possession of insurance. The first question did not contain any description of this insurance, while the the second question gave a detailed specification of the insurance cover. Only respondents that answered consistently on both questions were kept. Table 2 provides the number of observations divided into the three relevant categories: no insurance, privately bought and insurance through employer. Around 400 respondents fell out of the sample following the consistency check and the effective sample contains approximately 1800 respondents.

……..……TABLE 2……..

Table 2 shows that treatment insurance is quite rare, as expected. Moreover, the fraction of those who own privately bought insurance is lower than the fraction who own employer-provided insurance. This is in line with the pattern shown in Diagram 1. Table 3 breaks down the ownership pattern across socio-economic characteristics.

……..TABLE 3……..

The fraction of smokers among those who have received treatment insurance through their employer is remarkably high compared with the sporadic- and non-smokers. Note also the positive difference between smokers and non-smokers among those who have obtained private treatment insurance. In order to verify that this finding is not an artefact of this particular sample, I confirmed that the fraction of smokers in the sample is comparable with public figures. The

[16] According to the OECD (2005), more than six out of 10 households have Internet access in Norway. Only Korea, Iceland, Denmark and Switzerland surpass this figure. Internet penetration is lowest among the oldest and those with low household income (Statistics Norway, http://www.ssb.no/ikthus/tab-2005-11-16-02.html).

sample fraction of 25 per cent is very close to the official number provided by Statistics Norway: 26 per cent in 2004 and 25 per cent in 2005.[17]

Furthermore, note that insurance penetration increases with income and that the people with higher education are less likely to possess treatment insurance. There is a non-linear relationship between insurance possession and age for privately purchased treatment insurance. The likelihood is highest in the middle groups, from aged 35 to 45, while the likelihood is lower in the age groups from 45. The penetration of employer provided insurance is slightly decreasing in age.

7. Empirical analysis

The survey contains three sources of information that can be used to explain the underlying demand for this type of insurance: a) an interest question, b) an insurance tariff test, and c) possession of treatment insurance. Both the interest question and the insurance tariff test provide information about the heterogeneity in the latent utility of treatment insurance, while self-reported ownership of treatment insurance represents real demand.

I start the analysis by examining the interest question and then proceed to the insurance tariff test. Finally, results from insurance ownership regressions are presented. By doing this three-step exploration of the data I try to uncover consistent demand patterns. First, however, I provide a description of the covariates used in the analysis.

Covariates

I use the same set of covariates in all empirical applications. Two waiting list variables are included. The first is the number of referrals pending on a waiting list divided by the county population. Only referrals that have pended for more than three months are included to remove possible noise from the referrals that are exercised within days or weeks after the referral is written. These short-term referrals can hardly be said to pose a waiting list problem. The other waiting list variable is mean waiting time in days for completed cases, given that these cases have pended for more than three months (thus at least 90 days). This variable also captures the effects of supply constraints at hospitals and it gives a direct estimate of the average time spent in queues. In order to capture the persistent effects of waiting lists, these two variables are measured as the mean over the period 1998–2001. Recall that the survey was conducted in 2004. By leaving

[17] The estimate from Statistics Norway consists of people between ages 16 to 74. For the age group 25–54, Statistics Norway reports a figure of 27.7 per cent, which is somewhat higher than the sample percentage.

out the years prior to 2004, I also avoid possible simultaneity bias.[18] Finally, I restrict these waiting list variables to include only somatic treatment as most of these illnesses quite easily can be treated through private alternatives. A further elaboration of the waiting list variables is given in Appendix 2. It is important to note that the waiting list variables vary only across, not within, counties. This can be regarded as assuming that subjects belonging to a specific county face the same waiting list problem. Thus, any heterogeneity with respect to waiting time within the county is therefore not addressed in the analysis.

In addition to the waiting list variable, all specifications includes socio-economic characteristics such as a gender dummy, three income category dummies, four age category dummies, a dummy for college/university education, a blue-collar dummy and whether the respondent is a non-smoker, sporadic smoker or a daily smoker.

a) Interest in treatment insurance

This question started with the following description.

"Imagine that the following insurance is introduced in the Norwegian market: the insurance covers day surgery at a private hospital (not overnight stay) and it also covers all travel and possible accommodation costs that may occur as a consequence of the surgery. Given that the price for this insurance is acceptable, would this insurance be "Highly interesting", "Interesting", "Somewhat interesting", or "Not interesting"?

The structure of this question calls for an ordered probit/logit model, because of the natural ordering from low to high interest.[19] The notion of an "acceptable price" may of course vary across respondents.

Assume an underlying latent model. Let y^* denote the unobserved latent variable of interest, which represents the latent utility of treatment insurance.[20] Furthermore, assume that y^* generally can be written as

$$(6) \qquad y^* = \beta' X + e,$$

[18] Whether one uses the period from 1998 to 2001 or 1998 to 2003 does not alter the results significantly.

[19] The respondents were also given the option "Do not know/do not want to answer" and the respondents who chose this option were not included in the analysis. An alternative could be to include the "uncertain" respondents in the "Not interesting" group. I have tried the latter alternative. This did not change the results significantly.

[20] In order to keep notation as simple as possible, I suppress the use of index i for individual i.

where the X-vector represents individual and county variables that have an effect on insurance demand and β is a column vector of parameters. Moreover, assume that the zero mean residual u is uncorrelated with X.

Four responses are observed. These are: $y = 1$ – "Highly interesting", $y = 2$ – "Interesting", $y = 3$ – "Somewhat interesting" and $y = 4$ – "Not interesting". Assume now that the residual is normally distributed and that there are three unknown cut-off points: that is, $\alpha_1 < \alpha_2 < \alpha_3$. Modelling the responses in order from lowest interest (4) to highest interest (1) implies that the probability of $y = 4$ is $P(y = 4) = P(y^* < a_1) = P(\beta' X + e < a_1) = P(e < a_1 - \beta' X) = \Phi(a_1 - \beta' X)$, where Φ denotes the normal cumulative distribution. Likewise, the probability of observing response $y = 3$ is $\Phi(a_2 - \beta' X) - \Phi(a_1 - \beta' X)$, the response $y = 2$ is $\Phi(a_3 - \beta' X) - \Phi(a_2 - \beta' X)$ and the response $y = 1$ is $1 - \Phi(a_3 - \beta' X)$. Because the responses are cumulated, an underlying assumption is a common β for all responses. This means that we restrict the model so that the effect of a covariate is the same for each cut-off point, which may be denoted as an equal slopes assumption. Table 4 presents regression results as well as a test for the equal slopes assumption.

