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Public versus Private: Evidence on Health Insurance Selection

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Abstract

This paper models health insurance choice in Chile (public versus private) as a dynamic, stochastic process, where individuals consider premiums, expected out-of-pocket costs, personal characteristics and preferences. Insurance amenities and restrictions against pre-existing conditions among private insurers introduce asymmetry to the model. We confirm that the public system services a less healthy and wealthy population (adverse selection for public insurance). Simulation of choices over time predicts a slight crowding out of private insurance only for the most pessimistic scenario in terms of population aging and the evolution of education. Eliminating the restrictions on pre-existing conditions would slightly ameliorate the level (but not the trend) of the disproportionate accumulation of less healthy individuals in the public insurance program over time.

Keywords

Health insurance; adverse selection; public health

1 INTRODUCTION

Many countries have welcomed a mix of both public and private health insurance schemes. In the United States, policymakers have recently engaged in extensive debate over possible health reforms to cover the uninsured, improve coverage for the underinsured, and to contain escalating health care costs. Among reforms considered were the introduction of a public insurance option and the elimination of the ability of private insurers to impose barriers to entry through pre-existing conditions clauses. While ultimately, a public insurance option was abandoned, the elimination of pre-existing conditions clauses was enacted in 2010. While the U.S. has had limited historical experience with such policies, there is much to be learned from countries that do have a public-private mix of health insurance options.

The case of Chile is an illustrative example of a health insurance system in which public and private health insurance schemes exist side-by-side to cover individuals of all ages. By analyzing insurance choices in this country, we can draw lessons on what may be the impact of health insurance policy reform. Furthermore, the analysis of the Chilean case with panel data allows us to perform policy simulations and *ex-ante* program evaluation, where we can project whether adverse selection may contribute to a crowding out of private insurance, as well as what may be the impact of eliminating the ability of private insurance companies to restrict entry based on pre-existing conditions.

In Chile, workers and pensioners are required to purchase individual-based health insurance, and may choose either public or private coverage. The structure of insurance premiums, benefits and out-of-pocket costs differ between the two systems. In the private system, insurance premiums take into account the basic health risk of the insured and his or her dependents, and plans typically include more benefits as the premium increases. In contrast, in the public system individuals pay seven percent of their salaries, premiums increase with income but the benefits package does not improve as the premium increases. While the private system offers a wide variety of plans and often access to better technology and faster service, the public system offers a single benefits package, relies mostly on public hospitals, and may have longer wait times. Due to this structure, adverse selection arises as individuals with higher incomes are more likely to select a private plan as they can get more for their money. In contrast, those who have higher health risks may be more likely to choose public insurance, since premiums do not increase with greater utilization and out-of-pocket medical costs may be lower.

Furthermore, while people can move freely from the private to the public system, mobility in the other direction is limited. A negative health shock that is incurred while not covered by a private plan will henceforth be considered a pre-existing condition precluding coverage by any private plan in the future. Meanwhile, there are no such restrictions in the public system. This asymmetry in restrictions may imply that (i) sicker individuals accumulate in the public health system, as mobility from public to private is limited, and/or (ii) workers in the private system may maintain private coverage, even if in an unrestricted scenario they would optimally choose to move to the public system, due to the fear that unforeseen negative future health shocks may prevent them from ever switching back.

In this paper, we build and estimate a simple structural, dynamic model of health insurance choice through which we empirically test whether: (i) high-risk and poorer individuals are more likely to choose public insurance; (ii) the asymmetry in health insurance choice restrictions may prevent mobility from public to private insurance; (iii) the proportion of individuals in public insurance is predicted to increase over time and therefore to crowd out private insurance over time, as some experts have warned (Armstrong, 2009; Moffit, 2009); and (iv) the proportion of individuals in each system would change were the restrictions on pre-existing conditions eliminated.

Some of the questions we consider in this paper could be answered with simpler approaches. For instance, evidence of adverse selection can be directly observed by examining descriptive statistics. Table IV shows that the fraction of individuals in the public system increases with age, and holding age constant, it is greater for females. In addition, table VI suggests that participation in the public system decreases with health status. Likewise, Sapelli and Torche (2001) examine pricing and adverse selection in the Chilean health system. Relying on cross-sectional data from the “*Encuesta de Caracterización Socioeconómica Nacional*” (CASEN) survey,¹ the authors use a logistic model and find that the pricing system itself leads to rational segmentation of the healthy and wealthy into private insurance, and the poor and risky into public insurance.

Other previous research has also examined the choice of public versus private insurance in Chile. Sanhueza and Ruiz-Tagle (2002) also use CASEN to examine the determinants of insurance choice in Chile, but they focus on the endogeneity of this choice relative to expected service utilization. Henriquez (2006) uses a wide variety of explanatory variables to estimate the determinants that jointly affect both health insurance type and health care utilization decisions. Finally, unlike the aforementioned literature on health insurance in

¹National Socioeconomic Characterization Survey.

Chile, Duarte (2010) utilizes an individual-level administrative dataset from private health insurance companies to estimate the price elasticity of different health services, examining differences across demographic groups. By examining exogenous changes in out-of-pocket medical costs, his paper intends to predict willingness to pay for health care under alternative policies. This paper, however, is limited to the selection of plans within the private system only.

While the previous literature on insurance choice in the Chilean health system has highlighted issues of adverse selection, health insurance choice, health care utilization and the price elasticity of demand for health services, they rely exclusively on static models. However, the asymmetry in health insurance choice that pre-existing conditions impose makes the insurance selection an inherently dynamic problem as past insurance choices and past (as well as present) health status will influence one's choice of health insurance today.

In that regard, while most individuals can normally switch between systems at any time and in either direction (to the private system due to the higher amenities or to the public system due to potentially lower premium and/or out-of-pocket costs), the existence of pre-existing conditions imply that some individuals may get stuck in one system or the other due to an unexpected worsening in their health status. An individual under the above circumstances has no more choices to actively make. However, the probability (or fear) that one might get stuck in either system as a consequence of a negative future health shock (that is, the potentially irreversible nature of previous decisions) is what makes this model intrinsically dynamic. That is, given that current health insurance decisions can have important future repercussions, individuals would much rather prefer to get trapped in the better (at the time) of the two systems. Consequently, workers would make health insurance decisions considering all available information that they can use to predict future changes in health and income, including their age, sex, education, preferences and their health history.²

In addition, the structural approach allows us to identify the dynamic behavior of forward-looking individuals faced with health insurance choices, and to identify the underlying behavioral parameters driving individual behavior, given certain assumptions. Relying on these parameters, we can then perform policy simulations to (i) predict the evolution of such choices into the future, given some demographic assumptions on population aging, fertility, and the evolution of education, or (ii) to predict the impact of policy changes that have yet to be introduced.

Consequently, the objective and contribution of our paper is not to demonstrate or verify that there is adverse selection or mobility asymmetry, but to (i) account for those phenomena, and to exploit the panel nature of the data from the “*Encuesta de Protección Social*” (EPS) survey³ and the model dynamics, where past decisions (type of insurance and health status change) may affect present and future outcomes (out-of-pocket medical costs), in order to predict what decision people with certain characteristics under certain circumstances are more likely to make; and (ii) quantify the magnitude and welfare impact of the mobility asymmetry problem by simulating individuals' health insurance choices if restriction on pre-existing conditions were lifted.

