Private health insurance and utilization of health services in Chile

Ricardo Henríquez Höfter

School of Public Health, University of Chile, Independencia 939, Independencia, Santiago, Chile
E-mail: rhenriquez@sii.cl

This paper analyses the choice of private health insurance in Chile and how this relates to the utilization of health services. The results show the importance of some demographics on the insurance decision, particularly age, gender and marital status. Socio-economic factors such as education, income, employment status and zone of residence, all influence the probability of purchasing private insurance. The relevance of these determinants is confirmed using a simulation analysis with four representative decision-makers. This simulation also provides evidence of a positive selection into private insurance, although this would be driven by the different criteria used to set premiums under private and public insurance schemes. The potential linkage between utilization of health services and private health insurance is examined using a simultaneous two-equation framework. Two measures of utilization are estimated: outpatient health services, and length of stay in hospital. A number of explanatory variables, selected on the basis of previous findings, were used to estimate these two dependent variables, and self-assessed health status and long-term activity limitations emerge as important factors in explaining utilization. Private health insurance cover positively affects only one of the two measures of utilization: outpatient health services. This provides evidence of the moral hazard effect pointed out earlier by Arrow (1963).

I. Introduction

Although in Chile private pre-paid health insurance plans have offered an alternative to the publicly-provided health insurance since 1981, only two previous studies have looked at the factors underlying the choice of health insurance, and little (if any) empirical evidence exists of the relationship between this choice and the utilization of health services.

Sapelli and Torche (1998) estimate a simple dichotomic model of insurance choice based on the 1990 and 1994 versions of the National Socio-economic Characterization Survey, known as *Encuesta de Caracterización Socioeconómica Nacional* (*Casen*). According to this study, the most significant determinants of individual choice are income, age and zone of residence, but no evidence is provided on the effect of health insurance on utilization. Sanhueza and Ruiz-Tagle (2002), using *Casen* 1996, estimate jointly a linear probability model (for the demand for health services) and a probit model (for health insurance), taking a utilization index as a proxy for the demand for health services. They conclude that in the short-term there may well be a positive correlation between the holding of private insurance and the utilization of health services.

We extend the previous studies in various directions. First, we provide a detailed description of the health insurance system, where private pre-paid health insurance plans compete with the public insurer in a publicly regulated scheme. This conceptual framework is important as the choice of

health insurance itself depends on the institutional context in which the insurance system operates. Second, we carry out an in-depth analysis of the determinants in the choice of private health insurance making use of a more comprehensive set of variables drawn from *Casen* 2000.[1] The relevance of these determinants is further assessed using a simulation analysis with four representative decision-makers.

Finally, we examine the way in which private health insurance affects the utilization of health services. To disentangle the health insurance effect, we take health services utilization and private health insurance in a joint framework. We specify two measures of utilization: *outpatient health services* and *length of stay in hospital*. As these measures are censored at zero and health insurance is assumed to be endogenous, we estimate a tobit censored model jointly with a probit model for the insurance equation.

Arrow (1963) suggests that the decision to purchase health insurance and the utilization of health services are intertwined. Since insurance reduces the effective price of medical care, those insured would tend to use more health services (the moral hazard problem). Also, although individuals cannot perfectly predict their future demands, they are likely to have information about their health that could lead them to anticipate higher use of health services. Thus, not only do the levels of utilization depend on the individual's health insurance cover, but the level of cover may also depend on anticipated utilization (the adverse selection problem).[2]

A number of explanatory variables, selected on the basis of previous findings, are used to estimate utilization. We also assess the influence of some factors hypothesized to be specific determinants of outpatient health services and length of stay in hospital, including: number of doctors per thousand population, number of public and private beds per thousand population and frequency of physical activity. The data for the number of doctors and public and private beds per thousand population were gathered from records maintained by the Ministry of Health. The information was structured by municipal districts and assigned to each observation in the estimated sample.

II. The Health Insurance System[3]

Since the inception of private pre-paid health insurance plans (known in Chile as *Isapres*, *Instituciones de Salud Previsional*) in the early 1980s, the number covered by private insurance has increased radically, to almost 20% of the population today. Nearly 67% of Chileans receive health benefits through the public insurer, the National Health Fund, known as *Fonasa*.[4]

Health insurance is compulsory, but individuals can freely opt for *Fonasa* or one of the *Isapres*. Whatever the option chosen, the individual must contribute to financing the cost of insurance. This contribution currently stands at 7% of taxable income, although the privately insured can supplement this percentage to purchase a more comprehensive health plan. Health insurance is thus not a benefit provided by employers (corporate insurance), but a legal responsibility imposed by the state on all employees, and met from their pockets.

The public option offers complete cover (on a standard quality base), and no class of exclusions or risk selection is applied. Indigents and low-income individuals are automatically covered by public insurance. Private insurance, on other hand, offers higher quality cover but imposes exclusionary clauses and limitations on pre-existing conditions, which restrict access.

The health insurance decision is not simple due to asymmetric information, most evidently in the private market. An individual requires substantial expertise and time in order to assess the relative costs and benefits of the multiple health plans offered by private providers. Things are simpler in the public sector, where the public insurer offers what we could call a single health plan, making its evaluation easier.[5]

The choice of private insurance allows individuals to opt out entirely from making contributions to

[1] This version of the *Casen* series covers a larger number of households and provides information not previously recorded on individual health status and functional limitations. It also records more detailed data on the utilization of health services.
[2] According to Wilcox-Gök and Rubin (1994), if individuals anticipate a need for medical care and the decision to purchase private health insurance is affected by this anticipated need, then private health insurance cover is determined simultaneously with the demand for medical care.
[3] This section relies partly on Kifmann (1998).
[4] Of the remainder, 3% receive health insurance through the social programmes of the armed forces, and approximately 10% is thought to be self-insured.
[5] Although purely public provision and preferred providers are available for the publicly insured, both the contribution (7% of taxable income) and the level of cover are administratively fixed and unique under both public schemes. Therefore, we can properly talk of a single health plan under public health insurance.

public sector provision.[6] This characteristic of the system implies that private insurance does not represent a complement (or supplement) for the benefits provided by the state, as in the UK, Australia or Switzerland, but an independent alternative that both provides and finances health care services. Purchase of private insurance does not, however, prevent utilization of public facilities. Those who are privately insured can also use the public system, but must pay the cost of the services required.[7]

Currently the private health insurance system is composed of 18 *Isapres* and provides insurance to nearly 2.8 million individuals, of whom 1.25 million are policyholders. Using the compulsory contribution rate plus additional premiums, *Isapres* offer subscribers and their dependants both outpatient and inpatient medical care on a cost-sharing basis. Specifically, private insurance gives the insured a choice on hospitals and doctors.

The benefits provided by the *Isapres* are set in a very general form. The law only defines what relates to preventive care and non-medical costs, such as sick-pay benefits. But unfortunately there is no clear legal definition of a minimum benefit package that could be used to benchmark benefits in each individual policy. This, together with the lack of price regulation in the health care market, induces considerable price differences in physicians' fees and hospital charges. In this context, the *Isapres*' response has been to offer a great variety of health plans, each one entailing different arrangements on co-payments, cover caps and access to specific providers.[8] This constitutes a sharp contrast with the operation of private insurance markets in other countries. In Britain, for instance, the private market is dominated by a reduced number of firms and the type of contracts offered are broadly similar, with no more than two or three types of policies available. In Ireland, although new legislation has opened up the market to competing insurers, until year 2001 only the British insurer BUPA had entered the market. Insurers are obliged to operate community rating and a risk equalization fund is to redistribute profits in order to offset the impact of any *cherry-picking* of younger, healthier subscribers.