……TABLE 4……

The waiting list variable, referrals as a fraction of the county population, is indeed positive and statistically significant. Its marginal effect indicates that a one per cent increase in this variable increases the chances of expressing the highest interest by 0.4 per cent. The other waiting list variable, reflecting mean waiting time in days, is insignificant and close to zero. Moreover, note that daily smokers are more interested in this insurance than non-smokers. Furthermore, sporadic smokers are more interested; however, the point estimate is not statistically significant. One can also note that interest increases with income and the self-employed are significantly more interested in this type of insurance than employees are. Respondents with university education are significantly less interested than lower-educated people. Finally, the score test confirms the null hypothesis of equal slopes.

b) The insurance tariff test

After the interest test, respondents completed the insurance tariff test. Those who were not interested in insurance were not given the test. The results from the insurance tariff test are therefore conditional on a population that has at least some interest in this type of insurance.

This restriction might induce selection bias and it is therefore important to compare the results from the interest question (a question posed to the full sample) with the results from the insurance tariff test in order to judge the possible magnitude of this possible bias.

The respondents were presented with a price that was calculated according to age and smoking habit (the respondent was unaware of this). Smokers were offered a price equal to 1.25 times the non-smoking price irrespective of age. Sporadic smokers got the same price as non-smokers. Prices increased with age. For example, the price for a 50-year-old person was 2.2 times the price quoted for a person between 30 and 35. According to the product specialists in the insurance company, this price set-up reflected the price structure in the individual market at the time of the survey.

It is important to stress that each respondent was given only one price, which was the tariff price for this respondent. Thus, the respondents had no knowledge about the underlying tariff structure and the response is therefore only dependent on the respondent characteristics and the price each respondent was offered. Moreover, the respondents did not have any knowledge that they received different prices. Thus, any noise that one would expect to be present if the respondents knew they were treated differently can be disregarded. However, the insurance tariff structure causes problems with collinearity and restricts the possibility of identifying the effect of age on demand, an issue I will address later on.[21]

After a detailed explanation of the insurance cover (a description is given above), the exact formulation of the question that included the insurance tariff was

"If you were offered this insurance, would you be "highly likely", "likely", "somewhat unlikely" or "not likely at all" to buy if the price was P?"

where P = f (age group, smoking habit) and where "highly likely" was coded as 1, "likely" as 2, "somewhat likely" as 3 and "not likely at all" as 4.

In the choice situation, the respondent considers the utility of the insurance in two hypothetical situations—the situation with insurance and the situation without insurance. This situation was analysed theoretically in Section 5 and to empirically investigate this choice situation, I will depart from the expression of the willingness to pay given in equation (5). By a

[21] The ideal set-up would be random insurance prices. However, the data contain no such test.

slight reformulation of (5), the latent utility of having the insurance (U^*) can generally be written as

$$(7) \qquad U^* = \pi(aw + e) + \frac{R_a(a, aT + m)}{2}\pi(aw + e)^2 - P .$$

The first two terms on the right-hand side consist of the subjective probability of needing treatment, waiting time and individual risk aversion. I assume that this term, which includes both observable and unobservable factors, can be represented by a set of explanatory variables and an error term. That is, it can be written as $\beta' X + \varepsilon^*$, where ε^* is a normally distributed error term with constant variance σ^2. Moreover, I assume that ε^* is independent of the explanatory variables *X*. Under these assumptions the latent utility function can be written as

$$(8) \qquad U^* = -P + \beta' X + \varepsilon^* .$$

Note that the price term enters the latent utility function as an additive term. This is consistent with an assumption of CARA utility.[22] This assumption is often used in empirical work (see Einav et al. 2009). As Einav et al. (2009) point out; the CARA assumption is attractive because a change in the premium is independent of risk aversion and outcome probabilities.

The underlying continuous utility function given in equation (8) cannot be observed, only the choices that express the likelihood of buying the insurance. The respondent expresses a very strong intention to buy if the choice is "Highly likely" (HL). The intention to buy is moderately strong for the response "Likely" (L), it is weak for the option "Unlikely" (UL) and it is very weak for the choice "Not likely at all" (NL). The responses are ordered naturally from weak to strong preferences. An ordered probit or logit model is appropriate for modelling the choices and because of the assumption of a normally distributed ε^*, an ordered probit model is suitable.

Note that the model does not contain any information about the scaling of the underlying latent variable U^*. It is, therefore, not possible to identify both a unique variance (scale) and a unique vector or parameters. One alternative is to estimate equation (8) directly by fixing the parameter value of *P* equal to 1 and allow the variance σ^2 to be estimated freely. Another

[22] A typical CARA utility function can be expressed as $v = -e^{-\alpha m}$. With insurance, the utility can be written as $v = -e^{-\alpha(m-P)}$. Without insurance, the utility is $v = -e^{-\alpha m}$. Note that the risk aversion is constant and equal to α irrespective of the insurance choice. See Gollier (2001) page 27 for a detailed description of CARA preferences.

alternative is to fix the variance equal to 1 and include P as an explanatory variable in the X vector (see for example Greene and Hensher (2008), page 9). In Appendix 3, I show the results from the first alternative.

In the following, however, I apply the traditional approach, which is to fix the variance equal to 1 and include P as a standard explanatory variable. This means that I proceed from a rescaled latent model $U = -\varkappa P + b'X + \varepsilon$, where ε now has a variance of 1, $\varkappa = \frac{1}{\sigma}$, $b = \frac{\beta}{\sigma}$.