Previous research has used a structural approach to examine dynamic choices around health and insurance among a variety of other populations. For example, Cardon and Hendel (2001) also estimate a structural model of health insurance and health care choices, in order

²An analogy could be that of an investor that contemplates every period whether to embark upon an investment project. Once its execution is decided and cannot be undone, the investor has no more decisions to make. Therefore, the permanent nature of this kind of decision causes the investor to use all available information to choose the optimal instant to start the investment project.

³Social Security Survey.

to examine the extent of adverse selection in the U.S. insurance market. Using data on single individuals, though the authors find evidence of adverse selection, they cannot link this problem to the existence of asymmetric information. Blau and Gilleskie (2000) develop a structural dynamic model of employment, insurance and health care consumption choices for individuals near retirement age in the U.S. The authors conduct simulations of the impact of health care reforms on employment decisions. Finally, while Gilleskie and Mroz (2004) focus mostly on health care utilization during the insurance year, their dynamic optimization problem involves endogenous health insurance choice at the beginning of each year. These papers contain research questions similar to ours and their choice of modeling technique were influential to our approach. However, our intent is not to model health care utilization or labor force participation, but rather hone in on health insurance selection only.

The question of whether public insurance may crowd out private insurance has received substantial attention in the literature. Cutler and Gruber (1996) found that the Medicaid expansions of the late 1980s and early 1990s in the United States led to substantial crowding out of private insurance. Controlling for a number of factors, they suggest that roughly 17 percent of the reduction of private health insurance coverage from 1987 to 1992 was due to crowding out by expansions in Medicare. This work sparked a number of papers exploring the crowd-out issue employing a variety of analysis methods and utilizing a number of different data sources. Estimates based on SIPP or CPS data suggest little or no crowd out from expansions in public insurance (Aizer and Grogger, 2003; Blumberg et al., 2000; Ham and Shore-Sheppard, 2005), while others based on CPS, NLSY and MEPS data range from 30-60 percent, depending on the population considered (Dubay and Kenney, 1997; Hudson et al., 2005; Lo Sasso and Buchmueller, 2004; Shore-Sheppard, 1996; Yazici and Kaestner, 2000). Gruber and Simon (2008) followed up with additional work on expansions in Medicaid in the 1990s, and find a similar rate of crowd-out, suggesting that the number of privately insured falls by about 60 percent as much as the number of publicly insured rises. To the authors' knowledge, there have been no previous studies analyzing insurance crowd-out in Chile.

The extent of crowd out is difficult to characterize for a number of reasons—we can only observe overall trends in coverage, which reflect macroeconomic changes and a host of other phenomena, and estimates are sensitive to the data and underlying assumptions of the methods utilized. Furthermore, it is impossible to identify crowd-out at the individual level. While the present article does not attempt to measure or explain existing crowd-out of private insurance, our simulations project into the future the extent to which individual decisions on health insurance coverage type may lead the public health system to squeeze out private insurance over time.

The paper is structured as follows. Section 2 provides a description of the data and summary statistics of the sample to be used. Section 3 briefly describes the Chilean health system. Section 4 describes the theoretical model and estimation method. Section 5 presents the results of the estimation and section 6 simulates insurance choice over time and performs *ex-ante* program evaluation. We conclude with a discussion of the findings in section 7.

2 DATA

This analysis relies on data from Chile's "*Encuesta de Proteccion Social*" (EPS) survey for 2002, 2004 and 2006, which follows a panel of individuals over time. The survey includes questions on health and insurance status, as well as household demographic characteristics, labor market status, and income.

Health status is measured by a self-reported general health status question, rated on a 6-point scale, from "very poor" to "excellent." As in Blau and Gilleskie (2000), for simplicity, we

dichotomize this variable to health being either good to excellent (the top three categories) or fair to very poor (the bottom three categories). While the survey contains other measures of health, such as past medical usage, including more variables to construct the health status variable would increase the number of parameters and computational burden significantly.

The combined panel consists of 16,251 individuals for whom there are observations for at least two years. First, we limit the sample to adults between the ages of 24 and 70, in order to focus on adults who have likely completed schooling and who are likely to have already made insurance changes.⁴ Second, as in Gilleskie and Mroz (2004), we keep only individuals with zero dependents in both years. That is, in our sample, other household members, if any, have either their own insurance plan or no insurance. We take this path for tractability, comparability and due to some data limitations. To model a household with dependents requires more complex joint modeling of fertility and health status over time for each household member (and his or her probability to continue to belong to the family in the future). Since the main scope of this paper is to focus on choices in the individual health insurance market, we leave adding dependents to the analysis for future research.

Fourth, we exclude individuals who report having either no insurance (“none”) or some “other” insurance in one of the two years, as there is no choice to be modeled in these cases for the following reasons. First, health insurance in Chile is mandatory for salaried workers, so having no health insurance is not a relevant option. Second, the response “other” corresponds mostly to health insurance provided by the armed forces and police exclusively to their members. That is, only the civilian population makes health insurance choices and the only relevant options are the public provider (FONASA) or any of the private providers (ISAPRE). Therefore, the elimination of observations that present no choice relevant to the model should not produce biased results. These restrictions reduce our sample size to 4,825 individuals.

Descriptive data suggest that the transition from public to private insurance is less frequent than a transition from private to public. Table III shows the transition matrix for individuals changing insurance status between 2004 and 2006 for the full EPS sample. The vast majority (91 percent) of individuals with public insurance in 2004 maintains public insurance in 2006, and just over two percent switch to private insurance. Of individuals with private insurance in 2004, only three-quarters maintain this insurance status in 2006, while 20 percent move to public insurance.

There are some differences by age and sex in the likelihood of transitioning between systems (Table IV, panel *a*). Both men and women are most likely to move from public to private insurance when they are younger than 35 years old, suggesting that private insurance is more attractive to healthier individuals. Women are most likely to move from private to public coverage in older ages, while men are most likely to move from private to public at younger ages. Possibly, women move to public coverage when their spouse passes, and/or move to public coverage when chronic disease or disability takes effect. Meanwhile, men may move with changes in job, income, health status, or health preference. In our estimation sample (Table IV, panel *b*), the general direction of these differences is maintained, though magnitudes do vary somewhat, mainly due to the elimination of non-earning individuals and individuals with dependents.

Official data on the number of members in the private health system tend to show that there may not be strong loyalty for the bulk of members of private health plans. The majority of individuals have been in their private insurance plan for five years or less, with a fifth of

⁴After age 65, premiums for private insurance do not change and income is not likely to change, as most individuals have retired.

individuals having participated in their plans for two years or less. At the same time, a quarter of individuals have been in the same plan for 10 or more years, suggesting that some individuals do not change insurance very often (Sanchez, 2005). These data, however, do not include any breakdown by age, sex, or other demographic characteristics.

In addition, our estimation sample shows that 93.2% of individuals maintained the same health insurance system between 2002 and 2006, and only 0.6% changed twice, suggesting a stay in their health system for no longer than two years. Specifically, mirroring the findings of Table IV, the percentage of workers that tend to remain at least five years in the public system (private system) is higher (lower) for older individuals. Similarly, the percentage of workers that tend to stay at least five years in the public system (private system) decreases (increases) the greater their number of years of schooling.

