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under public insurance captivity***

by

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Provision of Private Health Insurance under Public Insurance Captivity

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Abstract

We lay out a model where private firms offer health insurance contracts, taking into account that individuals often are entitled to use the public provider and will enjoy double insurance. In addition to engage in risk selection, firms have in equilibrium incentives to engage in service selection: they design a contracts that attracts consumers selectively to certain (high margin) health care services. We relate the profitability to the the firm from contracting with consumers with the probability of observing a purchase. Profitability depends on consumers' wealth and health characteristics. We structurally estimate the model and test the model and we find strong support for its implications.

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1 Introduction

The analysis of health care services and health insurance has been intense since the seminal contribution by Grossman (72), where the household demand for health related inputs is analyzed in a partial equilibrium framework. Service supply is taken as given, and health status is modeled as a productive asset. The quality of the health asset increases the Present Discounted Value of the future income stream. This theoretical framework has been extended in subsequent research, among others by Dardanoni and Wagstaff (87), Selden (93) and Chang (96).

A common feature of these studies is that they do not explicitly consider the structure the industry and in particular composition of service supply. They do not spell out the implications of having a public provider of services interacting with one or several private providers, an industry configuration often relevant in health care markets. A second and very related literature tackles the issue of mixed composition of private and public firms in the industry. This literature is based on the mixed oligopoly in the provision of care and is intended to refer more generally than to the health sector¹. Important exponents of this literature are De Farja and Del Bono (89) and Cremer and Thisse (91).

This strand of work is complementary to the previous one. It studies the industrial organization of health services supply, with emphasis on the presence of the public sector, that vertically integrates into provision. Private suppliers choose whether to enter and the quality of the service they offer. The public provider chooses the quality provided. There is vertical differentiation among suppliers. Importantly, the public player is not a profit maximizer, but a welfare maximizer. This fact has the robust implication of increasing welfare under the presence of a public provider.

Although the mixed oligopoly literature is an important supply side complement to the demand side literature started by Grossman, there are a number of assumptions that make the work on mixed oligopoly somewhat restrictive to address certain theoretical and empirical issues.

1. Uncertainty. Strictly speaking, the mixed oligopoly models that have been laid out to study health care markets are models where there is not uncertainty. Consumers select the quality of service when they choose a provider, but they are never purchasing insurance, since there

¹An specific application to the health sector is Jofre (97).

is not scope for it. Yet, a central characteristic of health care markets is the fact that suppliers sell a contract that offers both service quality and insurance. It is unclear that models without explicit uncertainty in health shocks to consumers can capture the main relevant forces in these markets.

2. Incentives. Since they are based on models of perfect information it becomes unclear why a regulator cannot impose restrictions on the quality provided by the private firms, in order to achieve the social first best.
3. Consumer heterogeneity. Consumers are heterogeneous in income levels. The private provider engages in cream-skimming: it offers a health care contract that is bought only by the richest consumers. Yet there is strong evidence about the risk heterogeneity of consumers: they differ in their likelihood of suffering health shocks and therefore in their profitability as clients, from the point of view of the provider.
4. Consumers' discrimination. Mixed oligopoly models assume that firms can offer only one contract. They cannot discriminate among heterogeneous consumers. This is an extreme assumption that is rarely verified in reality. Firms can offer a large number of different health insurance contracts.
5. Double insurance and Service Selection. Related to the previous point, given the unidimensionality of the service provided these class of models do not allow for the possibility of what has been termed service selection (Pellisé (95)). Private providers often recognize that their clients still have access to the public provider. If the vector of relevant services is multidimensional, private providers can design contracts that attract consumers selectively. The consumer that contracts with the private firm uses the contract for one of the services only, but remains with the public provider for the other services.

In summary, mixed oligopoly models are a valuable avenue to address the problem of how to optimally organize health care provision, but it does face serious limitations. Moreover, there has not been so far an empirical implementation of these models, so it is not clear how much they contribute to explain observations.

In this paper we lay out a model that takes into account the points listed above and that at the same time is analytically tractable and that yields empirical implications that are readily testable. We build a model where consumers are heterogeneous in many respects, like wealth, risk aversion, the state of health and the probability of suffering different types of health reducing shocks. Firms can engage in second-degree price discrimination. They can distinguish a number of consumer's characteristics and offer contracts that depend on these observable characteristics. Firms take into account the existence of a public provider that offers exogenously given² levels of service qualities and insurance. In particular, firms sell a contract that specifies two different services, that we call treatments. Treatments are services that reduce the damage of health shocks, that can be of two types (mild, or type-1 and hard, or type-2). The firms can engage in service selection strategies. This means that they can offer contracts that deliver high quality treatment for one type of shock but low quality treatment for the other kind of shock. This service selection strategies are aimed at inducing consumers to use the public provider for services that yield a low profit margin to the firm. The model has direct implications on the (measurable) probability of a consumer contracting with a private provider, conditioned on consumer's covariates. Moreover, it has implications on the probability that the consumer uses a provider for certain services, given that he has contracted with the provider for comprehensive medical insurance. Our results are indicative of existence of risk selection and service selection.

Similarly to the models of mixed oligopoly we assume that there is not asymmetric information between consumers and firms, and that the latter make offers to consumers. We solve for the optimal strategies of the firm as a function of consumers' characteristics. We relate the profitability from serving a consumer at the optimal contract with the probability of observing that the consumer purchases a private contract in the sample. We are able to test the positive implications of the model with the Spanish National health Service.

In relation with the empirical papers that have measured the demand for private insurance, ours is relatively most related with Propper (93) and with Pellisé (95). Propper (93) models the purchase of private health insurance as a discrete choice that is the result of two hurdle conditions being satisfied

²Quality of service by the public provider should be thought of as exogenous to private firms, since the former is not a strategic player and profits are not in his agenda.

simultaneously. She estimates the model with data from the U.K.. Central to this model is the captivity condition of the consumer. In particular, consumers might be obliged to participate at the private contract. This is found to affect nonlinearly the total utility of purchasing a private contract.

Pellis  (95) (in particular chapter 3) analyzes the consequences of extending an experiment in managed competition in Spain to other sectors of the population. Subjects in this experiment are public servants, that are given rights to choose (without additional cost) among the public provider and a set of private providers of health care. Pellis  (95) models private firms' incentives to develop a portfolio of clients and shows that the market equilibrium produces *risk selection*: firms tend to select individuals according to an estimate of the expenditures they will generate ex post. She then looks at the evidence from a sample of public servants but she finds that the existence of risk selection is difficult to verify. An important limitation to prove the relevance of incentives to engage in risk selection is the fact that a sizeable share of individuals in the sample actually enjoy double insurance. Double insurance, she claims, might be used by private carriers to induce clients to use the public provider selectively, in particular for services that are relatively onerous. To this effect of selective utilization she refers as *service selection*. Pellis  (95) analyzes the demand for private carriers and compares it to individuals that are not captive: non-public servants that are not given the right to choose provider and that need to pay the standard insurance prime in order to access the private provider. Our contribution is complementary to that of Pellis  (95) in that we provide a formal framework where the notions of risk selection and particularly service selection are further formalized.