Assume that there are three unknown thresholds that separate the underlying latent utility categories. A very weak intention to buy implies that $U < t_1$, a weak intention implies that $t_2 > U \geq t_1$, a strong intention implies that $t_3 > U \geq t_2$, and a very strong buying intention implies that $U \geq t_3$. To complete the model, let y represent the responses to the insurance tariff test, where $y \in (NL, UL, L, HL)$. Then, one has the following possible response probabilities:

$$
\begin{aligned}
&P(y = NL) = P(U < t_1) = P(\varepsilon < t_1 + \varkappa P - b'X) = \Phi(t_1 + \varkappa P - b'X),\\
&P(y = UL) = P(t_2 > U \geq t_1) = P(t_1 + \varkappa P - b'X \leq \varepsilon < t_2 + \varkappa P - b'X) = \Phi(t_2 + \varkappa P - b'X) - \Phi(t_1 + \varkappa P - b'X),\\
&P(y = L) = P(t_3 > U \geq t_2) = P(t_2 + \varkappa P - b'X \leq \varepsilon < t_3 + \varkappa P - b'X) = \Phi(t_3 + \varkappa P - b'X) - \Phi(t_2 + \varkappa P - b'X),\\
&P(y = HL) = P(U \geq t_3) = P(\varepsilon \geq t_3 + \varkappa P - b'X) = 1 - \Phi(t_3 + \varkappa P - b'X).
\end{aligned}
$$

By using these probabilities, one can form the likelihood function and obtain the maximum likelihood estimates of b and $\varkappa$.

The explanatory variables are the same as those used in the interest regression (see Table 4). It is, however, important to recall that the price was a function of age and smoking.[23] This fact limits the identification of age effects because of collinearity. Using three age dummies is not possible because of perfect collinearity. I therefore define only two age dummies: one dummy for the group aged 40–45 and one for the group aged 45–54. Thus, the reference group is respondents below the age of 40. The smoking effect, however, is easier to identify because prices for smokers, sporadic smokers and non-smokers varies across age categories. A potential concern is a clear association between smoking and age. Fortunately, a formal statistical chi-

[23] Note that the latent utility model in (8) suggests a squared term for the waiting list variable. I have tried a specification where a squared waiting list is included. This turned out to be generally insignificant and inclusion of this variable does not alter the other results.

square test of this possible association confirms the null hypothesis of no association (chi-square value 2.26, p value 0.68).[24]

In general, collinearity does not lead to biased estimates, but it can lead to severe problems such as high variance and unstable estimates (Greene 2000, page 256). To address the magnitude of the potential problem I choose to estimate the model with two, one and zero age covariates. Dropping age from the model, however, is a bad strategy if theory predicts that it should be included in the model. However, as noted above, the model (8) provides significant flexibility for the type of factors that have an impact on insurance demand and a model without age can in principle be equally theoretically valid as a model with age. Irrespective of this, however, a comparison of the parameter estimates across the models shows that inclusion/exclusion of age controls only have minor effects on the other estimates.[25]

The maximum likelihood estimates are given in Table 5. Column 1 contains a model with two age dummies, column 2 with one age dummy and column 3 with zero age dummies.[26]

……TABLE 5……

Considering the parameter estimates, I find that the major relationships are the same as those in the interest regression. Smokers and the self-employed express strong preferences for treatment insurance, while university-educated respondents express very weak preferences. On average, people with high incomes have a higher preference for the insurance, a result that is also found in the interest regression.

Waiting lists affect the demand positively, as in the interest regression. However, the estimates are insignificant but consistently positive across all model variants. Note, however, that the insignificant result of the waiting list variables may be explained to some extent by the fact that this question contains a much smaller sample than in the interest regression (because of the

[24] The fraction of smokers in the sample is a little more than 23 per cent. The number of sporadic smokers is around 11 per cent. Comparable numbers reported by Statistics Norway for the period 2003–2007 are 25 and 11 per cent. Thus, the sample means mirror the national numbers quite accurately.

[25] Stability is also confirmed when both the smoking and age dummies are removed from the regression (not reported).

[26] The price that was shown to the respondent was given in NOK. Using the price directly in the regression produces very small estimates of κ, from zero to the third decimal point. Therefore, I scale down all prices by a factor of 10 000. This rescaling does not, of course, affect the other estimates, but increases the price estimate, which makes it easier to compare across the models.

restriction that only those who had some interest in the insurance participated in the insurance tariff test).

As expected, the price of the insurance affects the preference for insurance negatively. Note that the statistical significance of the price is affected by the inclusion of the age covariates, which is consistent with the presence of collinearity.

The overall result is in close correspondence with the interest question and the insurance tariff test. Moreover, all the results are in line with what one would expect intuitively. This is a reassuring feature considering that the insurance tariff test was presented to a limited set of respondents (a potential selection problem) and that prices are highly collinear with age.

c) Treatment insurance ownership

In light of the results presented above, it is of great interest to analyse the ownership rates for both privately purchased and employer-provided insurance. Because ownership represents real demand, it is of particular importance to check the consistency between the ownership regressions and the results presented above.

All the results shown above differ from a model for an individual buyer. However, as shown in Section 3, substantial market growth in the latter years has come through employer-provided insurance. The demand for employer-provided insurance might be driven by factors other than demand for individual insurance. For example, treatment queues in a county might matter less for a firm that operates in several counties. Moreover, workplace characteristics such as the average age of the workforce, how risky the firm sector is, the gender composition within a firm and the profit level of the firm may all be important characteristics that are, unfortunately, unobservable in the data.

A simple perspective is to assume that the employer acts on behalf of the employees' preferences. If this were the case, then one would expect that the theoretical predictions and empirical findings elaborated above should also be valid for holdings of employer-provided insurance. However, it is quite likely that demand for employer-provided insurance is dependent on workplace characteristics as well. For example, the earned income of an individual is likely to be correlated positively with the profits of the employer. Thus, it is likely that high-wage people work in firms that have high profits. Despite the potential for omitted variable bias, I believe it is interesting to present results for both private insurance and employer-provided insurance. However, in the discussion I focus primarily on the regression results considering private treatment insurance.