The great variety of private health plans on offer in Chile is also the result of the compulsory contribution for health insurance. Since individuals must contribute 7% of their taxable income, *Isapres* have been forced to offer health plans adjusted to a wide range of specific situations. The plans vary according to the cover provided and the clients' overall family health risk.

Premiums in the private market are set as community rates by groups, where age, sex and the number of dependants are the only legal factors the *Isapre* may use to estimate them. Basically, premiums are expected to reflect the expected costs of medical consumption. The benefit of a given policy is full or partial reimbursement of the medical costs of the treatments provided, but primary, long-term nursing, psychiatric and geriatric care are not covered by private policies.

Premiums in the public sector are set differently. The public insurer, *Fonasa*, offers a pre-fixed cover at a single price −7% of taxable income. No additional contributions are required. Benefits are independent of age, sex, health status or number of individuals covered. The mandatory contribution allows every individual, and his/her family group, to receive a fixed benefits package. All household members obtain the same cover; benefits are independent of the premium. Moreover, the cover offered by public insurance is not subject to exclusions, whether temporary or permanents, unlike the private system where the *Isapres* have imposed various restrictions on access to medical care in the form of exclusionary clauses, waiting periods before certain benefits can be demanded, and zero cover for pre-existing conditions.[9]

Cover for the elderly, whose medical care costs tend to be four or five times higher than those of younger age groups, is also limited in the private system. Individuals over 64 not previously affiliated to an *Isapre* find it hard to get accepted as new subscribers. As a result nearly 70% of *Isapres*'clients are under 50, and only 4.3% are 65 or older.

Termination rights are asymmetric in the private market. The *Isapre* cannot unilaterally terminate the contract, thus from their point of view policies run for an unlimited period. Policyholders, however, can end the contract after one year, and there are no restrictions on switching from the private to the public system. Individuals who terminate their contracts with the *Isapre* can immediately claim benefits from the public insurer.

The option to return to the public system has important implications for individuals' behaviour. Although in terms of outpatient benefits the public

[6] To some extent, those opting for private insurance continue supporting the public system through general taxes.
[7] Self-employed can voluntarily purchase private insurance. If they are unable to do so, the public insurer automatically covers them.
[8] This feature of the Chilean private health insurance system closely resembles the health insurance market in the USA.
[9] Following Propper (1989 pp. 778–79), if an individual applying for private insurance declares a pre-existing medical condition, the contract he/she is offered may exclude or limit the cover for treatments arising from that condition.

sector is relatively unattractive, compared with the private sector, the public sector offers satisfactory hospital care. Private insurance is therefore more valuable in the absence of a serious medical event, because it concentrates on relatively less expensive outpatient benefits. But if expensive treatment is needed, policyholders can return to the public system. In practice, this allows some strategic behaviour by individuals, as they purchase private insurance for outpatient health services while holding an implicit free public insurance for expensive inpatient care. As a consequence, the demand for (and offer of) catastrophic cover in the private market is reduced. This behaviour can be interpreted as the rational response to the fact that most *Isapre* policies set ceilings on cover for both individual benefits and overall benefits per year, which frequently leads to cases of low private cover for expensive treatments.

III. Determinants of the Health Insurance Decision

Econometric studies examining the choice of health insurance usually estimate the influence of factors frequently found in large-scale multipurpose surveys, such as the *Casen* 2000 survey on which we base our study. *Casen* 2000 contains satisfactory data on demographics, housing, education, income and employment, and information on individuals health status, including functional limitations and details on utilization of health services.

We assess the significance of three demographic factors: age, gender and marital status. The inclusion of age derives from the underlying hypothesis that medical needs increase with age. As van de Ven and van Praag (1981) point out, young individuals or families tend to be relatively less well off but healthier, although they may anticipate higher medical expenses due to births and childhood illnesses. Middle-aged families or individuals usually improve their financial position, while the elderly commonly face deteriorating health. So it is reasonable to expect different tendencies in selecting private health insurance as individuals move through their life cycle.

The relevance of gender is in its influence on expected medical consumption. Females make greater use of medical services, particularly during their reproductive years, so they should value more highly the comprehensive cover offered by private insurers. In Chile, 65% of private policyholders are males, since men represent a higher proportion of the labour force and are also lower risk than women. Also, married couples are more likely to have private cover than single people, which is related to the extension of cover to children.

Three socio-economic variables are incorporated: education, income and employment status. Basically, more educated individuals should be better equipped to evaluate the multiple private health plans available and their differences from the single health plan offered by the public insurer. They would also be more conscious of the benefits of better-quality cover. A simple cross-tabular analysis of the attributes of those privately insured shows that on average they have higher education levels.

The income of the decision-maker has proved relevant under different institutional arrangements governing health insurance systems (see Propper, 1989 for England and Wales, van de Ven and van Praag, 1981 for the Netherlands, and Cameron *et al.*, 1988 and Cameron and Trivedi, 1991 for Australia). In Chile, the compulsory nature of health insurance and its public–private mix has produced some segmentation, as most high-income earners opt for private insurance. Even though low-income earners can access private insurance, they usually demand cheaper policies with lower levels of cover. Under the public scheme income is not relevant since the cover is fixed, so higher income does not provide higher benefits.

The influence of employment characteristics on the insurance decision is probably linked to the particular design of the health insurance system. Under universal, tax-financed schemes such as in the UK and Australia, employment status does not affect the individual's entitlement to medical care. In the USA, on the other hand, the health insurance market is mostly private and not everyone can afford the cost of insurance. Furthermore, an important fraction of health insurance policies are corporate (offered by the employer). Thus the type and characteristics of the employment could play an important role in the health insurance decision made by North Americans.

In Chile health insurance is compulsory, and every Chilean has the right to health cover from the state. Hence employment characteristics should not play a decisive part in the decision to opt for public insurance. However, employment characteristics could become significant for those deciding to purchase a private health plan. The self-employed, for whom health insurance is not compulsory,[10] or those

[10] Only individuals who work as employees are obliged to make health insurance contributions. Individuals working independently are not subject to this mandatory scheme, although they can contribute voluntarily.

without a permanent job, could be less likely to purchase private insurance.

We also observe the effect of health status, which enters the estimation due to its probable impact on expected medical expenditure. A severe illness or a progressive deterioration of health could imply significant financial costs at some particular time, or permanent outlays over a long period. In situations like these, health insurance becomes essential to help individuals defray treatment costs. Hence the decision-maker should evaluate carefully the cost and cover of the policies offered by the alternative insurers. As we mentioned earlier, the public option in Chile is relatively unattractive in terms of outpatient care but it provides satisfactory hospital care.

The choice of private health insurance could also be influenced by individual attitudes to risk. Self-employed people, for example, could be regarded as less risk averse and therefore less likely to choose private insurance. However, individual attitudes to risk should be examined alongside the individual's own risk. More risky (and presumably costly) individuals could well find it harder to get accepted as new subscribers and consequently be less likely to purchase private health insurance.

Where the individual lives may also significantly affect his/her choice. In Chile most of the private providers who offer their services under the *Isapre* system are concentrated in urban areas, so urban residents would be more likely to opt for private insurance.