The rest of the paper is organized as follows. Section 2 gives a short description of the institutional background in Spain. Sections 3 and 4 lay out the assumptions and derive the analytical results respectively. Section 5 lists the testable implications of the model. Section 6 describes the sample and section 7 shows and interprets econometric results. Section 8 closes the paper with policy implications and concluding remarks.

2 The Model

We consider a setting with a number of firms³ and a large number of consumers. Consumers' characteristics are observable and the firm can engage in third-degree price discrimination. Consumers have utility from income (I), but the utility (U) from income increases with the level of health of the individual, $\widetilde{H}_1$, that is random. U exhibits risk aversion according to a negative exponential function:

$$U(I, \widetilde{H}_1) = -\exp(-\beta I - \alpha \widetilde{H}_1)$$

Consumers are subject to health shock $\tilde{\varepsilon}$, that can be of two types: small health shocks ($\tilde{\varepsilon} = \varepsilon_1$) or large (hospitalization) shocks, ($\tilde{\varepsilon} = \varepsilon_2$). The probability distribution of health shocks is the following. With probability λ_0 there is no health shock ($\tilde{\varepsilon} = \varepsilon_0 = 0$). With probability λ_1 , $\tilde{\varepsilon} = \varepsilon_1$ and with probability λ_2 , $\tilde{\varepsilon} = \varepsilon_2$. We have: $0 < \varepsilon_1 < \varepsilon_2$.

Consumers maximize expected utility $(E[U(I, \widetilde{H}_1)])$. In order to reduce the desutility from health shocks consumers can profit from a treatment. A treatment is defined by the vector $\tau = (\tau_1, \tau_2)$, where τ_i is a factor that dampens the effect of shock i on the stock of health ($0 < \tau_i < 1$). The smaller τ_i the larger the quality of the treatment, that is defined as $(1 - \tau_i)$. Under treatment τ health evolves according to

$$H_1 = \delta H_0 - \tau_i \varepsilon_i \quad \text{with probability } \lambda_i$$

where H_0 is the initial stock of health and δ is a "depreciation" factor.

Treatments can be acquired through contracts, $\theta = (q, \tau)$, where q is the monetary cost (to the consumer) of treatment τ . There is an available public contract, $\theta^s = (q^s, \tau^s)$. We say that a consumer is *captive* (to θ^s) if it is mandatory to him to pay q^s . If a consumer is captive the treatment is available to him, but he is not forced to use it.

The private firm can offer a contract $\theta^p = (q^p, \tau^p)$ to the consumer. There is a cost $c(\tau)$ of providing a contract, that depends on the quality $(1 - \tau_i)$ of the treatment. The total cost of delivering treatment τ is:

$$c(\tau) = f_1(1 - \tau_1) + f_2(1 - \tau_2)$$

³We don't need to be specific about the exact number of firms. There is no asymmetric information and firms practice second-degree price discrimination. Firms offer the optimal contract (the one that maximizes the joint surplus of the firm and the consumer). The extent of competition will change the bargaining power of these agents, changing the terms of trade, but not the contract characteristics.

where f_i is the marginal fixed cost of quality in treatment i .

The timing is the following. At $t = 1$, the firm offers a contract to the consumer. At $t = 2$ the latter either accepts or rejects. At $t = 3$ the consumer learns the health shock $\tilde{\epsilon}$. At $t = 4$ the consumer decides which treatment to use (if one is needed).

3 The Optimal Contract

To solve for the optimal contract we start from the last period, $t = 4$. At the last period individuals have already learnt the realization of $\tilde{\epsilon}$. If they did not have insurance ex ante, they suffer the whole reduction in the level of health. If they had one provider available, they use it. If they have access to two or more providers, they use that one with the highest quality (the lowest τ) for that kind of shock.

At $t = 2$ in equilibrium all offers are accepted. We need to know the willingness to pay of a consumer for a private contract. This will depend crucially on his relation to the public system and on his wealth and health characteristics. The state where the firm designs the contract is $t = 2$. The firm has incentives to discriminate against consumers with lower wealth, since they are less able to pay for the contract. Moreover, the firm does not react equally to health characteristics that are indicators of mild health shocks and of large health shocks, since it affects the expected profitability they will extract from the consumer. We derive conditions under which the firm designs contracts that are apparently comprehensive but that will actually be used only for certain types of treatments. The firm will engage in this form of *service selection* the lower is the profit margin it expects to extract from the consumer.

3.1 Utilization decision ($t = 4$):

Consider a consumer that has access to a given contract θ^o and is considering whether to purchase a private insurance contract θ^p . If the consumer has access to these two insurance contracts, the utilization decision (upon a type- i health shock occurring) is simply to choose the treatment that maximizes quality (minimum τ_i). In other words: upon shock i occurring, choose treatment τ_i^p if and only if $\tau_i^p \leq \tau_i^o$.

We will interpret θ^o as the regime the consumer is in when she gets θ^p offered by the firm. Consumers' regimes are:

- $\theta^o = (q^s, \tau_1^s, \tau_2^s)$ (CAPTIVITY): the consumer is required to pay q^s to the public provider and it has access to treatment quality (τ_1^s, τ_2^s) .
- $\theta^o = (q^s, \min(\tau_1^m, \tau_1^s), \min(\tau_2^m, \tau_2^s))$ (SEMI-CAPTIVITY): the consumer is forced to pay q^s to the public sector but is allowed to choose a carrier from a set that includes private providers plus the public provider.
- $\theta^o = (0, 1, 1)$ (NO CAPTIVITY): the consumer is not entitled to pay q^s but does not have access to any treatment.

The utilization decision implies a discontinuity in the profit function of the private firm. For treatment qualities lower than the public quality, the utilization decision of the consumer is discontinuous, and so it is the willingness to pay function. When the firm deviates from the public contract, for instance, in a direction that increases the quality of treatment 1 ($\tau_1^p < \tau_1^s$) but decreases the quality of treatment 2 ($\tau_2^p < \tau_2^s$), the consumer that purchases the private contract will only use it for purposes of treatment 1. The relevant marginal benefit to the firm with respect to treatment 2 is the marginal cost f_i , since there are no revenues associated.

The point is that the consumer might acquire the private contract in order to use it only for one of the treatments, but never for the other. This will give incentives (under certain parameter values) to the firm for "selecting risks": designing a policy that seems comprehensive but that directs the consumer to the public provider for some treatments.