3 BRIEF DESCRIPTION OF THE HEALTH SYSTEM IN CHILE

The Chilean health system is mostly an individual health care market in that employers do not provide health insurance, though there are a few private plans for which unions negotiate directly with providers. By law, workers and pensioners must spend at least seven percent of their salary on health insurance and individuals can choose between a public provider (FONASA) and one of the private insurers (ISAPREs). The private system, which was created in 1981, currently consists of seven competitive open private insurance companies and five closed insurance companies that are only available to workers in certain industries. ISAPREs are supervised by Chile's Superintendency of Health.

The two systems differ structurally in terms of access to health providers, coverage, exclusions, out-of-pocket costs and premiums. The premium for public coverage is fixed at seven percent of one's salary and benefits are standard in terms of quality. Depending on the household's income and family structure, public insurance may completely or partially cover the enrollee and his or her family, independent of their risk characteristics. That is, public insurance provides a single fixed benefits package and its premium increases solely with income. In addition, public insurance automatically covers low-income individuals. This system, however, relies on public hospitals (and some associated private facilities), and may have longer wait times, higher variance in provider quality, and restrictions on where care may be obtained.

In contrast, in the private system, premiums are set by the insurer and reflect their expected medical costs, taking into account the basic health risk of the insured individual and his or her dependents (using publicly available information regarding age, sex, and number of dependents). The premiums consider a "table of factors" that reflects the "relative values for each enrollee as a function of whether the person is the head of the family or a dependent, sex and age" (Sanchez and Munoz, 2008), multiplied by the price of the plan, which is a function of the level of coverage.⁵ A major consequence of mandating individuals to pay at least seven percent of their salary is that private insurance companies tailor plans according to each individual's exogenously set premium. Therefore, this structure has led to the proliferation of an enormous quantity of plans that differ in terms of benefits, coverage (coinsurance rates and payment caps) and thus premiums. However, a very limited subset of them with similar costs is available to each particular enrollee. For instance, by January 2011, there were more 12,000 different plans available for purchase in the private system whose enormous variety of characteristics are hard to evaluate or compare (Sanchez, 2011), leading to important information costs. In fact, about 47 percent of enrollees in the private

⁵See Appendix B.

system claim to be uninformed about how to access the services provided by their own insurer (Agostini, Saavedra and Willington, 2007).

Individuals must report all pre-existing conditions before enrolling in private plans, for which they may be denied partial or complete coverage. Policyholders can terminate the contract with private providers at any time after one year, and then move freely to the public system or to another private insurer. Private insurance tends to be more attractive for outpatient usage, as the cost of care tends to be lower and of higher quality.⁶ However, for more serious health conditions requiring expensive treatment, the public system becomes more appealing due to its lower out-of-pocket cost (Henriquez, 2006). Consequently, the structure of this system tends to discriminate against people with higher health risk, such as women of prime childbearing ages and older individuals.

Currently, the public system covers 12.5 million people (73.5 percent of population), while private companies insure about 2.8 million individuals, or about 16.3 percent of the population.⁷ In addition, there is clear evidence of market concentration within the private system. While there were 21 open private providers in 1995, this number has fallen over time to 15 by 2000 and to only seven open providers by 2011. Four of these companies covered more than 80 percent of individuals with private insurance in 2011 (Superintendencia de Salud, 2011).

4 THE MODEL

The discrete choice that each individual makes annually is which type of health insurance to select (ℓ), private or public, where the sources of uncertainty are the evolution of health status and income.

$$\ell = \begin{cases} 0 & \text{if Public} \\ 1 & \text{if Private} \end{cases} \quad (1)$$

We quantify health status (h) by classifying the answers to the question “Would you say your health is excellent, very good, good, fair, poor and very poor?” into two categories:

$$h = \begin{cases} 0 & \text{if good to excellent} \\ 1 & \text{if fair to very poor} \end{cases} \quad (2)$$

For computational tractability, we do not model health care utilization. However, income and education are important variables in determining preventive care utilization, and thus important in determining the evolution of health status over time. As in Ross and Wu (1995) and Cutler and Lleras-Muney (2006), education can be linked to health both directly (more educated people tend to be more informed and therefore take better care of themselves) and indirectly (more education implies more income and, thus, more medical care, since since health care is a normal good). Consequently, the probability of bad health for that an individual of age t (π_t) follows a stochastic process that is a function of the individual's health status at the beginning of the year, age (t), sex (f)⁸ and education (S) as a proxy for health utilization:

⁶Private plans typically provide access to better technology, faster service and choice around health facilities and doctors.

⁷About 10 percent either belong to the Armed Forces insurance system or are uninsured (Superintendencia de Salud, 2011).

⁸Females, all else equal, tend to be more likely to transit to a low health status than males, consistent with the observed higher morbidity for women. See, for instance, Verbrugge (1985).

$$\pi_t = \frac{\exp\{\gamma_0 + \gamma_1 h_{t-1} + \gamma_2 t + \gamma_3 f + \gamma_4 S_t\}}{1 + \exp\{\gamma_0 + \gamma_1 h_{t-1} + \gamma_2 t + \gamma_3 f + \gamma_4 S_t\}} \quad (3)$$

4.1 Utility Function and Budget Constraint

Let C_t be a bundle of goods for household consumption at age t . The utility an individual with health insurance choice ℓ receives every period is given by the following utility function:⁹

$$U_\ell(C_t) = \alpha_0 + \alpha_1 \ell_t + \alpha_2 h_t + C_t^\ell \quad (4)$$

where α_1 would capture the direct utility that private amenities, such as health care quality, access to new technologies and short waiting time, provides to the individual, and parameter α_2 would incorporate the direct utility from the individual's health status, including physical and mental discomfort of sickness.¹⁰

The per-period budget constraint is given by:

$$C_t^\ell = Y_t - I_t^\ell - h_t m_t^\ell \quad (5)$$

where Y_t is the monthly income, I_t^ℓ is insurance premium, and m_t^ℓ is the out-of-pocket medical treatment costs.

The standard earnings function is given by

$$\log Y_t = \eta_0 + \eta_1 S + \eta_2 t + \eta_3 t^2 + \xi_t = W_t + \xi_t \quad (6)$$

where S is the person's years of formal schooling and ξ_t is a serially uncorrelated log-normally distributed shock with a zero mean and a finite σ_ξ^2 variance.

Note that variables such as age and gender affect the probability of bad health (π_t). Once sick, however, the out-of-pocket medical costs that an individual would face are mostly determined by size of the insurance coverage he or she is entitled to at each point in time:

$$m_t^\ell = \rho_0 + \rho_1 \ell_t + \rho_2 \ell_t (1 - \ell_{t-1}) h_{t-1} \quad (7)$$

where ρ_1 captures the additional impact on out-of-pocket medical costs of quality and amenities of the private system relative to the public system ρ_0 .