Table 6 below shows the regression results. The first column depicts the results for privately owned insurance. The second column looks at employer-provided insurance and the third shows the parameter estimates where both individual and employer-provided insurance are included. Note that those who had employer-provided insurance are removed in the analysis of private insurance. Likewise, those who have private insurance are excluded in the analysis of employer-provided insurance.

.....……..TABLE 6…….....

Almost all of our earlier results are confirmed in column 1 of Table 6. Of particular interest is that both waiting list variables have the correct sign and with statistical significance at the 5 per cent level for privately bought insurance. Consistent with the interest and insurance tariff test, smokers are significantly more likely to possess treatment insurance, independent of whether it is employer-provided or private. The third consistent and statistically significant result is that penetration of this insurance increases with income.

8. Discussion

The results presented in this paper, taken together, indicate that queues in the public health care system do have an effect on the demand for treatment insurance. First, for privately bought insurance, the relation between queues and demand is statistically significant but its economic significance is rather small.Second, it is likely that queues affect the demand for private insurances and employer-provided insurances differently. It is quite easy to find arguments for why county-specific queues are important for the individual decision (people want to be treated close to their friends and family), while these arguments are less convincing when it comes to employer-provided insurance. For employers, who often operate across county boundaries, the national level of queues might be of more importance than at the county-specific level. Such a story is consistent with the results presented here, where I find a quite robust association between queues and private demand while this association is not present for employer-provided insurance.

A consistent finding across the different empirical specifications above is that smokers are more inclined to acquire this type of insurance. Why? One interpretation of the significant effect of smoking is that smokers assess the probability of requiring the insurance as higher than do non-smokers. Another possibility is that smokers possess higher risk aversion than non-smokers. However, it is well documented that smokers are less risk averse than non-smokers; see, for example, Barsky et al. (1997) or Aarbu and Schroyen (2009). Thus, if the probability of

requiring treatment is equal across smoking status and if risk aversion is lower among smokers, then smokers should be less interested, not higher as found here. Therefore, it makes more sense to argue that smokers believe that they will use the insurance with a higher probability than non-smokers and that this effect dominates the possible risk-aversion effect. Note also that their higher willingness to pay more than offsets the higher premium charged by the insurance company.There are several reasons why smokers may have a higher assessment of their probability of using the insurance than non-smokers. One reason might be poorer average health among smokers than for non-smokers, which is confirmed by Lundborg (2007). One should expect, however, that the insurance providers know this and therefore avoid this possible anti-selection through higher premiums for smokers. However, in immature and thin markets, as I analyse here, it may be difficult to set actuarially correct premiums because providers typically do not have enough experience data to set correct premiums. This may explain the quite large effect from smoking both in the insurance tariff test and for the possession of insurance.

Another possible reason is that smoking-related illnesses are prioritized lower in the public health care system than non-smoking-related illnesses. A third possibility is social stigmatization of smokers, which can indirectly affect the allocation of resources in the public health care system. For example, most of us are acquainted with warning signs on tobacco products, such as public-sponsored health campaigns against smoking and similar health debates in the media. Over time, these campaigns can cause social stigmatization of smokers. This effect can lead to higher interest and penetration of treatment insurance among this group if, for example, smokers are somewhat anxious about not being prioritized in the public health care system.[27]

In the ownership regressions, I find a strong association between employer-provided insurance and smoking habit. This association might be driven by workplace characteristics—characteristics that are unobservable to us. The results of Viscusi and Hersch (2001) point towards a connection between risky occupations and smoking. Lundborg (2007), using Swedish register data, provides direct evidence on a link between smoking and sickness absence. He finds that smokers are absent for a little more than 10 days a year more than non-smokers. Conditionally, controlling for risk selection, the estimate is a little more than seven days. Then, firms with a large fraction of smokers might on average face more problems with sick leave and

[27] One common illness caused by smoking is arteriosclerosis. In cases where this causes heart failure or other similar severe states, the public health care system is of course immediately available. However, for milder illnesses such as, for example, arteriosclerosis in the legs, waiting time can be justified and waiting time will be high if resources for habit-related illnesses are scarce.

this may explain the effect of smoking on employer-provided insurance. While one can argue that this effect might be relevant in a small immature market where knowledge of the risk landscape is scarce (this case), the argument is less convincing in a mature market. In the latter situation, insurance prices should reflect differences in accident probability, and selection effects from observable and relevant underwriting variables should not be present.

It is also worthwhile to note that the self-employed are significantly and consistently more interested in the insurance than employees. It is quite likely that one reason for this is that the compensation rules for sickness absence are inferior compared with sickness benefits for wage earners. In Norway, a wage earner receives 100 per cent of his/her wage starting from the first sick day, while a self-employed person receives only 65 per cent of his/her income from the 16th day of the sickness spell. Moreover, a self-employed person will probably carry costs that extend the direct monetary loss described above. For example, the self-employed can experience contract losses or other long-term consequences of being away from work while sick.

The effect of education on the demand for treatment insurance is somewhat puzzling. First, it is of opposite sign compared with the findings in Besley et al. (1999). Second, on average, highly educated people earn more than non-educated people. Thus, one should search for more country-specific reasons in explaining the education effect found here. One such reason is the fact that the public sector is a major employer of highly educated people. Figures from the Norwegian Labour and Welfare Administration (NAV) show that more than 50 per cent of those who have education above the four-year university level are employed in public administration (16.3 per cent), education (18.3 per cent) or health and social services (16.2 per cent).[28] Because health care is provided by the public sector, employees in the public sector are not provided with this kind of insurance, as this would undermine the whole idea of universal public health care. Therefore, the connection between education level and public sector employment might be an explanation for the strong negative effect of education found above. One obvious control would be to interact working sector with education in the regression. Unfortunately, the survey data set does not have any information about working sector.

I find mixed evidence for how age affects demand. Some evidence is found, however, that penetration of employer-provided insurance decreases with age. A study by Løvås et. al (2007) provides some support for this finding. They find that firms with a young work force are more likely to provide their employees with treatment insurance.