3.2 Consumer's decision to accept a private contract ($t = 2$):

For a consumer that is locked into contract θ^o , the expected utility upon acquiring θ^p is:

$$V(\theta^p, \theta^o) = \lambda_o \left(-e^{-\alpha\delta H_1 - \beta(w - q^o - q^p)} \right) \\ + \lambda_1 \left(-e^{-\alpha\delta(H_1 - \min(\tau_1^p, \tau_1^o)\varepsilon_1) - \beta(w - q^o - q^p)} \right) + \lambda_2 \left(-e^{-\alpha\delta(H_1 - \min(\tau_2^p, \tau_2^o)\varepsilon_2) - \beta(w - q^o - q^p)} \right)$$

since the consumer cannot forfeit the public price q^o . Notice that if the consumer is not locked into any contract then simply $q^o = 0$ and $\tau = (1, 1)$. The following notation will be useful:

$$x_i(\tau_i) \equiv e^{\alpha \varepsilon_i \tau_i} \quad y(q) \equiv e^{\beta q} \quad R_o \equiv -e^{-\alpha \delta H_1 - \beta(w)}$$

We can express the expected utility from purchasing and not purchasing the private contract respectively as:

$$\begin{aligned} V(\theta^p, \theta^o) &= \\ &= y(q^o) y(q^p) R_o [\lambda_o + \lambda_1 \min(x_1(\tau_1^p), x_1(\tau_1^o)) + \lambda_2 \min(x_2(\tau_2^p), x_2(\tau_2^o))] \end{aligned}$$

$$V(\theta^o) = y(q^o) R_o [\lambda_o + \lambda_1 x_1(\tau_1^o) + \lambda_2 x_2(\tau_2^o)]$$

This allows us to find the willingness to pay $\bar{q}^p$ by the captive consumer for a private contract that offers treatment quality (τ_1^p, τ_2^p) . In particular, $\bar{q}^p(\tau_1^p, \tau_2^p)$ is the solution to: $V((q^p, \tau^p), \theta^o) = V(\theta^o)$ what is given by:

$$\bar{q}^p(\theta^o, \tau_1^p, \tau_2^p) \equiv \frac{1}{\beta} \ln \left[\frac{\lambda_o + \lambda_1 x_1(\tau_1^o) + \lambda_2 x_2(\tau_2^o)}{\lambda_o + \lambda_1 \min(x_1(\tau_1^p), x_1(\tau_1^o)) + \lambda_2 \min(x_2(\tau_2^p), x_2(\tau_2^o))} \right] \quad (1)$$

So in particular if $\tau_1^p \geq \tau_1^o$ and $\tau_2^p \geq \tau_2^o$ the willingness to pay is zero.

It is clear from (1) that demand for a contract decreases with the degree of monetary risk aversion β^4 . This is because as β increases, the marginal utility of income is large and it is relatively more costly to invest in the contract. The effect of changes in aversion to health shocks on demand is on the other hand ambiguous and it depends on parameters' values. Other characteristics of the demand for the contract are:

Remark 1 *The willingness to pay for θ^p increases with the quality of any of the private treatments, at a decreasing rate.*

Remark 2 *Demand for quality of τ_i is complementary to quality of τ_j .*

This is clear since: $\frac{\partial \bar{q}^p(\tau_1^p, \tau_2^p)}{\partial \tau_i} > 0$, $\frac{\partial^2 \bar{q}^p(\tau_1^p, \tau_2^p)}{\partial \tau_i^2} < 0$ and $\frac{\partial^2 \bar{q}^p(\tau_1^p, \tau_2^p)}{\partial \tau_i \partial \tau_j} > 0$.

Finlay, regarding the acceptance decision at $t = 2$:

⁴In the empirical section we will use wealth related variables to proxy for β .

Remark 3 *The consumer will purchase θ^p if and only if $\bar{q}^p(\theta^o, \tau_1^p, \tau_2^p) \geq q^p$.*

At $t = 2$ the firm offers a contract to the consumer only if expected profits from acceptance are nonnegative. Since the firm has bargaining power consumers are made indifferent between accepting and rejecting offers.

3.3 The optimal contract offered ($t = 1$) :

The firm's program is to maximize expected profits subject to the consumer's participation constraint. The firm optimizes in a neighborhood of the public contract $\theta^s = (q^s, \tau_1^s, \tau_2^s)$:

$$\max_{\tau_1, \tau_2} \frac{1}{\beta} \ln \left[\frac{\lambda_o + \lambda_1 x_1(\tau_1^o) + \lambda_2 x_2(\tau_2^o)}{\lambda_o + \lambda_1 \min(x_1(\tau_1^p), x_1(\tau_1^o)) + \lambda_2 \min(x_2(\tau_2^p), x_2(\tau_2^o))} \right] - f_1 - f_2 \quad (2)$$

$$\text{subject to: } \sqrt{(\tau_1^p - \tau_1^s)^2 + (\tau_2^p - \tau_2^s)^2} = 1$$

From (2) it is clear that:

Remark 4 *Firm's profits are higher the lower the quality of the treatment available to the consumer, since $(\partial \pi / \partial \tau_i^o) > 0$.*

A consumer not entitled to a treatment ($\tau_i^o = 1$) will have higher willingness to pay than a consumer entitled to the public treatment ($\tau_i^o = \tau_i^s < 1$), who in turn will have higher demand than the semi-captive consumer with rights to choose ($\tau_i^o = \min(\tau_i^s, \tau_i^m) \leq \tau_i^s$).

In order to analyze the strategies of the firm we consider private contracts with qualities that are in the neighborhood of the qualities offered by the public contract⁵. In particular we restrict private contracts to deliver qualities that are at a maximum distance from the qualities of the public contract.

⁵We considered local deviations in order to simplify the exposition of the results. It is important to point out that global optima have the same implications than the local optima (the program is globally concave). Results would be qualitatively identical with interior solutions, but the exposition would be somewhat more cumbersome.

We normalize that distance to be one. With this restriction we find the optimal contract as a function of the parameters $(\beta, \alpha, \lambda_1, \lambda_2, \tau_1^s, \tau_2^s, f_1, f_2, \varepsilon_1, \varepsilon_2)$ and we analyze how the optimal private contract changes with changes on the parameters. We focus mainly on the effect of increases in the degree of monetary risk aversion β (that we interpret as decreases in wealth), the cost of the treatment to the consumer (ν_1, ν_2, f_1, f_2) and the kind of contract available to the consumer (τ_1^o, τ_2^o) .

Consider in the first place deviations from the public contract in directions that improve the quality of both treatments: $l_1 \equiv \tau_1^p - \tau_1^o < 0$ and $l_2 \equiv \tau_2^p - \tau_2^o < 0$. The gradient of the profit function evaluated at the public contract is:

$$\begin{pmatrix} \pi_1 \\ \pi_2 \end{pmatrix} \equiv \begin{pmatrix} \frac{\partial \pi}{\partial \tau_1^p} \\ \frac{\partial \pi}{\partial \tau_2^p} \end{pmatrix} = \begin{pmatrix} \frac{\lambda_1 \alpha \varepsilon_1 e^{\alpha \varepsilon_1 \tau_1^o}}{\beta(\lambda_o + \lambda_1 x_1^o + \lambda_2 x_2^o)} - f_1 \\ \frac{\lambda_2 \alpha \varepsilon_2 e^{\alpha \varepsilon_2 \tau_2^o}}{\beta(\lambda_o + \lambda_1 x_1^o + \lambda_2 x_2^o)} - f_2 \end{pmatrix}$$

and the profits from a contract that deviates in the direction of the gradient:

$$\pi(l_1, l_2) = \left(\frac{\partial \pi}{\partial \tau_1^p} \right) l_1 + \left(\frac{\partial \pi}{\partial \tau_2^p} \right) l_2 \equiv \pi_1 l_1 + \pi_2 l_2 = \sqrt{\pi_1^2 + \pi_2^2} \quad (3)$$