IV. Data and Econometric Estimation

The data

The data set comes from *Casen* 2000, which is a representative sample of the Chilean population. *Casen* 2000 introduced important changes with respect to earlier versions, of which the two most relevant for this study are: it contains information on a larger number of households (65 036 households equivalent to 252 748 individuals), and it provides more detailed information on individual health status and utilization of health services. In the raw data 19.8% of individuals had private insurance, while 61.86% had public insurance. These figures are in line with administrative data (20 and 67%, respectively).

As the health insurance decision implies a choice between alternatives, we excluded observations describing indigents and very low-income people for whom the State provides free health insurance. We also deleted observations for individuals in the armed forces' health insurance regimes, and for the self-insured.

The data structure allows identification of each family member in relation to the head of household. Following Hopkins and Kidd (1996), one can visualize the household as an income unit consisting of a head plus his/her spouse and family members who depend on the head.

We defined the decision-maker as the head of household or his/her spouse. Three restrictions were imposed: the decision-maker had to be working (employed or self-employed); he/she had to be contributing to the social security system (including health insurance and pension); and he/she had to be at least 18 years old. Individuals under 18 were not considered because they are mostly full-time students living at home, and most are covered through their parents' health insurance plan, whether private or public.

The sub-sample utilized consists of 28 797 observations. Descriptive statistics of the variables included in the estimation, the definition of each variable and the default groups are presented in Tables A1 and A2, respectively, in the Appendix. We shall now describe how we constructed these variables.

The dependent variable *private* is 1 if the head of household or his/her spouse declared as privately insured and 0 if publicly insured. The definition of the dependent variable recognizes the joint nature of the health insurance decision within the family where, for instance, cross-income effects can be relevant.

To capture the effect of age we use *age* and *age squared*, the latter being included to observe a possible non-linear effect of age on the probability of purchasing private insurance. We also use a dummy variable (*female*) to identify the individual's sex, which takes the value 1 if female and 0 if male.

To reflect individual's marital status we included a dummy variable, *married*, indicating 1 if the individual was married and 0 otherwise.

Educational attainment enters the insurance equation as an indicator (0/1) variable, labelled *education*, which takes the value 1 for individuals with complete secondary education or higher at the time of the survey. Complete secondary education regularly implies thirteen years of schooling, which is above the schooling average in the sample. Considering the positive correlation between education and expected income, lower levels of education are presumably associated with the choice of public insurance.[11]

[11] Overall, increases in both income and education would lead to an increased probability of taking out private health insurance.

As the decision-maker is defined to be either the head of household or his/her spouse, we included both the income of the head, *income head*, and the income of the spouse, *income spouse*, expressed in Chilean *pesos* (Ch.$).[12] If the spouse is working he/she can be considered as a secondary worker, and the head of household could assume his/her income to be a secondary rent. This fact could induce cross-income effects, which in turn could have an impact on the insurance decision. In our data most heads are males, although a significant proportion of females are in the labour market. Some surveys, like the National Health Survey in Australia, follow the practice of treating the male as the head of household, but this practice is not observed in the *Casen* survey.

Two dummy variables characterise employment status: *self-employed* and *permanent job*. The first of these dummies takes the value 1 if the individual works independently and 0 otherwise. Since health insurance is not mandatory for the self-employed, they could present a different tendency to insure. For example, they could prefer to pay directly for medical treatment at the source of care. The second dummy identifies individuals who were in permanent employment at the time of being interviewed. This variable is included to take into account the importance of employment stability in deciding on a private health plan.

The influence of health status is estimated by including four dummies and one continuous variable. The dummies, *very good health*, *good health*, *bad health* and *very bad health*, account for four categories of self-assessed health status, the default being fair health status. These measures can be seen as reflecting a short-term health condition. The continuous variable, *functional limitations*, records the number of physical limitations among household members and is intended to capture long-term health status.

Since *Isapres* are allowed to set premiums by assessing certain observable risk factors, specifically age, sex and number of dependants, an interactive variable labelled *risk* was included in the insurance equation. *Risk* is the result of the interaction between the number of dependants on the head of the household and a continuous score built on the basis of age-sex factors provided by one of the largest *Isapres* in the market.[13] These factors are applied to policyholders (and their dependants) as a means to measure how costly each client is. However, as individual-specific risk is not one hundred percent identified off the observable risk factors, adverse selection is a potential problem which must be taken into account.

Finally, since private health insurance gives preferential access to private providers, who tend to cluster in urban areas, we included a dummy, *urban*, taking the value 1 if the individual lived in a major urban centre and 0 otherwise. This variable may reflect the availability of medical services to an individual and therefore may influence his/her insurance decision. Three major urban centres were considered: greater Santiago, greater Valparaiso and greater Concepción, which together account for 60% of the population of the country.

Econometric estimation

We model the choice of health insurance as a probabilistic one. Each individual is assumed to choose between private and public insurance after evaluating the difference in expected utility (ΔV) derived from the two options. This difference is hypothesised to depend on the set of variables discussed before.

Therefore, we can write,

$$\Delta V_i = f_i(age_i,\ age\ squared_i,\ female_i,\ married_i,\ education_i,\ income\ head_i,\ income\ spouse_i,\ self\text{-}employed_i,\ permanent\ job_i,\ very\ good\ health_i,\ good\ health_i,\ bad\ health_i,\ very\ bad\ health_i,\ functional\ limitations_i,\ risk_i,\ urban_i) \quad (1)$$

where the subscript i indexes the decision-maker. The general function above can be specified more formally as follows.

$$\Delta V_i = \beta' Z_i + \varepsilon_i \quad (2)$$

with β a $(K \times 1)$ vector of unknown parameters and Z_i a $(K \times 1)$ vector of the exogenous values of each explanatory variable for observation i. ΔV_i is not directly observed, we only observe the outcome 1 if $\varepsilon_i > -\beta' Z_i$ and 0 if $\varepsilon_i < -\beta' Z_i$.

The discrete nature of the health insurance decision suggests the use of a discrete choice model. As is well known, logit and probit models are frequently used to deal with binary dependent variables. Under the logit model, errors (ε) are assumed to follow a logistic distribution, while the normal distribution function is assumed for the errors in a probit model. These two distributions are very close to each other (almost indistinguishable) except at the tails, where the probit approaches extreme values more rapidly. Although we are not likely to get very different results when using either of the two, we opted for a probit model.

Probit estimates are presented in Table 1. The goodness of fit, measured by the pseudo-R^2 (McFadden, 1974) is satisfactory considering the

[12] The average referential (*observado*) exchange rate in 2000 was Ch$539.49 = US$ 1.0.
[13] The age-sex factors utilized are presented in Table A3 in the Appendix.

Table 1. Probit estimates for the choice of private health insurance

	Coefficients	Std. Errors	Z	$P > \|z\|$
Constant	−2.9431	0.2564	−11.475	0.000
Age	0.0550	0.0112	4.897	0.000
Age squared	−0.0006	0.0001	−5.332	0.000
Female	−0.2695	0.0717	−3.757	0.000
Married	0.1907	0.0510	3.736	0.000
Education	0.8890	0.0401	22.133	0.000
Income head	8.78e-07	8.60e-08	10.220	0.000
Income spouse	2.00e-06	3.39e-07	5.898	0.000
Self-employed	−0.9310	0.0881	−10.566	0.000
Permanent job	0.6181	0.0619	9.970	0.000
Very good health	0.1336	0.0618	2.162	0.031
Good health	0.0841	0.0377	2.228	0.026
Bad health	−0.2256	0.1438	−1.568	0.117
Very bad health	0.0433	0.4908	0.088	0.930
Functional limitations	−0.0553	0.0267	−2.068	0.039
Risk	−0.0379	0.0029	−12.768	0.000
Urban	0.2893	0.0333	8.685	0.000

Notes: Number of observations = 28,797.
Wald $\chi^2[16] = 1{,}600.85$.
Prob > chi2 = 0.000.
Log Likelihood = −13,761.32.
Pseudo $R^2 = 0.28$.

qualitative and discrete nature of much of the data utilized in the estimation.[14]

From Table 1 we observe that the coefficient signs of *age* and *age squared* are consistent with the *a priori* expectations and both are statistically significant. These results are also consistent with administrative data that show that *Isapres* primarily sign up young and middle-aged individuals. Sapelli and Torche (1998), however, point out that age seems to have a rather low influence on the insurance decision, after observing a reduction in the age elasticity of the demand for private insurance between 1990 and 1994.