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[28] See www.nav.no/page?id=1073743228, accessed 24th August 2009. Both the Education Sector and the Health and Social Services sector consist almost entirely of public entities.

Along the same reasoning, the highly significant higher probability of males being provided with employer-provided insurance could be explained by the fact, for example, that males are more frequently represented in risky occupations, that males more often take on leadership positions or that males are more likely to work in the private sector than females. However, to investigate these issues further, one needs richer data that connect employees and employers and combine such data with insurance information. Such an exercise remains for future research.

9. Concluding remarks and future research avenues

By utilizing information from a unique survey data set containing the results of an interest question, an insurance tariff test and ownership of insurance, a consistent demand pattern for treatment insurance is found. For privately bought insurance, I find that county specific waiting lists affect the demand, while I cannot provide such evidence for employer provided insurance. Moreover, smokers express strong preferences for treatment insurance and theay are also more likely to own this type of insurance. The likelihood of acquiring this insurance increases with income, as expected. To the best of my knowledge, this is the first paper that investigates empirically the relation between queues in public health care and private treatment insurance demand within a Scandinavian context.

Because of scarce market data, more research in this area is needed. For example, one needs more knowledge regarding employer-provided insurance. This paper has shown that high-income individuals and smokers are more likely to own employer-provided insurance. However, because of the absence of workplace characteristics, the relationship between ownership of employer-provided insurance, firm characteristics and individual characteristics cannot be answered here.

Moreover, that smokers are more likely to acquire this type of insurance may be an indication of a potential information problem in this market. However, to map this information problem in more detail, one needs both tariff and claims data combined with socio-economic information. Thus, more knowledge about demand patterns for employer-provided insurance and explorations of adverse selection problems, using contract-level data, are fruitful avenues for future research.

Knowledge about the interaction between public and private alternatives is also important in understanding the transformation of the welfare state. How large can the privately provided health care sector grow before it threatens the (Nordic) principle of free of charge universal

health care? The latter question is particularly important to bear in mind in light of the rapid growth of the privately provided health care documented in this paper.

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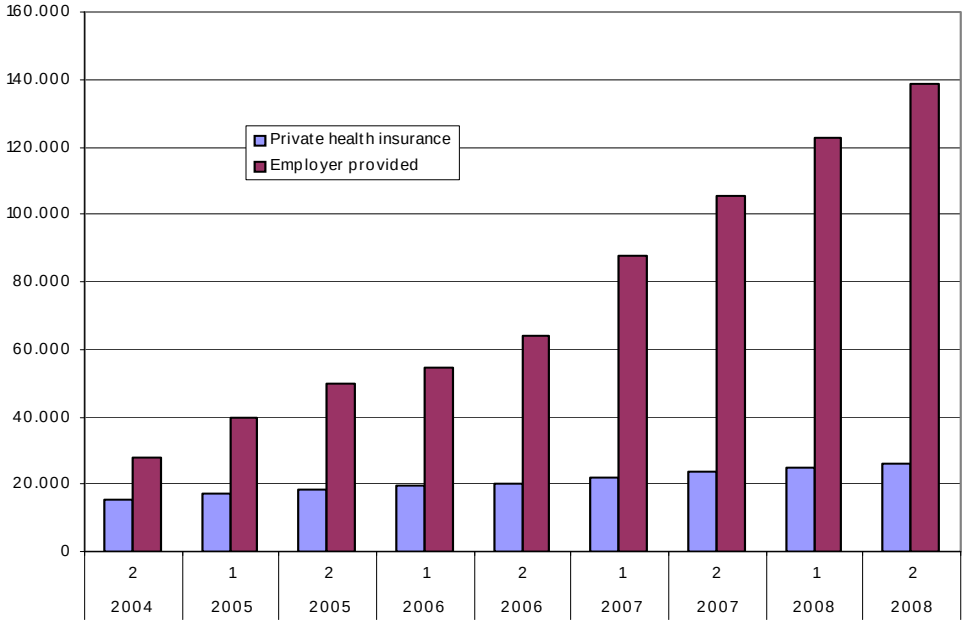
Tables and diagrams

Table 1. Mean waiting times in days after referral for treated patients: somatic treatment only

	Mean waiting time in days 1998–2004	Mean waiting time in days 2004–2005
County		
Østfold	103.81	68.78
Akershus	87.25	68.93
Oslo	73.22	60.40
Hedmark	87.48	66.48
Oppland	90.44	66.92
Buskerud	89.94	66.66
Vestfold	83.36	64.32
Telemark	91.41	65.44
Aust-Agder	80.20	78.18
Vest-Agder	84.21	69.52
Rogaland	100.46	78.58
Hordaland	97.78	126.47
Sogn & Fjordane	91.83	82.76
Møre & Romsdal	102.65	68.28
Sør-Trøndelag	103.08	80.55
Nord-Trøndelag	92.63	70.62
Nordland	91.47	75.28
Troms	95.94	76.28
Finnmark	97.81	88.06
All	90.98	75.71

Source: Norwegian patient register, extracted from www.npr.no July 2007.

Diagram 1. The evolution of private treatment insurance in Norway, 2003 to 2008. Number of insured.