3.4 Effect of higher wealth

From (3) we can show a result that will be useful for the empirical section:

Remark 5 *Profits from a contract increase with the wealth of the consumer: $\partial \pi / \partial \beta < 0$.*

This is clear since:

$$\begin{aligned} \partial \pi / \partial \beta &= \frac{\pi_1 (\partial \pi_1 / \partial \beta) + \pi_2 (\partial \pi_2 / \partial \beta)}{\pi} \\ \partial \pi_i / \partial \beta &= \left(\frac{-1}{\beta} \right) (\pi_i + f_i) < 0 \quad i = 1, 2 \end{aligned}$$

This is not surprising since wealth increases the demand for qualities of both treatments.

3.5 Effect of health characteristics

The health characteristics of the consumer affect the relative qualities of the contract offered. Higher probability of type 1 shock will bias the contract towards improving treatment 1 relatively to treatment 2. In that sense the private contract complements the public one since the former is better tailored to the needs of the consumer.

Remark 6 *Increases in the probability of a type- i shock (keeping λ_1 fixed) increases (decreases) the quality of treatment i (treatment j).*

This is clear since:

$$\begin{aligned}\frac{\partial \pi_i}{\partial \lambda_i} &= \frac{\alpha \varepsilon_i \beta x_i^s (\lambda_o + \lambda_i + \lambda_j x_j^s)}{\beta^2 (\lambda_o + \lambda_1 x_1^s + \lambda_2 x_2^s)^2} > 0 \\ \frac{\partial \pi_j}{\partial \lambda_i} &= -\frac{\alpha \varepsilon_j x_j^s (x_i^s - 1) \lambda_i}{\beta (\lambda_o + \lambda_1 x_1^s + \lambda_2 x_2^s)^2} < 0\end{aligned}\tag{4}$$

This last remark is important because it has implications on patterns of utilization of the insurance carrier. For instance, a high λ_1 captive consumer, provided she has enough wealth, will be given rights to a high quality type-1 treatment and a low quality type-2 treatment. But if the type-2 shock actually occurs, then she will use the public carrier instead of the private one.

The total effect of changes in consumer's health characteristics on profits are ambiguous, since the sum of the two partial derivatives in (4) can have a negative sign if the first term $\left(\frac{\partial \pi_i}{\partial \lambda_i}\right)$ is negative. The model has few implications on the profitability from costumers depending on their health characteristics. It tells us nevertheless that if marginal variable cost of treatment 2 relatively to treatment 1 is very large, we should expect to see little entry in the market of treatment 2 quality by the private providers.

3.6 Effects of the marginal cost of quality

The effect of changes in the marginal cost of providing quality is clear from (3).

Remark 7 *Everything else given, the firm specializes more in a treatment quality the cheaper it is to increase quality.*

Moreover, the firm might prefer to deviate from (τ_1^s, τ_2^s) in directions such that the quality of one of the treatments is lower. For instance, deviations such that $\tau_i^p > \tau_i^s$ imply that the consumer will not use τ_i^p . Therefore the partial derivative of profits in such direction is just the marginal fixed cost, f_i . The following remark point to the condition for service selection to exist. Service selection means simply that the provider specializes in high margin services, and "exits" other services, although the insurance contract is apparently comprehensive.

Remark 8 *If the marginal fixed cost (f_i) of increasing quality of treatment τ_i^p is sufficiently high ($f_i > \pi_i$), the firm will offer a contract such that $\tau_i^p > \tau_i^s$ and the treatment τ_i^p is not used.*

3.7 Effect of changes in the aversion to health shocks

We interpret the parameter of aversion to health shocks a as an index of consumers' age and overall state of health. The effect of aging (increase in a) on the profits of the firm from the contract, evaluated at the public provider contract, is positive. This is due to the effect of increased demand for treatment quality by the consumer.

Remark 9 *The derivative of firm profits with respect to aversion to health shocks, evaluated at the public contract quality levels is positive.*

taking derivatives in (3) at $l_1 = 0$ $l_2 = 0$, and simplifying, we get:

$$\begin{aligned} \frac{\partial \pi(\tau = \tau^s)}{\partial \alpha} &= \frac{\partial \pi_1(\tau = \tau^s)}{\partial \alpha} + \frac{\partial \pi_2(\tau = \tau^s)}{\partial \alpha} \\ &= \frac{(\varepsilon_1 \lambda_1 x_1^s + \varepsilon_2 \lambda_2 x_2^s) d + \lambda_1 \lambda_2 x_1^s x_2^s \tau^s (\varepsilon_1 - \varepsilon_2)^2}{\beta d^2} > 0 \end{aligned}$$

which is always positive and where $d \equiv \lambda_o + \lambda_1 x_1^s + \lambda_2 x_2^s$.

4 Empirical Implications

4.1 Implications on the probability to purchase a contract

The model above points to the determinants of profitability in the market for health insurance. We show now relate the theoretical model with the observed data. The sample is described below in the following section. The main characteristic that we have to take into account is that given consumer's covariates, observing whether private insurance was purchased is a random variable. In order to bridge this gap we assume that the probability of observing an individual contracting with a private provider should be positively related⁶ to the profitability of supplying to that consumer.

Let y_i be one if individual i is observed to purchase private insurance (and zero otherwise). Let $\mathbf{z}_i$ be observed covariates for i that proxy the variables in the model Then:

$$\Pr(y_i = 1 | \mathbf{z}_i) = \Phi(\pi(\theta^o, \beta, \alpha, \lambda_1, \lambda_2, h_1, h_2))$$

From this relation and the remarks above we have the following restrictions on the equation that predicts the probability of a consumer with covariates $\mathbf{z}_i$ purchasing the private contract.

1. Being a captive consumer should reduce the probability of observing purchase of the private contract, *caeteris paribus*.
2. Being a semi-captive consumer should decrease the probability of purchase, to a greater extent than being a captive consumer.
3. Being a consumer free of public captivity should increase the probability of purchase, relative to the captive or semi captive consumers.
4. Proxies positively related to wealth and social status should be positively related with the probability of purchase

⁶Firms' profits and probabilities of observing a contract should be related through a monotonic, increasing transformation. The rational is simply that firms are able to detect high margin consumers by directing marketing campaigns, but detection has random errors.

5. Proxies related to aversion to health risks (like aging and pregnancy) should have a positive effect on the probability of purchasing the private contract.
6. Proxies positively related to the marginal cost of providing health care should be negatively affected with the probability of observing the private contract.

We do not have a prediction of the effect of the shock probabilities on the contracting decision, since as the model shows, the effect is ambiguous.