An individual restricted by pre-existing condition clauses is one that is kept from switching to the private system because he or she currently has a health condition that private insurance provider are entitled by law to deny coverage. Notice that the dummy variable $\ell(1 - \ell_{t-1})h_{t-1}$ captures the pre-existing condition situation. Specifically, for an individual that is currently in the public system and contemplates switching to the private system but had moved to a low health status in the previous period (that is, $\ell_{t-1} = 0$, $\ell_t = 1$ and $h_{t-1} = 1$), if the sickness qualifies as a pre-existing condition, the person would face much larger out-of-

⁹As in Eckstein and Wolpin (1989), we assume for simplicity a linear utility function as it allows us to solve the model analytically. We can justify this assumption given the mandatory nature of the health insurance system in Chile in that workers' main decision is not whether to get insurance (like in the U.S.), but what type of insurance to buy: one that is more expensive but of better quality or one that is superior in quality but potentially more economical.

¹⁰Note that both health insurance choice and health status also affect utility through the budget constraint.

pocket medical costs than if he or she had received the shock while in the private system. Since private insurance providers are entitled to expel or deny coverage if a person fails to declare any pre-existing health condition, the person would be forced to either pay all medical costs out-of-pocket or stay in the public system. Such practices arise from the fact that, due to moral hazard, private health insurance companies assume that individuals may behave strategically as they expect to use medical care more intensely in the near future and find better quality and better coverage in the private system. Therefore, we expect a positive value for the ρ_2 coefficient.

In terms of the premiums, while workers pay seven percent of their salary for public insurance regardless of utilization (I_t^0), premiums in the private system are set by the insurer. The private premium depends both on the expected medical costs and coverage level. A “table of factors” that captures the basic health risk of the insured and his or her dependents (such as sex and age), reflects the household’s expected medical costs (see Appendix B).¹¹ As mentioned earlier, private insurers offer a wide variety of plans that differ in terms of benefits, coverage and thus prices. We assume for simplicity that private premiums (I_t^1) are a deterministic function of age and sex of the head of the family and his or her dependants:

$$\begin{aligned} I_t^0 &= 0.07Y_t \\ I_t^1 &= \delta_0 + \delta_1 f_t (1 + \lambda_t) \end{aligned} \quad (8)$$

where f_t computes the joint impact on the private insurance premium of the liaises’ age and gender, and λ_t represents the increase in premium due to the addition of dependents. As mentioned earlier, we limit the sample to respondents with no dependants ($\lambda_t = 0$).

Let $\Omega_t = (\ell_{t-1}, h_{t-1}, S, t, f_t, \xi_t)$ represent the vector of state variables.

4.2 Solution

This section briefly presents the model’s solution method. A more detailed description can be found in Appendix A.

Each individual of age t maximizes the present discounted value of utility over a time horizon until reaching an age T . Every period, individuals choose their health insurance of type $\ell \in \{0, 1\}$, given the state space Ω_t (including the realization of the earnings shock parameter, ξ_t) and the discount factor β .

$$V(\Omega_t) = \max_{\ell_t} E_t \left\{ \sum_{\tau=t}^T \beta^{\tau-t} \left[\ell_\tau U_\tau(C_\tau^1) + (1 - \ell_\tau) U_\tau(C_\tau^0) \right] \right\} \quad (9)$$

The value function above can be expressed as the maximum of the value functions that are specific to each health insurance type $V_\ell(\Omega_t)$,

$$V(\Omega_t) = \max \{V_0(\Omega_t), V_1(\Omega_t)\} \quad (10)$$

where

$$V_\ell(\Omega_t) = E_t U_\ell(C_t^\ell) + \beta E_t V(\Omega_{t+1} | \ell_t) \quad (11)$$

¹¹By law, private insurance companies cannot base their premiums on the current member’s health status.

For computational tractability, we set a maximum age $T = 70$ until which individuals actively make health insurance choices. That is, at age T individuals choose the insurance type that they will maintain for the rest of their lives.¹² Consequently, an individual of age T solves a static decision problem that affects their contemporaneous and future utility. In particular, he or she would prefer public health insurance for ages $t \geq T$ if the implied present discounted value of lifetime utility associated with that choice is greater than that for private health insurance. That is, if

$$V_0(\Omega_T) \geq V_1(\Omega_T) \quad (12)$$

Given that increases in earnings (Y_t) raise the public insurance premium (I_t^0) without corresponding increases in benefits, then, holding everything else constant, people with earning levels “sufficiently low” will prefer public insurance; otherwise they would choose private health insurance. Defining $\xi_t^*(\Omega_t)$ as the cutoff value for the earnings’ error term, ξ_t , that would make the health insurance options equally attractive for an individual, then he or she would prefer public health insurance if the realization of the earnings shock parameter (ξ_T) is lower than the aforementioned cutoff. That is, if:

$$\xi_T \leq \xi_t^*(\Omega_T) \quad (13)$$

Consequently, the health insurance decision rule at age T is given by the binomial logit form:

$$\ell_T = \begin{cases} 0 & \text{if } \xi_T \leq \xi_t^*(\Omega_T) \\ 1 & \text{if } \xi_T > \xi_t^*(\Omega_T) \end{cases} \quad (14)$$

Solving backwards, individuals of age $T - 1$ make health insurance decisions in a similar fashion. That is, they compare the value functions specific to each insurance type:

$$V(\Omega_{T-1}) = \max \{V_0(\Omega_{T-1}), V_1(\Omega_{T-1})\} \quad (15)$$

Unlike for the terminal age T , individuals of age $T - 1$ now consider the expected impact of current decisions on decisions for age T , which is given by the second term of the right-hand side of each insurance-specific value functions:

$$V_\ell(\Omega_{T-1}) = E_t U_\ell(C_{T-1}^\ell) + \beta E_{T-1} V(\Omega_T | \ell_{T-1}) \quad (16)$$

Notice that the term $\beta E_{T-1} V(\Omega_T | \ell_{T-1})$, which captures the expected discounted value function for age T with information as of age $T - 1$, equals the weighted average of the insurance-specific value functions,

$$E_{T-1} V(\Omega_T | \ell_{T-1}) = V_0(\Omega_T | \xi_T \leq \xi_t^*(\Omega_T | \ell_{T-1})) \cdot \Pr(\xi_T \leq \xi_t^*(\Omega_T | \ell_{T-1})) + V_1(\Omega_T | \xi_T > \xi_t^*(\Omega_T | \ell_{T-1})) \cdot \Pr(\xi_T > \xi_t^*(\Omega_T | \ell_{T-1}))$$

¹²This assumption is plausible, since, after the age of 70, pension earnings tends to be rather predictable and premium rates for private insurance do not change (see Appendix B).

where the weights are the probabilities of choosing either options that arise from the decision rules found for individuals of age T (equation (14)).

Following the methodology described above, it is possible to compute the cutoffs, $\chi_t^*(\Omega_{T-1})$, and the decision rules, ℓ_{T-1} , as a function of the relevant state space for age $T-1$, as well as for all each ages $t < T-1$.

With respect to the earnings function, as in Eckstein and Wolpin (1989), we assume that the salaries are reported with error, which helps alleviate the impact of outlier observations in the likelihood function.

$$\log Y_t^r = \log Y_t + \psi_t \quad (17)$$

where Y_t^r is the reported income, Y_t is the true income, $\psi_t \sim N(0, \sigma_\psi^2)$ and $E(\xi_t \psi_t) = 0$.