Source: FNH and various press sources.[29]

[29] See www.aftenposten.no/jobb/article959854.ece, http://www.dagensmedisin.no/nyheter/2006/06/09/kraftig-vekst-i-helseforsik/index.xml ,www.dagensmedisin.no/nyheter/2008/08/13/benytter-seg-mer-av-helsef/index.xml (all links in Norwegian)

Table 2. Possession of treatment insurance

	Privately bought	Employer provided	No insurance	Sum
Number of observations	78	138	1588	1804
Fractions	0.04	0.08	0.88	1

Table 3. Descriptive statistics: possession of treatment insurance across SES

	Privately bought	Treatment insurance through employer	Do not have insurance
Age category			
30–34	0.04	0.11	0.85
35–39	0.07	0.09	0.84
40–44	0.06	0.07	0.87
45–49	0.03	0.06	0.91
50–54	0.03	0.06	0.91
Smoking habit			
Yes, daily	0.06	0.10	0.84
Sporadically	0.04	0.07	0.88
No, not at all	0.04	0.07	0.89
Income			
Up to 299K	0.04	0.04	0.91
300K–599K	0.04	0.09	0.87
Over 600K	0.06	0.08	0.86
Gender			
Male	0.04	0.09	0.87
Female	0.04	0.06	0.90
Education			
Primary school	0.02	0.07	0.90
High school	0.05	0.09	0.86
Higher education	0.04	0.07	0.89
Occupation	0.05	0.10	0.85
Blue collar			
White collar	0.05	0.10	0.84
Leading position white collar	0.03	0.06	0.91
Other	0.05	0.05	0.90

	Privately bought	Treatment insurance through employer	Do not have insurance
Civil status			
Married/Partner	0.04	0.08	0.88
Other	0.04	0.07	0.89
Number in household			
Single household	0.04	0.08	0.87
More than one	0.04	0.08	0.88

Table 4. Maximum likelihood estimates: expressed interest in a completely specified treatment insurance. Ordered probit. Dependent variable is stated interest from "Highly interesting", to "Interesting", "Somewhat interesting", and "Not interesting".

	Estimate (Std Err)
Intercept 1	–1.15*** (.345)
Intercept 2	–0.1278 (.344)
Intercept 3	0.915*** (.344)
Referrals pending more than three months: fraction of county population	0.022** (.011)
Days from referral to treatment: pended more than 90 days (mean within each county)	–0.0000 (.000)
Male	–0.0055 (.054)
Daily smoker	0.162** (.064)
Sporadic smoker	0.141* (.083)
35–39	0.0830 (.082)
40–44	–.134* (.080)
45–49	–0.0958 (.079)
50–54	–.262*** (.080)
University education	–.349*** (.056)
Medium income	–0.0963 (.098)

	Estimate (Std Err)
High income	0.0848 (.118)
Highest income	0.326* (.172)
Blue collar	0.0829 (.067)
Self employed	0.186** (.093)

Additional statistics

Log likelihood	–2209.8506
N (n1,n2,n3,n4)	1723(215,535,631,342)
Score test for equal slopes (Pr>ChiSq)	0.4986

Table 5. Parameter estimates: an insurance tariff test for completely specified treatment insurance. Ordered probit estimation of stated likelihood for buying treatment insurance at a given price. Possible responses to the question were "highly likely", "likely", "somewhat unlikely" or "not likely at all".

	Two age dummies	One age dummy	No age dummies
	Estimate (Std Err)	Estimate (Std Err)	Estimate (Std Err)
Intercept 1	–1.13*** (.434)	–1.10** (.432)	–1.15*** (.417)
Intercept 2	0.1647 (.433)	0.1943 (.431)	0.1423 (.415)
Intercept 3	1.644*** (.435)	1.673*** (.433)	1.621*** (.417)
Referrals pending more than 3 months: fraction of county population	0.00536 (.013)	0.00545 (.013)	0.00559 (.013)
Days from referral to treatment: pended more than 90 days (mean within each county)	0.000075 (.001)	0.000070 (.001)	0.000068 (.001)
Male	–0.0122 (.064)	–0.00996 (.064)	–0.00873 (.064)
Smoker	0.251*** (.092)	0.268*** (.088)	0.250*** (.077)
Sporadic smoker	0.1403 (.097)	0.1417 (.097)	0.1435 (.097)
Age group 40–44	–0.0605 (.095)	:	:
Age group 45–54	–0.00201 (.161)	0.0589 (.129)	:
University education	–.225*** (.066)	–.219*** (.066)	–.219*** (.066)
Middle income	0.0643 (.113)	0.0593 (.113)	0.0573 (.113)
High income	0.331** (.137)	0.325** (.136)	0.323** (.136)

	Two age dummies	One age dummy	No age dummies
	Estimate (Std Err)	Estimate (Std Err)	Estimate (Std Err)
Highest income	0.737*** (.201)	0.732*** (.201)	0.730*** (.201)
Blue collar	0.0942 (.078)	0.0968 (.078)	0.0964 (.078)
Self employed	0.341*** (.106)	0.342*** (.106)	0.342*** (.106)
Price	–2.942* (1.506)	–3.393** (1.328)	–2.864*** (0.643)

Additional statistics

Log likelihood	–1455.9 (column 1)
	–1456.1 (column 2)
	–1456.2 (column 3)
N (n1,n2,n3,n4)	1285 (118,484,571,112)
Score test for equal slopes (Pr>ChiSq)	0.1350 (column 1)
	0.0941 (column 2)
	0.0693 (column 3)

Table 6. Parameter estimates: possession of treatment insurance

Probit models. The dependent variable coded 1 if the respondent has insurance, zero otherwise.

	Privately bought insurance	Employer-provided insurance	Both private and employer provided
	Estimate (Std Err)	Estimate (Std Err)	Estimate (Std Err)
Constant	–4.47*** (.895)	–2.12*** (.717)	–2.82*** (.613)
Referrals pending more than three months: fraction of county population	0.050** (.024)	0.0095 (.024)	0.0273 (.020)
Days from referral to treatment: pended more than 90 days (mean within each county)	0.003** (.001)	0.0003 (.001)	0.002* (.001)
Male	–0.0423 (.121)	0.198* (.102)	0.1229 (.086)
Daily smoker	0.261* (.133)	0.259** (.113)	0.274*** (.095)
Sporadic smoker	0.0936 (.184)	0.0404 (.157)	0.0363 (.133)
35–39	–0.2381 (.199)	–.315** (.151)	–.317** (.133)
40–44	–0.2769 (.200)	–.336** (.149)	–.335** (.132)
45–49	0.1873 (.176)	–.318** (.152)	–0.0753 (.126)
50–54	0.2058 (.180)	–0.0812 (.148)	0.0450 (.127)
University education	–0.0135 (.127)	–0.0836 (.105)	–0.0670 (.090)
Medium income	0.1661 (.230)	0.542** (.236)	0.420** (.182)
High income	0.3937 (.268)	0.2883 (.278)	0.355* (.214)
Highest income	0.966*** (.337)	1.018*** (.341)	1.118*** (.264)