The differential impact of gender on the probability of choosing private insurance is quite clear. The negative and statistically significant coefficient for *female* tells us that women are less likely to purchase a private health plan. Generally, private insurers charge higher premiums to females of fertile age, since they anticipate higher medical consumption by women. Births and maternity make females more risky from the insurer's point of view, so premiums are adjusted to reflect their associated higher cost. Sample statistics show that of the total number of individuals choosing private health insurance only 34% are women.[15]

The positive and well-defined coefficient of *married* was as predicted. In essence, it is reasonable to expect that individuals become more risk averse once they get married and this in turn is presumably related to the extension of cover to children. Married individuals may thus give more weight to the quality of cover from alternative insurance providers.

Educational achievement is highly significant, indicating that better-educated individuals are more likely to choose private insurance.[16] This result confirms the underlying hypothesis that more educated individuals could be in a better position to assess the *pros* and *cons* of the health plans offered by the *Isapres*, which becomes important at the moment of selecting one. The private plans are complex and differ in many dimensions, including magnitude of co-payments, levels of reimbursement, and limits on expenditures *per* year. They also differ among insurers, so the evaluation of a health plan is not an easy matter.

The income variables, *income head* and *income spouse*, present positive and significant coefficients. This is consistent with the general pattern revealed by administrative data, where higher income is linked to an increased probability of being privately

[14] Although the coefficients in Table 1 are not derivatives of the probability of *private* equalling 1, the signs of the coefficients are consistent with changes in the probability of *private* equalling 1.
[15] This figure makes sense if we consider that fewer women work, and that health insurance is compulsory only for those who are employees. On the other hand, married women can be covered by their husbands' insurance policies.
[16] However, and interestingly, Grossman (1972a, 1972b) points out that more-educated individuals have a more efficient production function of health, so they would have relatively better health and probably be less prone to contract any type of insurance.

insured. Although relatively less important, *income spouse* reflects the positive cross-income effect on the insurance decision. The income of the spouse can supplement the household budget allowing the head to devote more resources to health insurance and other goods. We should note, however, that the coefficients of both *income head* and *income spouse* are small, implying that income has less importance than believed. In other words, we could assume that over the years private insurance has shifted from 'luxury' to 'essential' good.

Self-employed and *permanent job*, which describe employment characteristics, are strongly significant but with opposite signs. In interpreting results, van de Ven and van Praag (1981) and Propper (1989) have hypothesized that the self-employed would be less risk averse and therefore less willing to choose private insurance. However, under a compulsory health insurance regime like Chile's, this argument does not adequately explain our result for *self-employed*. Rather, the combination of a less secure or regular income flow associated with self-employment and the higher premiums observed in the private market could best explain the self-employed individual's lower probability of purchasing private insurance. Besides, the self-employed could prefer to self-insure and if medical treatment is needed, pay directly for it at point of demand.

The positive coefficient of *permanent job* indicates that employment stability increases the probability of choosing private insurance. Individuals with a permanent job can plan the future with more certainty compared with the self-employed. They should therefore find it easier to contract private health plans that offer them a higher level of cover, but also higher premiums.

The results for the dummies accounting for self-assessed health status[17] show that individuals who reported being in *very good* or *good health* are more likely to choose private insurance. However, the estimates for *bad* and *very bad health* provide no evidence to support the notion that individuals in poorer health would be more likely to choose public insurance. This is so even though a cross-tabular analysis of self-assessed health status by type of health insurance shows that the numbers reporting *bad* or *very bad* health is higher, although only slightly, amongst those with public insurance (see Table A4 in the Appendix). It must be noted that self-assessment of personal health tends to reflect primarily short-term health status, and could therefore be influenced by what the interviewed perceives is a very good, good, bad or very bad health.

Functional limitations, a proxy for long-term health status, have a negative and significant impact on the choice of private insurance. This result seems to be linked to the anticipated (and usually permanent) higher expenditures derived from physical limitations, and to the well-known fact that *Isapres* impose entry restrictions on individuals with pre-existent health conditions.

The negative and strongly significant coefficient of *risk* was as predicted. Since the factors (age, sex and number of dependants) combined to construct this interactive variable define how risky (costly) an individual is, higher values of *risk* result in higher private premiums (but not higher public premiums), which in turn reduce the probability of choosing private insurance.

Finally, the positive and statistically significant dummy variable *urban*, which defines whether or not an individual lives in a major urban centre, tells us that those who live in such areas have a higher probability of choosing private insurance. Given that most private providers tend to cluster in these centres, and that private cover gives preferential access to private provision, urban residents are more likely to opt for private insurance.

V. Simulation Analysis

To assess the effect of changes in the determinants of the insurance decision on the probability of choosing the private option, we develop here a simulation analysis. The focus is on the impact of personal attributes (including age, sex, marital status, and health status), and income combined with employment characteristics.

Following Hopkins and Kidd (1996), we define a representative decision maker (RDM) as being male, 42 years old, married, with a permanent job, with completed secondary education and with an average income of Ch.$255 142. His/her spouse has an average income of Ch.$50 334. Both head and spouse self-report good health, and neither has physical limitations. The predicted probability associated with the RDM is 0.54.

Table 2 presents the results for changes in personal characteristics on the probability of choosing private insurance. We observe that as the RDM reaches

[17] We test for the joint significance of the four dummies for self-assessed health status and the result allowed us to reject the null hypothesis of non-significance at the 1% level. Therefore, these dummies do belong to the insurance equation.

Table 2. Effect of age, sex, marital status and health status on the choice of private insurance

	Probability of choice (%)
Representative decision-maker (RDM)	0.54
RDM is now 65 years old	0.38
RDM is in bad health	0.41
RDM has a functional limitation	0.51
RDM is single	0.46
RDM is now female with all other characteristics as for a male representative decision-maker.	0.43
RDM is female & 65 years old	0.28
RDM is female in bad health	0.31
RDM is female & has a functional limitation	0.41
RDM is female & single	0.36

Table 3. Effect of income and employment characteristics on the choice of private insurance

	Probability of choice (%)
Representative decision maker (RDM)	0.54
RDM's income increases by 1 standard deviation	0.74
RDM's spouse's income increases by 1 standard deviation	0.68
RDM without a permanent job	0.30
RDM is now single	0.46
RDM is single & income increases by 1 standard deviation	0.67
RDM is single, without a permanent job	0.24
RDM is now female with all other characteristics as for a male representative decision-maker.	0.43
RDM is female & income increases by 1 standard deviation	0.58
RDM is female & spouse's income increases by 1 standard deviation	0.64
RDM is female, without a permanent job	0.21
RDM is female & single	0.36
RDM is female, single & income increases by 1 standard deviation	0.50
RDM is female & single, without a permanent job	0.16

retirement age (65), his/her probability of being privately insured reduces to 0.38 (a 30% decrease). This significant reduction simply reflects the restrictions faced by the elderly who wish to join private health insurance plans.