The probabilities of choosing either system provided by the solution of the optimization problem through the cutoffs ($\xi_t^*(\Omega_t)$), define the corresponding likelihood function:

$$L = \prod_n \prod_{\tau=t}^T \Pr(\xi_\tau > \xi_t^*(\Omega_\tau))^{\ell_\tau} \Pr(\xi_\tau \leq \xi_t^*(\Omega_\tau))^{1-\ell_\tau} \quad (18)$$

where for each individual τ

$$\Pr(\xi_t \leq \xi_t^*(\Omega_\tau), Y_\tau^r) = \Phi\left(\frac{\xi_t^*(\Omega_\tau) - k \frac{\sigma_\xi}{\sigma_\xi} u_\tau}{\sigma_\xi \sqrt{1-k^2}}\right) \frac{1}{\sigma_u} \phi\left(\frac{u_\tau}{\sigma_u}\right) \quad (19)$$

and $\Phi(\cdot)$ is the cumulative normal distribution function, $\phi(\cdot)$ is the normal probability density function, $u_\tau = \xi_\tau + \psi_\tau$, $\kappa = \sigma_\xi / \sigma_\psi$ and $\sigma_u = \sqrt{\sigma_\xi^2 + \sigma_\psi^2 (1-k^2)}$.

We follow a standard estimation algorithm. Given an initial set of parameter values, the computer calculates all predicted decisions (as given by the cutoffs, $\xi_t^*(\Omega_t)$), and computes the likelihood function value using the actual decisions (ℓ s). The optimization program finds a new set of parameters and the iterative process is repeated until the improvement in the likelihood function falls below a certain convergence criteria. The resulting set of parameters provides predicted responses that best match the actual responses.

The “initial condition problem,” as described in Heckman (1981), implies that the use of predetermined state variables as initial conditions normally generates inconsistent parameter estimates, as they contain information from previous choices. When the shocks are not serially correlated, however, these estimations problems need not occur. Consequently, as in Eckstein and Wolpin (1999) and Todd and Wolpin (2006), we assume serial independence of the error term (ξ_t). This assumption allows us to use observed values of the state variables, including age (26 years old), sex, education, health status and health insurance, in the likelihood function, without implying inconsistent estimates.

4.3 Identification

Though the variables of a structural model are identified by construction, the solution of the model and the functional form of some of its equations may imply that some variables cannot be uniquely identified. In this model, the functional form of the earning function and data on health status, earnings, age and health insurance participation allow the direct

identification of the following parameters: the cutoff values ($\xi_t^*(\Omega_t)$), the probability of change in health status parameters ($\gamma_0, \gamma_1, \gamma_2, \gamma_3, \gamma_4, \sigma_h^2$), the earnings parameters ($\eta_0, \eta_1, \eta_2, \eta_3$), the utility from public insurance amenities (α_0), the medical cost of sickness in the public sector (ρ_0), the medical cost of sickness under potential pre-existing condition exclusions (ρ_2), the joint impact of the affiliates' age and gender on the private insurance premium (δ_1), the volatility of "true" earnings (σ_ε^2) and the volatility of reported earnings (σ_ψ^2). In addition, the following groups of parameters are identified: $c_1 = \alpha_1 - \delta_0 + \beta\theta_0$, $c_2 = \alpha_2 - \rho_0 + \beta\theta_1$, $c_3 = \alpha_1 - \delta_0$ and $c_4 = \alpha_2 - \rho_0$, which allow us to identify and obtain the values for the terminal value function parameters ($\theta_0 = 11314.4$ and $\theta_1 = 6904.8$).

The functional form assumptions of the structural model, however, does not allow for the unique identification of four parameters. As observed from equations (25) and (26), the utility from private insurance amenities (α_1) cannot be identified from the cost of those amenities included in the private insurance premium (δ_0). Equivalently, the disutility from being sick (α_2) cannot be distinguished from the medical cost of sickness in the public sector (ρ_0). However, the difference between the aforementioned parameters, $c_3 = \alpha_1 - \delta_0$ and $c_4 = \alpha_2 - \rho_0$, are identified and they can be directly interpreted as the net direct utility of being insured in the private system and the net direct utility of being sick, respectively.

5 RESULTS

Table V presents the maximum likelihood results. First, there is persistence in health status ($\gamma_1 > 0$) as the probability of poor health depends significantly on the state of health in the previous period. In addition, as expected this probability increases with age and if the individual is female ($\gamma_2 > 0$ and $\gamma_3 > 0$), and it is lower the more educated the person is $\gamma_4 > 0$.

Second, as one might expect, the potential cost of pre-existing conditions reduces the marginal utility of switching to the private system (that is, $\rho_2 > 0$). We can interpret this parameter as the value of relaxing the pre-existing conditions restriction to an individual who has transited to a poor health status while outside of the private system. In particular, he or she would be willing to pay on average roughly 35,000 Chilean pesos extra every month in addition to the premium, or almost 25 percent of the sample's median monthly wage, to gain access to private insurance.¹³ This result suggests that the existence of the pre-existing conditions restrictions may lead to more individuals involuntarily choosing public insurance.

Third, as observed in the raw data, the marginal utility of participating in the private system is decreasing for females and falls with age (that is, $\delta_1 > 0$). At the same time, since wages increase with education ($\eta_1 > 0$), an individual is less likely to choose public insurance as income increases, since the public premium increases with income, but with no accompanying increase in benefits. The marginal utility of choosing private insurance is positively affected by the age of individuals due to its correlation with labor experience ($\eta_2 > 0$). Intuitively, the impact of experience on salaries, all else equal, raises the premium in the public system while keeping its benefits and the private premium constant.

Table VI shows the actual insurance participation rates and those predicted by the model on the overall as well as by age category, sex, education and health status. the model does a good job of estimating true participation, judged by the 95-percent confidence chi-square test of goodness of fit.

¹³Given that people affected by pre-existing conditions would remain uncovered by the private system and thus would not switch, ρ_2 captures a monthly cost instead of a lump sum payment.

The results by health status in d reveal that, indeed, individuals with a lower health status are more likely to choose public insurance, as out-of-pocket medical costs tend to be more predictable and, in some cases, lower (in particular for low income individuals). However, it could also be a consequence of pre-existing condition clauses for private insurance as leaving the public system may not even be an option for those who have transitioned to low health status. Examining these choices by age and health status, both the model predictions and the actual data show higher public participation for people with poor health, regardless of age category. At young ages, however, participation in the private system is substantially higher for those with good health than for those with poor health.

6 SIMULATIONS

Having estimated the structural parameters for the model, we can conduct simulations in order to examine (1) the evolution of insurance choice over time, (2) its impact if the restriction on pre-existing conditions were to be eliminated.

6.1 Accumulation of Individuals Over Time

In order to project decisions in participation in either system over time, we need to make some assumptions upon the evolution of some demographic variables. To project mortality over time we use age and sex-specific death rates from the 2008 World Health Organization (WHO) life table. For population growth, we assume that the number of individuals entering the sample at age 26 increases by a simple rate r with respect to the cohort that entered in the previous period, while maintaining a standard male-to-female sex ratio of 1.04. In order to account for a realistic aging population, we calibrate r so that it implies a sample median age that increases over time at a rate similar to the one projected for Chile for the next 40 years. To replicate a population that ages at a rate of 0.8096 percent per year (United Nations, 2009), it was necessary to set $r = 1.31$ percent. We also project a population that ages more quickly by assuming a scenario with no population growth ($r = 0$).