	Privately bought insurance	Employer-provided insurance	Both private and employer provided
	Estimate (Std Err)	Estimate (Std Err)	Estimate (Std Err)
Blue collar	0.0785 (.148)	0.0972 (.113)	0.0923 (.101)
Self employed	0.1445 (.188)	--	–0.2254 (.161)

Additional statistics

	Privately bought insurance	Employer-provided insurance	Both private and employer provided
Log likelihood	–279.37	–411.21	–594.35
N (n1,n0)	1569 (74,1495)	1481 (125,1356)	1698 (203,1495)

Appendix 1: Derivation of equations (2) and (4) and the derivative $\frac{\partial P^*}{\partial a}$

The expected utility of an uninsured person (where I for convenience suppress the subscript *i*) is

$$Ev = \pi v(a, a(T-w)+m-e) + (1-\pi)v(a, aT+m)$$
$$\Downarrow$$
$$Ev = v(a, aT+m) - \pi v(a, aT+m) + \pi v(a, a(T-w)+m-e).$$

The exact expression for the second-order Taylor expansion around $(a, aT+m)$ is

$$v(a, aT+m) + +\pi v_m(aT+m-[a(T-w)+m-e]) + \frac{1}{2}\pi v_{mm}(aT+m-[a(T-w)+m-e])^2$$
$$= v(a, aT+m) - \pi v_m(aw+e) + \frac{1}{2}\pi v_{mm}(aw+e)^2,$$

which gives equation (2).

If the person is insured then expected utility is

$$Ev = v(a, aT+m-P).$$

The first-order Taylor expansion around $(a, aT+m)$ gives

$$v(a, aT+m) + v_m(aT-m-P-(aT-m)) = v(a, aT+m) - v_m P,$$

which gives equation (4).

The derivative $\frac{\partial P^*}{\partial a}$ is

$$\pi w + \frac{1}{2}\frac{\partial R_a(a, aT+m)}{\partial a}\pi(aw+e)^2 + R_a(a, aT+m)\pi w =$$

$$\pi w(1 + R_a(a, aT+m)) + \frac{1}{2}\frac{\partial R_a(a, aT+m)}{\partial a}\pi(aw+e)^2.$$

The definition of R_a is

$$R_a = -\frac{v_{mm}(a, aT+m)}{v_m(a, aT+m)} \Rightarrow \frac{\partial R_a(a, aT+m)}{\partial a} = -\frac{\partial}{\partial a}\left(\frac{v_{mm}(a, aT+m)}{v_m(a, aT+m)}\right).$$

For convenience, I drop the functional argument $(a, aT+m)$ from here. Taking the derivative of the above expression gives

(a1) $$\frac{\partial R_a}{\partial a} = -\left[\frac{v_m[v_{mma} + v_{mmm}T] - v_{mm}[v_{ma} + v_{mm}T]}{v_m{}^2}\right].$$

By symmetry, $v_{ma} = v_{am}$. By Roy's identity $v_a = -lv_m$, where l is the demand for leisure and v_m is marginal utility of wealth. Thus, we have

(a2) $$v_{ma} = \frac{\partial}{\partial m}\left[-lv_m\right] = -lv_{mm} - v_m l_m.$$

Furthermore, using the symmetry of the derivatives and Roy's identity, one obtains

(a3) $$v_{mma} = \frac{\partial}{\partial m}[-lv_{mm} - v_m l_m] = -lv_{mmm} - 2l_m v_{mm} - v_m l_{mm}.$$

Substituting (a2) and (a3) into (a1) gives

$$\frac{\partial R_a}{\partial a} = -\left[\frac{v_m[-lv_{mmm} - 2l_m v_{mm} - v_m l_{mm} + v_{mmm}T] - v_{mm}[-lv_{mm} - v_m l_m + v_{mm}T]}{v_m{}^2}\right],$$

which can be simplified further to

$$\frac{\partial R_a}{\partial a} = [\frac{v_{mm}^{\ 2}}{v_m^{\ 2}} - \frac{v_{mmm}}{v_m}](T-l) + l_m \frac{v_{mm}}{v_m} + l_{mm}$$

$$= R_a(R_a - P_a)(T-l) - l_m R_a + l_{mm},$$

where R_a and P_a is absolute risk aversion and absolute prudence, defined as

$$R_a = -\frac{v_{mm}}{v_m}, P_a = -\frac{v_{mmm}}{v_{mm}}.$$

This implies

(a4) $$\frac{\partial P}{\partial a} = \pi w(1 + R_a(a, aT + m)) + \frac{1}{2}[R_a(R_a - P_a)(T-l) - l_m R_a + l_{mm}]\pi(aw + e)^2.$$

Define labour supply as $L \equiv T - l$. From this identity, $L_m = -l_m$ and $L_{mm} = -l_{mm}$.

Substituting these into (a4) gives

(a5) $$\frac{\partial P}{\partial a} = \pi w(1 + R_a(aw + e)) + \frac{1}{2}[R_a(R_a - P_a)L + L_m R_a - L_{mm}]\pi(aw + e)^2.$$

The term $R_a(R_a - P_a)L$ is the income effect connected to the wage increase. Furthermore, note that $R_a(R_a - P_a)L = \frac{\partial R_a}{\partial m}L$. It is reasonable to assume that absolute risk aversion decreases in income. Under this assumption: $\frac{\partial R_a}{\partial m}L < 0$. Moreover, $L_m < 0$ given that leisure is a normal good. Finally, it is reasonable to assume that $L_{mm} > 0$ because the marginal demand for leisure declines when leisure reaches the time limit T.[30] To sum up, the second term in (a5) is negative. Because the second term, however, is a second-order effect it is likely that it will be dominated by the first term in (a5), which leads to the conclusion that $\frac{\partial P}{\partial a}$ is most likely positive.