4.2 Implications on the probability to use the private contract by captive consumers.

Now consider the case of a *captive* consumer that has purchased private insurance, is and does get a type- j health shock. The decision to use the private provider depends on the difference $(\tau_j^s - \tau_j^p)$. This will depend on two things: the quality composition of the contract (l_j/l_i) and the norm of the gradient of the profit function at the public contract ($|\nabla\pi|$). From (4) we know that the quality composition depends on λ_j . In particular increases in λ_j increase l_j/l_i . The norm of the gradient is:

$$|\nabla\pi(\tau = \tau^s)| = \sqrt{(\pi_1^s)^2 + (\pi_2^s)^2}$$

that is equal to the realized profits in (3).

From this we have the following predictions: for the subsample of employees that have ex post access to the public and private treatments and that do get a type- j health shock:

1. The probability of actually using the private contract for treatment j should be positively related to the (estimated) ex ante probability of getting the shock.
2. The utilization probability should be positively related to the (measured) profitability of the contract for the firm.

The following section implement econometrically our hypothesis.

5 Data Characteristics

The Spanish National Health Survey⁷ of 1993 is a random sample of 18751 adult individuals. The survey is based on hour long interviews with individuals in a given location. Questions belong to three broad categories: i) they are asked about their perceived state of health whether they suffer from chronic diseases, etc. ii) They are asked about the providers of care they have access to and their exact actual utilization. iii) Finally the interviewers gather information about life habits and personal characteristics of the interviewed.

From this large set of questions we have selected a number of variables and constructed our data covariates⁸. In addition to these variables, some cross products of the variables are used in the regressions.

Geographical information:

- RICH: Dummy variable equal to one if the individual is in a province with income per head above the national average.
- CITYSIZE: Discrete variable (from 1 to 7). Classifies city of residence by size.

State of health

- HEALTH-*i*: Five discrete dummy variables (1 to 5). Classify individuals according to their self-perceived health status, from better to worse.
- CHRONIC: dummy variable. Indicates that an individual suffers from any chronic disease..
- SMOKER: Dummy variable. Indicates that the individual smokes at least ten cigarettes daily
- QUA-SMOKER: Indicates that the individual smokes between three and ten cigarettes daily.
- KG/CM: Is defined the kilograms of weight per centimeter of height.

⁷*Encuesta Nacional de Salud 1993*. The methodology and exact variable definition is described in Ministerio de Sanidad y Consumo (1993), cited below.

⁸See the appendix for exact data construction.

- EXER- i : set of 4 dummy variables. Indicate from least to most the level of physical exercise the individual practices usually
- OBES- i Five dummy variables indicating if body weight .of the individual is below ($i = 1$) or above ($i = 5$) normal. OBES-3 indicates self-perceived normal weight.
- SHOCK1: Dummy variable. Equals one if the individual had a health problem important enough to make him change his normal life style but that did not require hospitalization.
- SHOCK2: Equals one if the health shock implied hospitalization.

Relationship with the public provider:

- CAPTIVE: Equals one if the individual is forced to contribute to the social security and is entitled to use, only, the public provider of health care. Equals zero otherwise.
- SEMI-CAPTIVE: Equals one if the individual is forced to contribute to the social security but he has the right to choose among a set of providers, one of them being the social security. The set includes a portfolio of private carriers⁹. Equals zero otherwise.
- NOT-CAPTIVE: It is one the individual is not required to contribute to public system but also is not entitled to its use.

Ex post utilization:

- UTSHOCK1: Dummy equal to one if, given SHOCK1 equal to one, the individual uses a private carrier.
- UTSHOCK2: Dummy equal to one if, given SHOCK2 equal to one, the individual uses a private carrier when hospitalized.

Individuals' covariates:

- AGE (in years)

⁹This corresponds to the contractual setting of public servants in Spain, often referred to as *MUFACE*.

- GENDER: (1 for female)
- STUDIES- i : Set of five dummy variables ($i = 1...5$) According to level of studies (STUDIES-5 $\rightarrow$ university level).
- WORKSIT- i : Work situation of the individual. Eight dummy variables ($i = 1...8$). Classifies individuals according to groups related mainly to their situation in respect to the labor market. (see the appendix and the section *Empirical Results*).
- STATUS LOW: . Social status. Dummy variable if individual belongs to a lower income group.
- SOLO: Dummy. Indicates that the individual lives alone.

6 Estimation Results

In order to test the implications listed above we follow a three stage procedure.

1. Health equation

In the first place we model the probability of observing a recent type-1 or type-2 (hospitalization) shock, as defined above. We use stationary characteristics of the individual. From this equation we obtain estimates of the probability of the individual having a type- i shock at the time the contract decision could be taken. Call $\hat{\lambda}_{1i}$ and $\hat{\lambda}_{2i}$ to these estimates.

2. Purchase of private contract equation

We model the probability of observing purchase of a private contract, that we relate to the theoretical profitability associated to the consumer. We use the measured variables $\hat{\lambda}_{1i}$ and $\hat{\lambda}_{2i}$ as input in this equation. The predicted probability of accepting a contract is $\hat{\pi}_i$.

3. Utilization equations.

We select two subsamples. We take individuals that were captive, **and** had purchased the private contract **and** suffered a type- i shock. We estimate the probability of actually using the private contract. There is clearly a self selection problem, since we are selecting types more likely to suffer from health shocks and more profitable. To correct for selection bias we use a Heckman 2 step procedure and we use the predicted probabilities $\hat{\lambda}_{1i}$ and $\hat{\lambda}_{2i}$ and $\hat{\pi}_i$ obtained before.

6.1 Health Equation

Let $s_{1i} = 1$ if consumer i has suffered a type- k health shock and zero otherwise. The ex ante probability of $s_{1i} = 1$ depends on a linear index and is given by:

$$\Pr(s_{ki} = 1 | \mathbf{z}_i) = \Phi(\gamma' \mathbf{z}_i) \quad (5)$$

where $\mathbf{z}_i$ is the vector of covariates and $\Phi(\cdot)$ is the c.d.f. of the normal distribution. The descriptive statistics of $(\mathbf{s}, \mathbf{z})$ can be found in table 1 and the maximum likelihood estimation of (5) is shown in tables 2 and 3.

The purpose of estimating (5) for both types of shocks ($k = 1, 2$) is to produce a parsimonious description of the health status of the consumer, that simplifies the interpretation of the estimation results in terms of the model. In the right hand side of both equations there are nineteen characteristics that describe the state of health and the life style of the consumer. We reduce this information to two characteristics: the estimated probabilities of suffering a type k health shock. These estimates are used as input in the next estimation stage. Notice in particular that the right hand side variables are overall good at predicting the left hand side variable, as the log likelihood of the full model indicates and as most of the t-statistics indicate.