With respect to the evolution of education, we assume that the average years of schooling of each new cohort that enters the sample in 2010 or later grows at a certain annual growth rate g . As a “realistic” scenario, we set g equal to the long-run annual growth rate of years of schooling of each cohort relative to the immediately older cohort, which in our dataset we find it to be equal to 0.76336 percent. For a pessimistic scenario, we assume $g = 0$.

Figure 1 shows the projected participation in public insurance through year 2045, under four different scenarios, ranked from more optimistic to more pessimistic: (i) $r = 1.31$ percent and $g = 0.76336$ percent; (ii) $r = 0$ and $g = 0.76336$ percent; (iii) $r = 1.31$ percent and $g = 0$; and (iv) $r = 0$ and $g = 0$. For scenario (i), we observe a gradual drop in public participation over time. This result is mostly driven by the increasing average years of schooling for younger individuals in the estimation sample, which results in higher earning power over time. Since education levels keep rising with entering cohorts, the percent of individuals choosing public continues to fall over time.

Under the second scenario, public participation follows a declining path similar to scenario (i) but at a higher level due to the faster population aging (1.01 percent vs. the 0.8096 percent). For scenario (iii), participation in the public system stays almost constant over time. The impact of the sample’s rising average educational level is roughly offset by the impact of a constantly aging population.

Finally, scenario (iv) is the most pessimistic one as it assumes no growth in the size of the new young cohorts or its educational levels. This scenario is the only one that shows a gradual increase in public participation over time, as the overall average education level

grows only because new generations have more years of schooling on average than generations that exit the sample due to death. However, the gain in purchasing power under this scenario is not enough to compensate for the impact of an increasingly older population.

While the time path of participation depends upon the scenario, a realistic case probably lies somewhere between scenarios (i) and (iv); that is, the median age and years of schooling of new cohorts grow, but at decreasing rates. The most likely outcome of such scenario is one in which neither insurance type is crowded out over time.

It is worth mentioning that while education is a major determinant of income that drives much of the insurance decision, its importance in explaining the long-run evolution of selection over time lies mostly in the fact that the average years of schooling for younger workers is greater than for older generations. Consequently, the sample's average level of education increases over time, even if the education level in each new generation were kept constant. Policy changes aimed at increasing high school and graduation rates should have great impact on insurance selection in the long run.

6.2 Relaxing the Restriction on Pre-Existing Conditions

Lifting these restrictions would allow enrollees with pre-existing medical conditions to reduce out-of-pocket medical costs, since as of today they are either uncovered or must insure themselves in the public system. At the same time, however, the elimination of these clauses would increase the pool of sicker patients in the private system, raising expected medical costs for the insurer. Consequently, in the absence of additional interventions, premiums in the private system would have to increase, imposing welfare costs on individuals currently enrolled in private plans. The decrease in out-of-pocket medical cost for affected individuals combined with the corresponding increase in private premiums make it difficult to predict the net flow of individuals between systems.

A scenario that is possible to analyze is one in which the government provides offsetting subsidies to private plans in order to cover the increased medical costs. Given that adverse selection in the public system ultimately imposes costs to taxpayers by subsidizing sicker individuals, providing offsetting subsidies to the private system would not substantially alter the government role, yet would give sicker people the opportunity to access higher quality medical services. A simple way to analyze this case is by setting the value of the parameter ρ_2 equal to zero. That is, given a transition to a poor health status while not in the private system, individuals would not expect higher out-of-pocket medical costs if they chose private in following periods.

Table VII suggests a noteworthy change in participation. In particular for individuals with poor health status, private participation rises from 3.4 percent to almost 10 percent. Therefore, the limitation on individuals with pre-existing conditions does impose a constraint for many individuals. This result is particularly important for younger individuals, while less substantial for individuals older than 60 years old.

Figure 2 shows the projected participation in the public system over time, including the case with no preexisting conditions clauses in place, under the two opposite extreme scenarios with respect to population aging and the evolution of education. This figure suggests that public participation falls by about 2-2.5 percent with respect to the *status quo* throughout 2045, although there is no evidence of a trend change.

The less substantial impact of this policy change on the overall sample may result from the fact that pre-existing condition restrictions limit not only the flow of people with poor health towards the private system, but indirectly they also limit the flow in the opposite direction.

Intuitively, under some circumstances, individuals may find themselves captive in the private system knowing that if they ever exit, they might never be able to return if their health unexpectedly deteriorates. That is, pre-existing condition clauses limit the flow in both directions, which implies that an elimination of these restrictions would not necessarily imply a sizable net flow of people moving towards the private system.

Table VIII shows the predicted flow of individuals between systems. As expected, 100 percent of those moving to the private system present poor health status. In addition, those moving in the opposite direction tend to present good health. As indicated earlier, these individuals may have chosen private in order to avoid being permanently excluded from the private system were they to become ill in the future. With no pre-existing condition clauses, some individuals can save on premium costs by switching to the public system while healthy without fearing the consequences if they get sick outside of the private system.

7 CONCLUSIONS

This paper builds a dynamic stochastic model of an individual's choice of health insurance type. The model accounts for (i) asymmetry in restrictions regarding pre-existing health conditions, and (ii) differences in insurance premiums, allowing us to quantify the dynamic effects of these processes on individual health insurance choices.

While our findings confirm that the population insured by the public system is indeed less healthy and wealthy, aside from the most pessimistic scenario, we do not find evidence that the structural features of the insurance system will lead to the accumulation of individuals into public insurance or crowding out of private insurance. In contrast, the model predicts that over time, the percent of individuals choosing private insurance may gradually increase if the average education grows quickly enough over time. That is, the increased earnings power due to higher levels of education in the population more than compensate for the existence of a constantly aging population.

We find that restrictions on pre-existing conditions are indeed binding for individuals who present poor health. Forbidding such restrictions, as the law recently passed in the U.S. does, would almost triple the percent of individuals with poor health status who choose private insurance.

APPENDIX

A Solution

An individual of age t chooses the health insurance of type A that maximizes his or her present discounted value of lifetime utility:

$$V(\Omega_t) = \max_{\ell_t} E_t \left\{ \sum_{\tau=t}^T \beta^{\tau-t} \left[\ell_{\tau} U_{\tau}^1(C_{\tau}^1) + (1 - \ell_{\tau}) U_{\tau}^0(C_{\tau}^0) \right] \right\} = \max \{V_0(\Omega_t), V_1(\Omega_t)\} \quad (20)$$

At the terminal age T , the value function corresponding to each option is given by:

$$\begin{aligned} V_0(\Omega_T) &= \alpha_0 + \exp\{W_T + \xi_T\} - 0.07 \cdot \exp\{W_T + \xi_T\} + \pi_T(\alpha_2 - \rho_0) + \beta \bar{V}_0 \\ V_1(\Omega_T) &= \alpha_0 + \alpha_1 - \delta_0 - \delta_1 f t_T - \pi_T[\alpha_2 - \rho_0 - \rho_1 - \rho_2(1 - \ell_{T-1})h_{T-1}] + \exp\{W_T + \xi_T\} + \beta V_1 \end{aligned} \quad (21)$$

where $\bar{V}_t = \bar{V}(\Omega_t | \ell_t)$ captures future utility, which we assume is a function of the state space for age T , and whose parameters are jointly estimated with the other parameters of the

model.¹⁴ Note that since health status is unknown at the beginning of each year, the expected out-of-pocket cost of poor health is given by its expected value (i.e., $E_t h_t m_t^\ell = \pi_t m_t^\ell$).