Likewise, an RDM in bad health has a lower probability of being covered by private insurance. In fact, his/her probability falls to 0.41 (a 24% reduction). Functional limitations also reduce the probability of the RDM being privately insured, but only slightly (a 6% reduction). These results, in conjunction with the estimates for age, seem to support the existence of a positive selection into private insurance: younger and healthier individuals are more likely to be attracted by private insurance providers.

On the other hand, the probability of choosing private insurance decreases when the RDM is single. We also observe that the results for a female RDM follow the same pattern as for a male RDM, although with lower probabilities.

The simulation results for changes in income and employment characteristics are shown in Table 3. We see that as income increases, the probability of choosing private insurance increases significantly (from 0.54 to 0.74), highlighting the segmentation prevalent in the private health insurance market. The higher cost of private insurance and the higher quality cover offered are a more attractive combination for high-income individuals. The *Isapres* have accordingly aimed most of their sales efforts at young, high-income individuals, who are frequently over-insured. Confirming the importance of cross-income effects, the probability of choosing private insurance increases (from 0.54 to 0.68) when the income of the RDM's spouse increases. This provides evidence of the collective (family-related) character of the health insurance decision.

The nature of employment also plays an important role in individuals' choice. An RDM without a permanent job is significantly less likely to choose private insurance; his/her probability falls to 0.30 (a 44% reduction) when compared with RDM's probability. The fact of not having a permanent job has a similar effect on the probability of choosing private insurance for each of the RDMs considered in Table 3. Those who work sporadically or in jobs subject to seasonal variations cannot contribute regularly, and although this does not affect their entitlement to public cover it impedes them from taking out private policies. As before, we observe that the results for a female RDM follow the same pattern as for a male RDM, but with lower probabilities.

VI. Private Health Insurance and Utilization of Health Services

Against the background of the previous section, we turn now to examine the linkage between private health insurance and the utilization of health services. This relationship has been widely researched, and

several studies show that health insurance cover plays a significant role in the decision to use health services.[18]

Since the purchase of private health insurance in Chile is a choice, the potential endogeneity emerging from this decision must be taken into account. We use a two-stage procedure suggested by Maddala (1983) to estimate the influence of private insurance on two measures of utilization: *outpatient health services* and *length of stay in hospital*.[19] The model can be formalized simply as follows:

$$Y_1 = \alpha_1' X_1 + \beta_1 Y_2 + \varepsilon_1 \tag{3}$$

$$Y_2^* = \alpha_2' X_2 + \varepsilon_2 \tag{4}$$

where,

$$Y_2 = 1 \quad \text{if} \quad Y_2^* > 0$$
$$Y_2 = 0 \quad \text{otherwise}$$

Equation 3 describes utilization of health services (Y_1) as a function of a vector (X_1) of explanatory variables[20]; a dummy variable (Y_2), the realized value of the latent variable Y_2^*, which captures the propensity of individuals to buy private health insurance; and a random error term (ε_1). The latent variable Y_2^* is a function of X_2 and ε_2 (a random error term). The column vector X_2 contains the same set of explanatory variables previously estimated. X_1 includes a subset of the exogenous variables in X_2 plus some specific factors influencing only outpatient health services or length of stay in hospital.

It must be noted that the model defined by Equations 3 and 4 is identified even if the error terms ε_1 and ε_2 are not independent and X_1 includes all the variables in X_2.[21] However, some variables included in the first stage insurance equation were omitted in the second-stage utilization equation. We excluded those variables thought to be specific to the choice of health insurance: *self-employed*, *permanent job* and *risk*. *Income head* and *income spouse* were also excluded. Instead, we used only one measure of individual income (the monthly monetary income) labelled simply *income*. We also included a variable hypothesised to influence only outpatient health services, *doctor*, which accounts for the number of doctors per thousand population. Likewise, five specific variables were included in the equation for length of stay in hospital: *private beds*, *public beds* and three dummies, *sport1*, *sport2* and *sport3*. These variables stand for the number of private and public beds per thousand population, and the frequency of physical activity undertaken by individuals in the last month, respectively.[22]

The two-stage procedure suggested by Maddala (1983)[23] implies the following: in a first stage a probit regression is used to generate a predicted value for the choice of private health insurance, which provides a correction for endogeneity. This predicted value, labelled *private-hat*, is then used as a regressor in the second- stage estimation for utilization. Since the two measures of utilization are censored at zero, we use a tobit censored model in the second stage.

The results for both equations are shown in Table 4. It is worth noting that given that we use a generated regressor (*private-hat*), the standard errors are not strictly correct. Therefore, we compute bootstrap estimates for the standard errors of the coefficients (Tables A5 and A6 in the Appendix). According to Efron (1982), when the estimated bias is less than 25% of the standard errors, bias should not be a serious concern. In the outpatient equation, the estimated bias, as a percentage of the standard errors, fluctuated between 1% and 13%, while in the length of hospital stay equation it ranged between 3% and 25%. Thus, the estimated biases in this case are nothing to take note of.

We observe that private health insurance has a strong positive impact on the use of outpatient health services, but has no significant effect on the length of hospital stay. Basically, the elements that influence the choice of private insurance correlate positively with usage of that insurance in outpatient health services. Although moral hazard could be influencing this particular result, we think that a reasonable explanation for the differential impact of private insurance on the two measures of utilization relies on two main facts: first, while in terms of outpatient benefits the public sector is relatively unattractive,

[18] See Harmon and Nolan (2001), Chiappori *et al.* (1998), Holly *et al.* (1998), van de Ven (1987).
[19] Descriptive statistics and the definition of these two variables are presented in Tables A1 and A2, respectively, in the Appendix.
[20] Several variables included in X_1 have also been used in other empirical and theoretical studies on health services utilization. For a summary of the empirical results of some studies see Leopold and Langwell (1978, pp. 53–58).
[21] For details, see the discussion of *Model 5* in Maddala (1983, pp. 120–21).
[22] Descriptive statistics and the definition of the new variables included in the equations for utilization are shown in Table A1 and Table A2, respectively, in the Appendix.
[23] Maddala (1983) describes this procedure in the context of a series of models in line with the larger class of models discussed by Heckman (1976, 1978) and further extended by Lee (1976).