Most of the right hand side variables are *dummy* variables. From all groups of dummies, we have excluded the one that is an indicator of good health and we have included those that are indicators of less good health or of bad health. In particular for the variables that indicate the self assessed state of health (HEALTH-1 to HEALTH-5) we have excluded the indicator of very good health (HEALTH-1) and we included the rest. These clearly are a good predictor of the probabilities of shocks¹⁰. Indeed, the coefficient is always increasing in i (for instance, the coefficient on HEALTH-6 is about six times larger than that on HEALTH-2 in the case of type-1 shocks and it is about 12 times larger in the case of type 2 shocks). Suffering a chronic illness significantly increases the probability of suffering a type-1 shock, but not that of a type-2 shock.

With respect to life style, the variables related to smoking habits have no measured effect on type-1 shock and, surprisingly, they have a mild negative effect on the probability of a type-2 shock. The variables related to self assessed body weight adequacy are predictors of type-1 shock. This is true both for body weight lower than normal (OBES-4) as for body weight greater

¹⁰Recall that HEALTH- i is an indicator of worse perceptions of health as i increases.

or much greater than normal (OBES-1 and OBES-2). This set of variables do not capture an effect on the probability of a hospitalization shock.

The effect of demographic characteristics is particularly important in the case of the variable AGE and its square, AGE². Jointly, they imply a U-shaped effect of shock probability (for both types of shocks). The exponential effect of AGE for large values was to be expected. The relatively large values for young ages could be due to pregnancy in women. Yet, as stated above, these equations do not reflect economic decisions and are computed just for the purpose of implementing the model.

Table 1
DESCRIPTIVE STATISTICS
 (Number of observations = 18755):
 DISTRIBUTION AMONG OUTCOME CATEGORIES FOR VARIABLE:
 $s_{i1} = 1 \iff$ (TYPE-1 SHOCK OCCURS):
 $s_{i1} = 0$ Percent 0.8711 $s_{i1} = 1$ Percent: 0.1289

	Mean	Std Dev	Minimum	Maximum
SALUD2	0.5831	0.4931	0.0000	1.0000
SALUD3	0.2441	0.4296	0.0000	1.0000
SALUD4	0.0561	0.2302	0.0000	1.0000
SALUD5	0.0102	0.1004	0.0000	1.0000
CRONIC	0.2955	0.4563	0.0000	1.0000
FUMDIARI	0.3239	0.4680	0.0000	1.0000
FUMBAST	0.0411	0.1985	0.0000	1.0000
KGPCM	0.5185	0.7839	0.0400	7.1357
EJER1	0.5397	0.4984	0.0000	1.0000
EJER2	0.3326	0.4712	0.0000	1.0000
EJER3	0.0888	0.2845	0.0000	1.0000
OBES1	0.0803	0.2718	0.0000	1.0000
OBES2	0.3266	0.4690	0.0000	1.0000
OBES4	0.0734	0.2607	0.0000	1.0000
SOLO	0.0704	0.2559	0.0000	1.0000
EDAD	43.4169	18.3791	16.0000	98.0000
EDAD2	2222.8000	1729.9079	256.0000	9604.0000
MUJER	0.5164	0.4997	0.0000	1.0000
MUJMAYOR	22.9694	25.9503	0.0000	98.0000

Table 2

Estimation of equation (5).

PROBIT RESULTSCategorical variable: s_{i1} (TYPE-1 SHOCK)

	Estimate	Std Dev	t-value	$p > t $
CONSTANT	-1.3469	0.1055	-12.76	0.000
SALUD2	0.2636	0.0537	4.91	0.000
SALUD3	0.9400	0.0565	16.64	0.000
SALUD4	1.5040	.0666	22.59	0.000
SALUD5	1.5954	0.1061	15.04	0.000
CRONIC	0.1115	0.0290	3.85	0.000
FUMDIARI	-0.0393	0.0303	-1.30	0.194
FUMBAST	0.0015	0.0661	0.02	0.981
KGPCM	0.0001	0.0157	0.01	0.990
EJER1	-0.1411	0.0684	-2.06	0.039
EJER2	-0.12371	0.0691	-1.79	0.073
EJER3	-0.0061	0.0761	-0.08	0.935
OBES1	0.1378	0.0450	3.06	0.002
OBES2	0.0819	0.0282	2.91	0.004
OBES4	0.1760	0.0469	3.75	0.000
SOLO	-0.0184	0.0481	-0.38	0.702
EDAD	-0.0180	0.0037	-4.84	0.000
EDAD2	0.0001	0.0000	4.19	0.000
MUJER	0.0479	0.0665	0.72	0.471
MUJMAYOR	0.0028	0.0014	2.10	0.036

MEASURES OF FIT:

Likelihood Ratio Chi-square: 1688.9382 with 19 d.f., prob= 0.0000

Log Likelihood for full model: -6361.9026

Log likelihood for restricted model: -7206.3717

Table 3
PROBIT RESULTS
Categorical variable: SHOCK2

	Estimate	Std Dev	t-value	$p > t $
CONSTANT	-1.6406	0.1231	-13.33	0.000
SALUD2	0.1051	0.0570	1.84	0.065
SALUD3	0.6104	0.0607	10.06	0.000
SALUD4	1.1988	0.0711	16.87	0.000
SALUD5	1.2366	0.1134	10.90	0.000
CRONIC	0.0143	0.0338	0.42	0.671
FUMDIARI	-0.0656	0.0343	-1.92	0.055
FUMBAST	-0.0908	0.0774	-1.17	0.241
KGPCM	0.0212	0.0169	1.26	0.209
EJER1	0.0412	0.0830	0.50	0.619
EJER2	0.0343	0.0837	0.41	0.682
EJER3	-0.0492	0.0939	-0.52	0.600
OBES1	0.0289	0.0521	0.56	0.579
OBES2	-0.0122	0.0325	-0.38	0.706
OBES4	0.0414	0.0549	0.75	0.451
SOLO	-0.0314	0.0572	-0.55	0.583
EDAD	-0.0114	0.0043	-2.65	0.008
EDAD2	0.0001	0.0000	2.93	0.003
MUJER	0.3621	0.0756	4.79	0.000
MUJMAYOR	-0.0076	0.0015	-4.91	0.000

MEASURES OF FIT:

Likelihood Ratio Chi-square: 749.0367 with 19 d.f., prob= 0.0000

Log Likelihood for full model: -4599.8250

Log likelihood for restricted model: -4974.3433

6.2 Purchase of private contract equation

Let $y_i = 1$ if consumer i is currently under a contractual relationship with a private health care provider and let $\hat{\lambda}_{1i}(\mathbf{z}_i)$ and $\hat{\lambda}_{2i}(\mathbf{z}_i)$ the predicted probabilities that the consumer suffers the shocks, conditioned on the covariates. We considering estimating the probability that $y_i = 1$ through:

$$\Pr(y_i = 1 | \hat{\lambda}_{1i}, \hat{\lambda}_{2i}, \mathbf{z}_{oi}) = \Phi(\mu'(\hat{\lambda}_{1i}, \hat{\lambda}_{2i}, \mathbf{z}_{oi})) \quad (6)$$

where $\mathbf{z}_{oi}$ is a subset of $\mathbf{z}_i$. The descriptive statistics of the variables are in table 4 and the results of the probit estimation are shown in table 5.