The cutoff value for the earnings's error term from which individuals base their health insurance decisions is given by

$$\xi_t^* (\Omega_t) = \log \{-c_1 + \pi_t (\rho_1 + \rho_2 (1 - \ell_{t-1}) h_{t-1}) + \delta_1 f t_t\} - \log (0.07) - W_t \quad (22)$$

where $c_1 = \alpha_1 - \delta_0 + \beta \theta_0$. That is, an individual of age T would choose private insurance for ages if $\xi_t \geq \xi_t^* (\Omega_t)$.

The expected discounted value function at age T is:

$$\begin{aligned} E_{T-1} V (\Omega_T) &= [\alpha_0 + \pi_T (\alpha_2 - \rho_0 + \beta \theta_1)] \cdot \Pr (\xi_T \leq \xi_T^* (\Omega_T)) \\ &+ (1 - 0.07) \exp \{W_T\} E_{T-1} \{e^{\xi_T} | \xi_T \leq \xi_T^* (\Omega_T)\} \Pr (\xi_T \leq \xi_T^* (\Omega_T)) [\alpha_0 + \alpha_1 - \delta_0 + \pi_T (\alpha_2 - \rho_0 - \rho_1 + \beta \theta_1 - \rho_2 (1 - \ell_{T-1}) h_{T-1} + \beta \theta_0 \\ &+ \exp \{W_T\} E_{T-1} \{e^{\xi_T} | \xi_T > \xi_T^* (\Omega_T)\} \Pr (\xi_T > \xi_T^* (\Omega_T)) \end{aligned}$$

which, given the assumption of normal distribution for ξ , implies

$$\begin{aligned} E_{T-1} V (\Omega_T) &= \alpha_0 + c_2 \pi_T + \exp \{W_T\} e^{0.5 \sigma_\xi^2} \left[1 - 0.07 \cdot \Phi \left(\frac{\xi_T^* (\Omega_T) - \sigma_\xi^2}{\sigma_\xi} \right) \right] \\ &+ [c_1 - (\rho_1 + \rho_2 (1 - \ell_{T-1}) h_{T-1}) \pi_T - \delta_1 f t_T] \left[1 - \Phi \left(\frac{\xi_T^* (\Omega_T)}{\sigma_\xi} \right) \right] \end{aligned} \quad (23)$$

where $c_2 = \alpha_2 - \rho_0 + \beta \theta_1$ and $\Phi(\cdot)$ is the cumulative distribution function for the normal distribution.

Solving backwards brings in the value functions for each age $t < T$ as a function of the relevant state space:

$$\begin{aligned} V_0 (\Omega_t) &= \alpha_0 + \pi_t (\alpha_2 - \rho_0) + \exp \{W_t + \xi_t\} - 0.07 \exp \{W_t + \xi_t\} + \beta E_t V (\Omega_{t+1} | \ell_t = 0) \\ V_1 (\Omega_t) &= \alpha_0 + \alpha_1 - \delta_0 - \delta_1 f t_t + \pi_t (\alpha_2 - \rho_0 - \rho_1 - \rho_2 (1 - \ell_{t-1}) h_{t-1}) + \exp \{W_t + \xi_t\} + \beta E_t V (\Omega_{t+1} | \ell_t = 1) \end{aligned} \quad (24)$$

which implies the following decision rule and expected discounted value function as of the beginning of age t :

$$\ell_t = \begin{cases} 0 & \text{if } \xi_t \leq \log \{-c_3 + \pi_t (\rho_1 + \rho_2 (1 - \ell_{t-1}) h_{t-1}) - \delta_1 f t_t \\ & \quad - \beta [E_t V (\Omega_{t+1} | \ell_t = 1) - E_t V (\Omega_{t+1} | \ell_t = 0)]\} \\ & \quad - \log (0.07) - W_t \\ & \quad = \xi_t^* (\Omega_t) \\ 1 & \text{if } \xi_t > \xi_t^* (\Omega_t) \end{cases} \quad (25)$$

¹⁴That is, $\bar{V} (\Omega_t | \ell_t) = \theta_0 \ell_t + \theta_1 h_t$.

$$\begin{aligned}
E_{t-1} V(\Omega_t) &= \alpha_0 + c_4 \pi_t + \beta EV(\Omega_{t+1} | \ell_t = 0) \Phi\left(\frac{\xi_t^*(\Omega_t)}{\sigma_\xi}\right) \\
&+ [c_3 - \delta_1 f_t - \pi_t (\rho_1 + \rho_2 (1 - \ell_{t-1}) h_{t-1}) + \beta EV(\Omega_{t+1} | \ell_t = 1)] \left[1 - \Phi\left(\frac{\xi_t^*(\Omega_t)}{\sigma_\xi}\right)\right] \\
&+ \exp\{W_t\} e^{0.5\sigma_\xi^2} \left[1 - 0.07 \cdot \Phi\left(\frac{\xi_t^*(\Omega_t) - \sigma_\xi^2}{\sigma_\xi}\right)\right]
\end{aligned} \quad (26)$$

where $c_3 = \alpha_1 - \delta_0$ and $c_4 = \alpha_2 - \rho_0$.

B Table of Factors

Age Group	Head		Dependents	
	Male	Female	Male	Female
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	1.54	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

Source: Henriquez (2006)

Table II

Variable Means, Full Sample versus Estimation Sample

Insurance Type						
	Full sample			Estiation sample		
	2002	2004	2006	2002	2004	2006
% public	70.69	75.41	78.16	83.52	84.75	85.53
% private	12.54	12.76	12.27	16.48	15.25	14.67
% none	4.36	8.80	5.80			
% other	12.40	3.03	3.77			
Observations	12,922	16,727	16,443	3,652	4,650	3,510

Other Variables						
	2002		2004		2006	
	Mean	Std Dev.	Mean	Std. Dev.	Mean	Std. Dev.
<i>Full sample</i>						
Age	44.31	15.74	45.91	16.28	47.56	15.72
Female (%)	45.31	0.50	49.88	0.50	50.20	0.50

Other Variables						
	2002		2004		2006	
	Mean	Std Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Years schooling	9.63	4.29	9.49	4.34	9.67	4.37
Poor health (%)	35.70	0.48	35.79	0.48	36.88	0.48
Income (thousand)	179.0	325.0	192.5	1,252.0	262.9	2,092.0
<i>Estimation sample</i>						
Age	45.37 *	13.03	46.71 *	13.32	48.30 *	13.18
Female (%)	50.41 *	0.50	52.09 *	0.50	55.27 *	0.50
Years schooling	9.27 *	4.26	9.27 *	4.38	9.52	4.50
Poor health (%)	36.70	0.48	36.88	0.48	37.72	0.48
Income (thousand)	209.3 *	407.2	225.4 *	343.3	311.1	2,616.9

Source: Authors' calculations, EPS 2002, 2004, 2006.