Table 4. Tobit second-stage coefficient estimates of outpatient health services and length of stay in hospital

	Outpatient health services		Length of stay in hospital	
	Coefficients	Std. Errors	Coefficients	Std. Errors
Private-hat	1.0814[a]	0.2003	1.4711	1.1551
Age	0.0186[a]	0.0072	−0.2185[a]	0.0416
Age squared	0.0003[a]	0.00007	0.0032[a]	0.0004
Female	1.9782[a]	0.0502	5.2575[a]	0.2952
Married	0.3512[a]	0.0533	3.3721[a]	0.3075
Education	0.2549[a]	0.0683	0.5764	0.3891
Income	1.59e-07[a]	5.60e-08	4.69e-07	3.04e-07
Very good health	−1.1615[a]	0.1181	−1.9284[a]	0.6805
Good health	−0.8434[a]	0.0539	−0.8065[a]	0.3072
Bad health	3.1661[a]	0.1065	9.7508[a]	0.5668
Very bad health	4.6858[a]	0.2908	15.115[a]	1.4403
Functional limitations	0.1351[a]	0.0254	0.2840 [b]	0.1413
Doctor	0.6816[a]	0.0806		
Sport1			−2.0712[a]	0.7454
Sport2			−2.7150[a]	0.4485
Sport3			−1.1011	0.8666
Public beds			1.1600[a]	0.2112
Private beds			−0.0898	0.2860
Urban	0.2867[a]	0.0752	−0.4069	0.3906
Constant	−7.6234[a]	0.1692	−36.8221[a]	1.0931

Notes: [a] significant at 1%.
[b] significant at 5%.
[c] significant at 10%.

it offers satisfactory hospital care. Second, the legal framework governing the public option allows privately insured patients to return to the public system if expensive treatment is needed. Private insurance is thus more attractive in the case of outpatient care, as it concentrates on relatively less expensive ambulatory benefits.[24]

Age proves to be an important determinant in both equations, although the pattern of influence is different. In interpreting the results, we find that outpatient health services seem to be part of the normal life, so individuals require these services steadily as they move through their life cycle. In contrast, the offsetting impact of age squared on age in the length of stay equation indicates that even though hospitalizations can occur at any age, the length of stay increases as individuals get older, when the stock of health depreciates.

Utilization is also higher among females, consistent with the well-documented fact that women generally make greater use of the health system. Sindelar (1982a) shows that when utilization is measured in monetary expenditure or physical quantity, women on average use more total medical services and more of each type, even after controlling for gynaecological and obstetric care and severity of illness.

Marital status has a significant impact on both measures of utilization, in line with other empirical studies (Sindelar, 1982b; Laroche, 2000). Education, on the other hand, is positive in both equations but is well-defined only for outpatient health services. This last result is consistent with the hypothesis that better-educated individuals would value more highly the benefits of using health services. But it differs from the view that higher education levels correlate with medical knowledge, so that more highly educated people would be capable of caring for their health more efficiently and therefore tend to make less use of health services.

Utilization is also responsive to individual income. Both measures of utilization increase as income increases. We observe, however, that the magnitude of the coefficient of income is rather low in both equations. This result is akin to that obtained by Cameron and Trivedi (1991), who find that income appears to be more crucial in determining health insurance choice than in explaining the utilization of health services.

The pattern of coefficient signs and the significance of the four dummies accounting for individuals' self-assessed health status clearly show that a poorer health condition increases both the use of outpatient

[24] This fact is also in line with administrative data, which show that privately insured tend to use relatively more outpatient health services than publicly insured.

health services and the length of hospital stay. Conversely, better health conditions allow individuals to reduce the use of outpatient health services and the number of days in hospital.

The significant impact of self-assessed health status on the utilization of health services contrasts with its rather low incidence in the insurance decision. In the utilization equations self-reported health status seems to effectively capture the individual health condition, but it appears to be more closely related to risk in the insurance equation.

Functional limitations, on the other hand, significantly increase the use of outpatient health services and positively affect the number of days in hospital.

The positive and well-defined coefficient of *doctor*, a regressor specific to the outpatient health services equation, indicates that utilization increases as the number of physicians increases. There is probably relatively more specialization in areas where physicians are more numerous, so for a given number of potential patients each doctor would attend fewer cases, propitiating the so-called induced demand by physicians (Pauly, 1978).[25]

The frequency of physical activity, described by the three dummies *sport1*, *sport2 and sport3*, has a negative effect on the length of stay in hospital. This means that, once hospitalized, individuals who practice some physical activity on a regular basis tend to spend fewer days in hospital, providing evidence of the importance of sporting activities in improving individual health status.

On the other hand, length of stay increases with the number of public beds per thousand population, and decreases (but not significantly) with the number of private beds per thousand population. These results are consistent with sample data that show the average length of stay in public hospitals is 9.2 days, while in private hospitals it is 5 days.[26] Two main factors could help explain these results: first, the cost per day of public beds is far lower than the cost of private beds. Second, the absence of pre-surgical hospitalization days in private compared to public hospitals, where in the latter patients may spend two or three days before the operation. This probably reflects the fact that patients in the private sector arrive with an established diagnosis, while public patients need to be re-diagnosed.

Finally, the dummy accounting for the condition urban/rural residence is statistically significant only in the outpatient health services equation. The positive sign of its coefficient indicates that urban residents tend to use more outpatient health services than rural ones. This result seems to indicate that where the supply of health services is regular and not subject to geographic or seasonal restrictions (as usually occurs in rural areas), the utilization of outpatient health services is greater.

VII. Summary

In this paper we looked at the choice of private health insurance and its relationship with the utilization of health services. The study was based on the eighth version of the *Casen* survey series, *Casen* 2000. This large-scale multipurpose survey has been conducted by the Chilean government since 1985 to gather information to characterize the population in both demographic and socio-economic terms, to monitor social programmes, and to assess public policies.

We developed an in-depth analysis of the determinants of individual's choice and discussed the impact of private health insurance on the utilization of health services. The results show the importance of some demographics on the insurance decision, particularly age, sex and marital status, and other factors such as education, income, employment status, risk and health status.

The estimates for age and self-assessed health status revealed a positive selection into private insurance (younger and healthier individuals are more likely to choose private insurance), although better measures of health status are required to test this point more precisely. It must be noted, however, that selection is driven by the different criteria used to set premiums under both insurance schemes: while private premiums are risk-adjusted, public premiums only reflect individual income level. This has been identified as a major structural problem that could be solved if the public insurer sets premiums contingent on its clients' risk, providing direct subsidies only to those who cannot afford the cost of insurance.

Since the utilization of health services was hypothesised to depend, among other factors, on the type of health insurance, we estimated a two-equation

[25] Pauly (1978) deals in some detail with a model in which physicians manipulate the demand curve for their services in the presence of imperfect information.

[26] The average length of stay by cause of hospitalization and type of health insurance is presented in Table A7, in the Appendix.

model using a two-stage procedure suggested by Maddala (1983). Two measures of utilization were analysed: outpatient health services and length of stay in hospital. As these two measures were censored at zero, a tobit censored model was employed in the second stage estimation for utilization.

Interestingly, the results showed that individuals covered by private insurance tend to use more outpatient health services, but do not spend longer stays in hospital. The first of these results seems to derive from the fact that private insurance provides better outpatient health services (usually less expensive compared to hospitalization), while the public option offers satisfactory hospital care. Probably the restrictive policies implemented by private insurers prevent individuals who anticipate the use of expensive health services (like those generated by inpatient services) from purchasing private insurance, as they are unlikely to be accepted as new clients. Individuals who anticipate greater utilization presumably also expect high out-of-pocket outlays, and if they cannot afford the higher cost of better quality cover offered by private providers, they will probably select the less expensive option of public insurance.

Whether over-utilization of outpatient health services by the privately insured is due to pure moral hazard, induced demand by physicians, or the result of the rationing of services prevalent in the public sector, is an empirical challenge that with the current available data is not possible to undertake. What is clear, however, is that over-utilization has at least two important economic implications. First, private insurers usually respond to over-consumption by increasing premiums. Second, over-consumption commonly implies over-expenditure in non-cost-effective health services.

To tackle the moral hazard problem, some have argued that private insurers should complement co-payments with deductibles. Of course, the potential benefits of such a policy depend on the effectiveness of deductibles in reducing excessive utilization. If moral hazard is an important feature of health expenditure, then not only deductibles are socially acceptable, but they improve welfare. However, according to Chiappori *et al.* (1998), imposing to everyone some minimum deductible is inefficient because it reduces the scope of mutually beneficial insurance contracts, without any gain in terms of aggregate risk.