[30] This, however, does not rule out the possibility that L_{mm} in some segments between zero and T is less than zero.

Appendix 2: Description of explanatory variables

Public waiting lists

There are several alternatives that can be used as instruments for the importance of waiting lists on treatment insurance ownership. Besley et al. (1999) use both spending measures and waiting list measures and find that only long-term waiting lists are significant. I have access to waiting list data at the county level, but not spending data. Two waiting list measures are used. The first is the number of referrals as a percentage of county population given that the referrals pended more than three months. This quantity will grow when the number of new referrals exceeds the number of completed cases and will therefore reflect changes in both supply and demand factors. Whatever the reason, whenever private treatment insurance implies faster treatment within an acceptable distance from the place of residence, one should expect feeding effects from pending referrals to treatment insurance purchases. The other measure is the mean waiting time in days for completed referrals given that it has pended for at least 90 days. The last measure captures the severity of completed waiting spells. Table A2. 1 shows descriptive statistics for these two variables.

Table A2. 1. Waiting list variables: mean over the period 1998–2001

Variable	Mean	Std Dev	Max	Min
Fraction of referrals pending more than three months as a percentage of county population	9.427	2.372	13.81	5.561
Mean waiting time in days for completed referrals: pended for at least 90 days	665.9	56.51	764.2	487.5

Age and smoking habits

I include both smoking habit and age category in the regressions below. The age information available here is divided into the following categories: 30–35, 36–40, 41–45, 46–50 and 51–54. These categories are represented through dummies, where the 30–35 category is used as the reference category. Moreover, a dummy for permanent smokers and for sporadic smokers are included. Non-smokers are the reference group.

Personal characteristics

As shown in the theoretical section, individual income is expected to affect the decision to insure. Besley et al. (1999) show that under mild assumptions one would expect sorting into private treatment insurance by income. I define three income categories. The lowest income category is from zero to 300 000 kroner, the middle-income category ranges from 300 000 to 600 000, and the high income category is defined as individuals with an annual income higher than 600 000. I introduce a dummy for the middle and high-income group leaving the low-income group as a reference.

Occupational characteristics and education

Characteristics that might reveal information about underlying firm characteristics are captured by three dummy variables. First, a dummy for blue-collar workers that takes the value of one if occupation "blue collar" is observed. Second, I construct a similar dummy for the self-employed. The reference category is white-collar respondents. Third, I define a dummy that represents university education. Finally, a dummy that takes the value 1 if a male is observed represents the gender effect.

Appendix 3: Estimation of the latent model given in equation (8)

Free variance and price parameter set equal to 1

Recall that equation (8) was given by $U^* = -P + \beta' X + \varepsilon^*$. Recall also that the responses were ordered as follows: "Highly likely" (HL), "Likely" (L), "Unlikely" (UL), and "Not likely at all" (NL). These responses can be denoted by $y \in (NL, UL, L, HL)$.

The response probabilities can be written as

$$P(y = NL) = P(U^* < t_1) = P(\varepsilon^* < t_1 + P - \beta' X) = \Phi(\frac{t_1 + P - \beta' X}{\sigma}),$$

$$P(y = UL) = P(t_2 > U^* > t_1) = P(t_1 + P - \beta' X \le \varepsilon^* < t_2 + P - \beta' X) = \Phi(\frac{t_1 + P - \beta' X}{\sigma}) - \Phi(\frac{t_2 + P - \beta' X}{\sigma}),$$

$$P(y = L) = P(t_3 > U^* > t_2) = P(t_2 + P - \beta' X \le \varepsilon^* < t_3 + \varkappa P - \beta' X) = \Phi(\frac{t_2 + P - \beta' X}{\sigma}) - \Phi(\frac{t_3 + P - \beta' X}{\sigma}),$$

$$P(y = HL) = P(U^* > t_3) = P(\varepsilon^* \ge t_3 + P - \beta' X) = 1 - \Phi(\frac{t_3 + P - \beta' X}{\sigma}).$$

These probabilities lead to the likelihood function

$$L(\beta, \sigma, t_1, t_2, t_3) = \prod_{i=1}^{n} \{\Phi[\frac{P_i + t_1 - \beta' X]}{\sigma}\}^{y_1} \{\Phi[\frac{P_i + t_2 - v}{\sigma}] - \Phi[\frac{P_i + t_1 - \beta' X]}{\sigma}\}^{y_2} \{\Phi[\frac{P_i + t_3 - \beta' X}{\sigma}] - \Phi[\frac{P_i + t_2 - \beta' X}{\sigma}]\}^{y_3} \{1 - \Phi[\frac{P_i + t_3 - \beta' X}{\sigma}]\}^{y_4},$$

where $y_k, k = 1,2,3,4$ takes the value 1 if the response is in category k and zero otherwise. The maximum likelihood estimates of the model with no age dummies are given in the table below. If one divides the parameter estimates by the estimated $\hat{\sigma}$, it is easy to verify that these are exactly equal to the results obtained in column 3 of Table 5.

Table A3.1 Model equivalent to model in third column in Table 5, but with fixed price parameter instead of fixed variance. Ordered probit estimation of stated likelihood of buying treatment insurance for a given price.

	Parameter estimates for model with fixed price parameter (set to 1) and freely estimated σ . No age dummies.
Intercept 1	–.402**
	(.194)
Intercept 2	0.04969
	(.143)
Intercept 3	0.566***
	(.162)
Referrals pending more than three months: fraction of county population	0.001953
	(.005)
Days from referral to treatment: pended more than 90 days (mean within each county)	0.000024
	(.000)
Male	–0.00305
	(.022)
Smoker	0.087***
	(.028)
Sporadic smoker	0.05016
	(.036)
University education	–.076***
	(.028)
Middle income	0.02001
	(.039)
High income	0.113**
	(.052)
Highest income	0.255***
	(.087)
Blue collar	0.03367
	(.029)

Self employed	0.120***
	(.044)
$\hat{\sigma}$	0.349***
	(.079)
Log likelihood	–1456.2

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