Notice from table 4 that the average estimated probability of suffering a type-1 shock is about 13% and that of suffering a type-2 shock is 7%. Moreover, the fraction of individuals that are within the public system is 95%, the fraction of individuals that are public servants and have chosen a private carrier is 3% and the fraction of individuals that enjoy a employer provided health care is 1.4%.

Concerning estimation results in table 5, interestingly the effect of the estimated probability of a type-1 shock is positive and significant at the 1% level. But the effect of a higher estimated probability of a hospitalization (type-2) shock is negative, greater in absolute value and also significant at the 1% level. We interpret this as evidence of risk selection. Type-2 treatments are generally much more expensive. Authors that have studied risk selection (Like Van de Ven and Van Vliet (90) and Pellisé (95)) have precisely pointed to the notion that firms select individuals that generate less expenditure ex post.

Demographic characteristics are also very significant at explaining contract acquisition. Age increases the probability of contracting but at a decreasing rate (AGE^2) is negative. Women have a greater probability of contracting, but particularly so for younger women, what could be explained by tendency to use private carriers by pregnant women.

Sociologic variables ply the predictive role that could be expected. Concerning the level of studies, the excluded dummy is STUDIES-5, that identifies individuals that completed university degrees. STUDIES-1 means no studies, and so forth. Notice from table 4 that graduates account for about 10% of the sample. The effect of levels of studies on the probability of contracting is positive and monotonic: the higher the educational degree attained the greater the probability of contracting. This could be due both to the correlation of studies and wealth (greater wealth should increase the

probability of contracting) and to a specific valuation of health insurance resulting from higher education). We find that the size of the city is negatively (and significantly) related to contract probability. This is in contrast to other studies, like González (94). This could be due to differences in the vector of control variables, but nevertheless remains as a puzzling result. The variables that indicate the situation with respect of the labor market are also overall consistent. The excluded variable (WORK-1) represents that the individual is in this moment active and employed. All other situations represent economically less favorable situations. This explains the systematically negative signs of the coefficients. In particular WORK-2 indicates retired former employee and WORK-3 retired and formerly engaged in working at the household. Both coefficients are negative and significant, with the latter greater in size. WORK-4 and WORK-5 represent active but unemployed individuals. These individuals buy less frequently private insurance. WORK-4 are individuals that have lost a job and WORK-5 are searchers for a first employment. The latter have an even lower probability of purchasing: they are likely to be younger and moreover are less likely to have savings. WORK 6 are students and WORK-7 are individuals employed within the household. We interpret the coefficients as due to different income levels: university students signal relatively wealth whereas domestic work signals in the average relatively lower income.

Finally, the effect of the captivity variables is very negative and very significant. It is exactly consistent with the model. Here the excluded dummy is NON-CAPTIVE, i.e., individuals without any link with the public system. CAPTIVE indicates that the individual is obliged to participate in the public system. The effect on demand is negative and large in size (greater than the effect of no educational degree). SEMI-CAPTIVE individuals are better off in terms of health care than captive individuals since for the same contribution they have a larger choice set (they can use private carriers without an additional contribution). Consequently the impact on contracting additional insurance is negative (and 50% larger in size). Individuals who benefit from an employer provided insurance (BENEFIT) have an still lower probability of contracting..

Table 4

Estimation of equation (6).

DESCRIPTIVE STATISTICS

(NUMBER OF OBSERVATIONS=18751):

 $y_i = 0$: Percent 0.9465 ; $y_i = 1$,Percent 0.0535

	Mean	Std Dev	Minimum	Maximum
STATUS LOW	0.5494	0.4976	0.0000	1.00000
PROB. SHOCK 1	0.1289	0.1091	0.0199	0.6095
PROB. SHOCK 2	0.0745	0.0595	0.0188	0.3997
RICH REGION	0.4567	0.4981	0.0000	1.0000
CITY SIZE	5.4914	5.8933	1.0000	83.0000
AGE	43.4162	18.3794	16.0000	98.0000
AGE ²	2222.7536	1729.9458	256.0000	9604.0000
WOMAN	0.5164	0.4997	0.0000	1.0000
WOMAN*AGE	22.9707	25.9515	0.0000	98.0000
STUDIES 1	0.1511	0.3581	0.0000	1.0000
STUDIES 2	0.5067	0.5000	0.0000	1.0000
STUDIES 3	0.1849	0.3882	0.0000	1.0000
STUDIES 4	0.0747	0.2629	0.0000	1.0000
WORK 2	0.1319	0.3384	0.0000	1.0000
WORK 3	0.0411	0.1984	0.0000	1.0000
WORK 4	0.0751	0.2635	0.0000	1.0000
WORK 5	0.0158	0.1246	0.0000	1.0000
WORK 6	0.1036	0.3047	0.0000	1.0000
WORK 7	0.2274	0.4192	0.0000	1.0000
WORK 8	0.0042	0.0644	0.0000	1.0000
CAPTIVE	0.9517	0.2700	0.0000	2.0000
SEMI-CAPTIVE	0.0252	0.1598	0.0000	2.0000
BENEFIT	0.0142	0.1223	0.0000	2.0000

Table 5

PROBIT RESULTS

Estimation of equation (6).

Endogenous variable: $y_i = 1$ if private insurance is purchased

variable	estimate	std.dev.
CONST	-0.9371	(0.1648)**
STATUS LOW	-0.2002	(0.0730)**
PROB. SHOCK 1 $(\hat{\lambda}_{1i})$	1.7086	(0.6084)**
PROB. SHOCK 2 $(\hat{\lambda}_{2i})$	-3.5737	(1.0967)**
RICH REGION	0.5915	(0.0361)**
CITY SIZE	-0.0074	(0.0032)**
AGE	0.0236	(0.0063)**
AGE ²	-0.0001	(0.0001)*
WOMAN	0.2680	(0.1084)**
WOMAN*AGE	-0.0045	(0.0027)*
STUDIES 1	-0.9427	(0.0894)**
STUDIES 2	-0.6602	(0.0676)**
STUDIES 3	-0.2601	(0.0671)**
STUDIES 4	-0.1386	(0.0736)*
WORK 2	-0.1485	(0.0761)*
WORK 3	-0.6523	(0.1404)**
WORK 4	-0.1965	(0.0755)**
WORK 5	-0.5194	(0.1771)**
WORK 6	-0.1768	(0.0872)*
WORK 7	-0.3249	(0.0846)**
WORK 8	-0.0424	(0.2375)
CAPTIVE	-1.0410	(0.0532)**
SEMI-CAPTIVE	-1.4806	(0.1403)**
BENEFIT	-1.6743	(0.3512)**

MEASURES OF FIT:

Likelihood Ratio Chi-square: 1268.6471 with 23 d.f., prob= 0.0000

Log Likelihood for full model: -3281.2685

Log likelihood for restricted model: -3915.5921

6.3 Utilization Equation

Finally, for $k = 1, 2$ let i be a consumer such that $y_i = 1$, $s_{ik} = 1$ and such that $\theta_i^o = \theta^s$. Such consumers suffer a type- k shock and are able to choose between the private and the public provider. Let $u_i^k = 1$ if the consumer chooses to use the private carrier for treatment k . Again, we model the probability as a probit:

$$\Pr(u_i^k = 1 | \hat{\lambda}_{1i}, \hat{\lambda}_{2i}, \hat{\pi}_i, \theta_i^o = \theta^s, y_i = 1, s_{ik} = 1) = \Phi(\rho'(\hat{\lambda}_{1i}, \hat{\lambda}_{2i}, \hat{\pi}_i))$$

where $\hat{\pi}_i$ is the probability of $y_i = 1$ estimated in (6) and $\hat{\lambda}_{1i}, \hat{\lambda}_{2i}$ are the probabilities of suffering type-1 and type-2 shocks respectively, estimated in subsection 6.1.