The long-term viability of the private market clearly relies on the possibility of both controlling opportunistic behaviour and skimming the market. The latter, however, will turn to be increasingly difficult as the *Superintendencia de Isapres* (the regulator) is currently introducing several modifications in the legal framework governing private insurance, which will impede *Isapres* from discriminating individuals on the basis of factors other than age and sex.

Acknowledgements

I am grateful to Professor Richard Disney, at the School of Economics, University of Nottingham, for his comments on earlier drafts of this paper. The usual disclaimer for remaining errors holds.

References

Arrow, K. J. (1963) Uncertainty and the welfare economics of medical care, *American Economic Review*, **53**, 941–73.

Cameron, A. C. and Trivedi, P. K. (1991) The role of income and health risk in the choice of health insurance. Evidence from Australia, *Journal of Public Economics*, **45**, 1–28.

Cameron, A. C., Milne, F. and Piggott, J. (1988) A microeconomic model of the demand for health care and health insurance in Australia, *Review of Economic Studies*, **55**, 85–106.

Chiappori, P.-A., Durand, F. and Geoffard, P.-Y. (1998) Moral hazard and the demand for physician services: first lesson from a French natural experiment, *European Economic Review*, **42**, 499–511.

Efron, B. (1982) *The Jackknife, the Bootstrap and other Resampling Plans*, Society for Industrial and Applied Mathematics, PA.

Grossman, M. (1972a) The demand for health: a theoretical and empirical investigation, National Bureau of Economic Research, Occasional Paper 119, New York.

Grossman, M. (1972b) On the concept of health capital and the demand for health, *Journal of Political Economy*, **80**, 223–55.

Harmon, C. and Nolan, B. (2001) Health insurance and health services utilization in Ireland, *Health Economics*, **10**, 135–45.

Heckman, J. (1976) The common structure of statistical models of truncation, sample selection and limited dependent variables and a simple estimator for such models, *Annals of Economics and Social Measurements*, **5**, 475–92.

Heckman, J. (1978) Dummy endogenous variables in a simultaneous equation system, *Econometrica*, **46**, 931–59.

Holly, A., Gardiol, L., Domenighetti, G., *et al.* (1998) An econometric model of health care utilization and health insurance in Switzerland, *European Economic Review*, **42**, 513–22.

Hopkins, S. and Kidd, M. P. (1996) The determinants of the demand for private health insurance under medicare, *Applied Economics*, **28**, 1623–32.

Kifmann, M. (1998) Private health insurance in Chile: basic or complementary insurance for outpatient services?, *International Social Security Review*, **51**, 137–52.

Laroche, M. (2000) Health status and health services utilization of Canada's immigrant and non-immigrant populations, *Canadian Public Policy-Analyse de Politiques*, **26**, 51–75.

Lee, L. F. (1976) Estimation of limited dependent variable models by two-stage methods, PhD dissertation, University of Rochester.

Leopold, J. R. and Langwell, K. M. (1978) The demand for health care with special emphasis on cost containment: a review of the literature, in *National Commission on the Cost of Medical Care*, 1976–1977, Vol. 3, American Medical Association, Chicago.

Maddala, G. (1983) *Limited Dependent and Qualitative Variables in Econometrics*, Cambridge University Press, Cambridge.

McFadden, D. (1974) The measurement of urban travel demand, *Journal of Public Economics*, **3**, 303–28.

Pauly, M. V. (1978) Doctors and their workshops: physician influences on the use of medical resources, Unpublished Manuscript.

Propper, C. (1989) An econometric analysis of the demand for private health insurance in England and Wales, *Applied Economics*, **21**, 777–92.

Sanhueza, R. and Ruiz-Tagle, J. (2002) Choosing health insurance in a dual health care system: the Chilean case, *Journal of Applied Economics*, **1**, 157–84.

Sapelli, C. and Torche, A. (1998) El seguro previsional de salud: determinantes de la elección entre seguro público y privado, 1990–1994, *Cuadernos de Economía*, **106**, 383–406, Pontificia Universidad Católica de Chile.

Sindelar, J. L. (1982a) Differential use of medical care by sex, *Journal of Political Economy*, **90**, 1003–19.

Sindelar, J. L. (1982b) Behaviorally caused loss of health and the use of medical care, *Economic Inquiry*, **20**, 458–71.

Van de Ven, W. (1987) An econometric model for the simultaneous estimation of the demand for medical care and the demand for health insurance, *Economic Letter*, **24**, 299–303.

Van de Ven, W. and Van Praag, B. (1981) The demand for deductibles in private insurance: a probit model with sample selection, *Journal of Econometrics*, **17**, 229–52.

Wilcox-Gök, V. and Rubin, J. (1994) Health insurance cover among the elderly, *Social Science and Medicine*, **38**, 1521–9.

Appendix

Table A1. Descriptive statistics ($N = 28{,}797$)

	Percentage of observations = 1	Mean	St. Deviation
Dependent variables			
Private	26.15		
Outpatient health services		0.58	1.98
Length of stay in hospital		0.41	2.70
Explanatory variables			
Age		42.17	10.97
Female	26.73		
Married	75.26		
Education	48.11		
Income head[a]		255,142	617,584
Income spouse[a]		50,334	184,535
Income		162,529	443,246
Self-employed	7.25		
Permanent job	85.64		
Risk		4.73	7.39
Very good health	5.95		
Good health	31.33		
Bad health	1.47		
Very bad health	0.15		
Functional limitations		0.13	0.76
Doctor		0.84	0.38
Sport1	4.03		
Sport2	14.71		
Sport3	2.80		
Public beds		1.98	0.66
Private beds		0.56	0.56
Urban	21.73		

Note: [a] Reported in Chilean *pesos* (Ch$).

Table A2. Variable definitions

Dependent variables	
Private	Dummy: 1 = private insurance, 0 = public insurance.
Outpatient health services	Number of outpatient health services demanded in the last three months. This includes general consultations, consultations to specialists, consultations due to emergencies, laboratory exams and x-ray exams.
Length of stay in hospital	Nights spent in hospital in the last year by those who entered hospital.
Explanatory variables	
Age	Individual age in years.
Female	Dummy: 1 = female, 0 = male.
Married	Dummy: 1 = married, 0 = otherwise.
Education	Dummy: 1 = the individual has completed secondary education or above, 0 = otherwise
Income head & *income* spouse	Monthly monetary income of the head of household, and his/her spouse expressed in Chilean *pesos* (Ch$).
Income	Monthly monetary income of the individual expressed in Chilean *pesos* (Ch$).
Self-employed	Dummy: 1 = the individual works independently, 0 = otherwise.
Permanent job	Dummy: 1 = the individual has a permanent job, 0 = otherwise.
Risk	Interaction variable that measures individual risk. It was built using an index based on age and sex, multiplied by the number of dependants.
Very good health, good health, bad health, very bad health.	Dummies accounting for individual self-reported health status. The default category is *fair* health status.
Functional limitations	Number of functional limitations among household members.
Doctor	Number of doctors per thousand population.
Sport1–Sport3	Set of three dummy variables accounting for frequency of physical activity: (1) very frequently, (2) frequently and (3) occasionally. The omitted category is (4) never.
Public beds	Number of public beds per thousand population.
Private beds	Number of private beds per thousand population.
Urban	Dummy variable: 1 = individual lives in a major urban area, 0 = otherwise.
Private-hat	Predicted value for the probability of being privately insured.

Table A3. Age–sex factors

	Policyholder		Dependants	
Age group*	Male	Female	Male	Female
0–1	0.8	2.56	0.92	0.79
2–5	0.8	2.56	0.84	0.71
6–20	0.8	2.56	0.37	0.56
21–25	0.8	2.56	0.37	0.97
26–30	1.0	3.17	1.5	1.19
31–35	1.0	3.17	1.5	1.19
36–40	1.0	2.93	1.5	1.08
41–45	1.0	2.76	1.5	1.08
46–50	1.36	2.76	1.5	1.08
51–55	1.36	2.75	1.5	1.21
56–59	1.96	2.75	1.5	1.21
60–64	1.96	4.13	3.5	1.86
65–99	3.92	4.13	3.5	1.86

Note: * Factors for the age groups 0–1 and 2–5 (and partly those applied to ages below 15) constitute and administrative requirement established by the *Superintendencia de Isapres*.

Table A4. Population distribution by type of health insurance and self-assessed health status (percentages)

	Self-assessed health status				
Type of health insurance	Very good	Good	Fair	Bad	Very bad
Public	9.7	58.05	28.3	3.4	0.3
Private	16.3	68.7	14.4	1.2	0.2

Source: Author's own estimates obtained from the sample data, *Casen* 2000.

Table A5. Bootstrap statistics: outpatient health services equation

Variable	Observed Coefficient	Bias	Std. Error	[95% Conf. Interval]		
Private-hat	1.081418	0.0069813	0.1868323	0.7059643	1.456871	N
				0.7714884	1.448788	P
				0.7714884	1.448788	BC
Age	0.018602	0.0002093	0.0070247	0.0044853	0.0327187	N
				0.0069276	0.0335526	P
				0.0069276	0.0397387	BC
Age squared	0.0003137	−7.71e-07	0.0000726	0.0001678	0.0004596	N
				0.0001777	0.0004323	P
				0.0001777	0.0004323	BC
Female	1.978277	−0.0027352	0.0549466	1.867857	2.088696	N
				1.883827	2.070258	P
				1.883827	2.083183	BC
Married	0.351256	−0.0030293	0.0519808	0.2467967	0.4557152	N
				0.2604321	0.428677	P
				0.2604321	0.428677	BC
Education	0.2549363	0.0040131	0.0628795	0.1285752	0.3812973	N
				0.1193906	0.4002748	P
				0.1193433	0.4002748	BC
Income	1.59e-07	7.93e-09	6.20e-08	3.39e-08	2.83e-07	N
				4.43e-08	2.83e-07	P
				1.13e-08	2.77e-07	BC
Very good health	−1.161553	0.0030959	0.1294393	−1.421671	−0.9014353	N
				−1.34953	−0.8578193	P
				−1.34953	−0.8578193	BC
Good health	−0.8434877	−0.0044194	0.0544951	−0.9529997	−0.7339756	N
				−0.9270409	0.7602074	P
				−0.926503	−0.7437856	BC
Bad health	3.166198	0.0027574	0.1100321	2.94508	3.387316	N
				2.985139	3.374569	P
				2.965039	3.374569	BC
Very bad health	4.685832	0.0108592	0.4291095	3.823504	5.54816	N
				4.01875	5.462162	P
				3.976445	5.384478	BC
Functional limitations	0.135103	−0.0035995	0.0298885	0.0750399	0.1951662	N
				0.065792	0.189895	P
				0.065792	0.1965394	BC
Doctor	0.6816426	−0.0008719	0.0873033	0.5062001	0.8570851	N
				0.5344408	0.858408	P
				0.5452478	0.8744665	BC
Urban	0.2867317	−0.0091927	0.0692617	0.147545	0.4259184	N
				0.1683512	0.3907648	P
				0.1723509	0.3993684	BC

Notes: N = normal.
P = %ile, BC = bias-corrected.

Table A6. Bootstrap statistics: length of hospital stay equation

Variable	Observed Coefficient	Bias	Std. Error	[95% Conf. Interval]		
Private-hat	1.471146	−0.0957531	0.9790719	−0.4963727	3.438665	N
				−0.4480074	3.097635	P
				−0.4480074	3.712802	BC
Age	−0.2185924	0.0019876	0.0468486	−0.3127382	−0.1244465	N
				−0.3127777	−0.1290799	P
				−0.3290548	−0.1290799	BC
Age squared	0.0032036	−0.0000295	0.0004494	0.0023004	0.0041068	N
				0.0022994	0.0040863	P
				0.0022994	0.0041313	BC
Female	5.257538	0.0080687	0.2650316	4.724937	5.790139	N
				4.785659	5.688996	P
				4.352704	5.660018	BC
Married	3.372118	0.0239987	0.3295546	0.709853	4.034383	N
				2.642194	3.99398	P
				2.642194	3.99398	BC
Education	0.57646	0.0352897	0.3059025	−0.0382741	1.191194	N
				0.0297335	1.124712	P
				−0.0187879	1.122906	BC
Income	4.69e-07	−4.36e-08	2.34e-07	−1.43e-09	9.40e-07	N
				−3.09e-08	7.73e-07	P
				2.18e-08	1.12e-06	BC
Very good health	−1.928448	−0.0415101	0.5993046	−3.132796	−0.7241006	N
				−3.228251	−0.8488153	P
				−2.936841	−0.2846493	BC
Good health	−0.8065105	0.0516244	0.2736684	−1.356468	−0.2565533	N
				−1.240602	−0.2138578	P
				−1.52255	−0.3289705	BC
Bad health	9.750882	0.0336912	0.6797783	8.384817	11.11695	N
				8.344883	10.81794	P
				8.083352	10.81794	BC
Very bad health	15.115	−0.1286134	1.646873	11.80549	18.42452	N
				12.12641	17.6837	P
				12.12641	17.6837	BC
Functional limitations	0.2840275	−0.0259626	0.1237418	0.0353591	0.5326959	N
				0.039786	0.4953442	P
				0.0760743	0.5042887	BC
Sport1	−2.071258	−0.0102567	0.7763474	−3.631386	−0.5111294	N
				−3.699136	−0.7895854	P
				−4.046338	−0.8806403	BC
Sport2	−2.715068	−0.0946002	0.3658531	−3.450277	−1.979859	N
				−3.561649	−2.213953	P
				−3.561649	−2.205231	BC
Sport3	−1.101127	−0.1899809	0.8413717	−2.791926	0.5896729	N
				−2.916913	−0.0569668	P
				−2.778215	−0.0021314	BC
Public beds	1.160069	−0.0316289	0.2231599	0.711613	1.608526	N
				0.6646659	1.597487	P
				0.8898992	1.68455	BC
Private beds	−0.0898787	−0.0071638	0.2448602	−0.5819437	0.4021863	N
				−0.4749837	0.398724	P
				−0.4749837	0.5840049	BC
Urban	−0.4069578	−0.0783802	0.4103062	−1.231499	0.4175834	N
				−1.298752	0.2403799	P
				−1.137781	0.3133628	BC

Notes: N = normal.
P = %ile, BC = bias-corrected.

Table A7. Length of stay (days) by cause of hospitalization and type of health insurance

	Length of stay by cause of hospitalization			
Type of health insurance	Operation	Delivery	Medical treatment	Total
Public	9.6	4.4	11.9	9.2
Private	4.7	4.0	6.6	5.0

Source: Author's own estimates obtained from the sample data, *Casen* 2000.