If quality levels of private providers were unidimensional we would expect to see that a consumer who purchases the private contract always uses the private provider facilities upon suffering a shock. Yet we observe that a fraction of consumers that contract do not use the private facilities upon certain type of shocks. Then it must be that treatment quality is at least a 2-dimensional vector. Firms' design of contract for health care might then be oriented towards the coverage of certain type of specific treatments, counting with the public provider for other kinds. Indeed, recall we obtained above that probability of type-1 shock is rather positively related to contracting, everything else given, but a higher type-2 shock probability is negatively related to contracting: an effect that we can explain through the implications of supplier's behavior.

In this section we select from the sample those individuals who have the option of taking an utilization decision upon a shock. For each kind of shock, we select individuals that have double insurance and that have suffered that type of shock. We estimate the utilization of the private provider probability. In order to control for selection bias, we use the estimated probabilities of the shock and of purchasing extra insurance from the private provider. The drawback of this approach is in that the attrition in the sample from selecting those individuals is rather extreme. The subsample sizes for double insured individuals that suffer type-1 and type-2 shock respectively is 142 and 81, down from 18755. Our results should therefore be confirmed with data from other samples.

Subject to this caveat we find that the estimated profitability associated to the client ($\hat{\pi}_i$) is clearly significant at explaining utilization patterns. This

is the prediction from our model that we described in subsection 4.2. Measured profitability ($\hat{\pi}_i$) is a measure of the (unobserved) quality of the contract and it should explain utilization of the private provider. Indeed, a lower value of $\hat{\pi}_i$ for an individual *that has purchased* the private contract reduces significantly the probability of using the private provider for a treatment.

Moreover, the predicted shock probabilities do not appear as statistically significant in tables 7 and 9. This is not surprising since the information on $\hat{\lambda}_{i1}$ and $\hat{\lambda}_{i2}$ is already contained in $\hat{\pi}_i$. Interestingly, tables 7 and 9 indicate that service selection is not necessarily biased towards type-1 treatments. It is not always the case that firms design contracts in order to induce consumers to use them for non-hospitalization shocks. Certain types of consumers will receive offers that attract them for certain hospitalization shocks, but not for non-hospitalization shocks. Women that are pregnant and that choose a private carrier for giving birth are an instance of this. A more sophisticated analysis of service selection than ours would characterize a larger set of health shocks and would identify finer service selection strategies by firms. Such an analysis would require however a larger data set than ours.

Table 6
DESCRIPTIVE STATISTICS
(N=142):
DISTRIBUTION AMONG OUTCOME CATEGORIES FOR VARIABLE:
 $u_{i1} = 1$ if individual i uses private type-1 treatment
 $u_{i1} = 0$: Percent 0.7254 $u_{i1} = 1$ Percent 0.2746

variable	Mean	Std Dev	Minimum	Maximum
PRCONT	0.1480	0.1498	0.0070	0.6793
PRSSHOC1	0.1875	0.1353	0.0382	0.5928
PRSSHOC2	0.0976	0.0742	0.0204	0.3376

Table 7
PROBIT RESULTS
Categorical variable: u_{i1}

variable	Estimates	std.dev.	t-value	p> t
CONST	-1.1298	0.2400	-4.71	0.000
PRNOCONT	1.9715	0.7452	2.65	0.008
PRSSHOC1	1.8666	2.1370	0.87	0.382
PRSSHOC2	-1.3910	3.9007	-0.36	0.721

MEASURES OF FIT:
Likelihood Ratio Chi-square: 8.5398 with 3 d.f., prob= 0.0361
Log Likelihood for full model: -79.2015
Log likelihood for restricted model: -83.4715

Table 8
DESCRIPTIVE STATISTICS
(N=81):
DISTRIBUTION AMONG OUTCOME CATEGORIES FOR VARIABLE:
 $u_{i2} = 1$ if individual i suffers a type-2 shock
 $u_{i2} = 0$: Percent 0.2593; $u_{i2} = 1$: Percent: 0.7407

variable	Mean	Std Dev	Minimum	Maximum
PRCONT	0.1242	0.1215	0.0106	0.6793
PRSSHOC1	0.1759	0.1311	0.0226	0.5026
PRSSHOC2	0.0943	0.0715	0.0262	0.2861

Table 9
PROBIT RESULTS —
Categorical variable: P16Q

variable	Estimates	std.dev.	t-value	p> t
CONST	0.8380	0.4185	2.00	0.045
PRNOCONT	3.5588	1.9576	1.82	0.069
ESTATB	-0.0953	0.3282	-0.29	0.771
PRSSHOC1	-1.0861	3.1761	-0.34	0.732
PRSSHOC2	-3.1807	5.6975	-0.56	0.577

MEASURES OF FIT:
Likelihood Ratio Chi-square: 11.2158 with 4 d.f., prob= 0.0242
Log Likelihood for full model: -40.7468
Log likelihood for restricted model: -46.3547

7 Conclusions

Our main contribution in this paper has been to lay out a simple model of risk selection and service selection in a setting where consumers are heterogeneous in many respects and where firms engage in second-degree price discrimination. Consumers are averse to random health shocks, that can be of two types: type-1 or mild shock that alter normal life style and type-2 or hospitalization shocks.

Service selection (Pellisé (95)) means that firms specialize in certain treatments but induce consumers to use the public provider for other treatments. We find that firms have incentives to engage in service selection. We derive the optimal contract the firm offers to the consumers as a function of the characteristics of the latter. The quality of the treatments depends on the wealth of the consumer and on a number of health characteristics, like age, gender and probability of shocks.

The model yields implications that are easily testable through standard maximum likelihood techniques. We find that the predictions of the model are overall very consistent with estimation results. Firms appear to have a bias against contracting with consumers that are relatively more likely of suffering a type-2 shock than a type-1 shock.

Regarding utilization patterns, consumers that have double insurance and are entitled to choose between the public and private treatments show in the sample a dispersion of decisions. The measured expected profit the private firm makes on them is a strongly significant predictor of the probability of deciding to use the private provider.

With additional information on individuals' income and wealth, our model and estimations yield a simple procedure to estimate the welfare gain associated to experiments in managed competition. In particular it can lead to a measurement of the effects of reorganizing the Spanish Social Security System in the direction already implemented for public servants

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