Note: The "Other" category includes individuals covered by the armed forces and those who do not know which insurance type they have

* signifies that the full sample and estimation sample means are statistically different.

Table III
Insurance Status Transitions, Full Sample

Status 2004	Status 2006				
	Public	Private	Other	None	Total
Public	90.84	2.23	3.97	2.96	100
Private	20.12	75.80	2.92	1.16	100
Other	65.56	3.54	26.04	4.85	100
None	51.36	4.47	8.19	35.98	100
Total	78.80	11.49	5.91	3.81	100

Source: Authors' calculations, EPS 2004, 2006.

Note: The "Other" category includes individuals covered by the armed forces and those who do not know which insurance type they have.

Table IV
Insurance change (percentage change relative to previous year)

	Change to public 2004	Change to private 2004	Change to public 2006	Change to private 2006
<i>a. Full sample</i>				
Females	6.3	0.5	19.1	1.9
age <=34	12.1	0.8	22.8	4.0
age 35-44	3.0	0.5	16.9	2.2
age 45-64	4.6	0.3	16.4	1.1
age 65-74	0.0	0.0	35.7	0.2
age >74	12.5	0.0	41.7	0.0
Males	6.4	0.6	21.2	2.7
age <=34	7.9	1.8	25.6	7.2

	Change to public 2004	Change to private 2004	Change to public 2006	Change to private 2006
age 35-44	6.8	0.5	22.4	2.7
age 45-64	5.6	0.1	15.7	1.1
age 65-74	11.1	0.0	19.4	0.4
age >74	11.1	0.0	9.1	0.4
All	6.3	0.5	20.1	2.2

b. Estimation sample

Females	4.0	0.8	17.1	2.0
age <=34	5.6	3.1	17.5	7.8
age 35-44	3.2	0.9	19.4	2.7
age 45-64	3.8	0.2	17.1	1.0
age 65-74	0.0	0.0	33.3	0.0
Males	6.1	0.8	24.3	4.1
age <=34	6.8	3.0	29.0	10.3
age 35-44	3.6	0.4	18.8	4.1
age 45-64	8.6	0.2	14.7	0.9
age 65-74	9.1	0.0	22.2	0.9
All	5.1	0.8	20.8	2.9

Source: Authors' calculations, EPS 2002, 2004, 2006.

Table V
Maximum likelihood estimates

Parameter	Coefficient	Parameter	Coefficient
γ_0	-1.472 [*] (0.24)	η_1	0.1117 [*] (0.0026)
γ_1	0.648 [*] (0.108)	η_2	0.002 [*] (0.0066)
γ_2	0.014 [*] (0.003)	η_3	1.88E-06 (6.90E-05)
γ_3	0.174 [*] (0.05)	c_1	-8443.26 [*] (1271.25)
γ_4	-0.032 [*] (0.007)	c_2	534.23 (1.24E+09)
a_0	6362.15 (1.32E+10)	c_3	-18654.53 [*] (607.50)
ρ_1	-328.09 (430.07)	c_4	-5697.32 (1.17E+10)
ρ_2	34686.79 [*] (2660.80)	σ_h^2	0.301 [*] (0.06)
δ_1	1524.14 [*] (219.55)	σ_ξ^2	0.3314 [*] (0.0141)
η_0	10.78 [*] (0.1535)	σ_ψ^2	0.677 [*] (0.0134)
log L	-11853.63		

Notes: Standard errors are in parentheses.

* signifies statistically different from zero at 95% confidence.

Table VI
Participation in Public Insurance, Actual and Predicted Values, Overall and by Age, Sex, Education and Health Status

	Age Category										χ^2 (row)
	All Ages		26-36		37-48		49-59		60-71		
	A	P	A	P	A	P	A	P	A	P	
<i>a. Overall</i>	0.845 (5,904)	0.845	0.754 (1748)	0.762	0.832 (1870)	0.828	0.858 (1693)	0.873	0.940 (1676)	0.921	1.3464
χ^2 (column)	0										
<i>b. Sex</i>											
Males	0.835 (2,765)	0.824	0.753	0.752	0.844	0.816	0.865	0.869	0.922	0.908	1.066
Females	0.854 (3,139)	0.863	0.755	0.777	0.822	0.841	0.854	0.877	0.952	0.929	2.048
χ^2 (column)	0.783		0.453		1.311		0.639		0.711		
<i>c. Years of Schooling</i>											
1-8	0.979 (2,957)	0.980	0.949	0.965	0.977	0.971	0.979	0.983	0.988	0.988	0.12
9-12	0.863 (2,617)	0.846	0.821	0.820	0.877	0.849	0.885	0.875	0.894	0.857	1.44
13-17	0.548 (1335)	0.575	0.582	0.596	0.525	0.574	0.425	0.536	0.698	0.563	11.68*
18+	0.244 (78)	0.283	0.259	0.348	0.214	0.264	0.267	0.273	0.250	0.144	1.51
χ^2 (column)	3.106		0.896		2.885		5.885		5.381		
<i>d. Health Status</i>											
Good	0.790 (3,465)	0.778	0.730	0.727	0.793	0.778	0.796	0.801	0.896	0.849	2.248
Poor	0.938 (2,439)	0.958	0.861	0.917	0.927	0.949	0.932	0.961	0.978	0.975	1.995
χ^2 (column)	1.903		1.098		0.670		0.659		1.816		

Notes: A is actual value, P is predicted value;

* signifies the actual and predicted to be statistically different; sample sizes are in parentheses; χ^2 = chi-square statistic.

Table VII
Predicted private participation in 2006 with and without pre-existing condition clauses, overall and by health status and age

Age Category											χ^2 (row)
All Ages		26-37		38-49		50-61		62-75			
C	NC	C	NC	C	NC	C	NC	C	NC		
Health Status											
Good	0.224	0.214	0.277	0.270	0.222	0.208	0.197	0.186	0.155	0.148	1.14
	(2,189)										
Poor	0.034	0.097	0.076	0.174	0.047	0.131	0.032	0.090	0.018	0.065	160.11 [*]
	(1,321)										
χ^2 (column)	161.25 [*]		17.76 [*]		41.33 [*]		41.81 [*]		60.35 [*]		
n (column)	(3,510)		(911)		(864)		(872)		(854)		

Notes: C (NC) is (no) pre-existing conditions constraint in place; χ^2 = chi-square statistic;

^{*} signifies the actual and predicted to be statistically significantly different; sample sizes are in parentheses.

Table VIII
Predicted flow of individuals between systems from eliminating pre-existing condition clauses, overall for 2006 and by health status

Total flow of people	
average (number of individuals)	109
% of sample	2.25%
% with poor health	79.66%
% with good health	20.34%
Flow from public to private	
average (number of individuals)	85
% of sample	1.76%
% with poor health	100%
% with good health	0%
Flow from private to public	
average (number of individuals)	24
% of sample	0.49%
% with poor health	6.95%
% with good health	93.05%
Increase in utility	
flow from public to private	3.64%
flow from private to public	1.84%

poor health, public to private	3.64%
poor health, private to public	2.34%
good health, private to public	1.82%

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Figure 1.
Public Participation Over Time (2010 - 2045)

Figure 2.
Impact of No Pre-existing Condition Restrictions Over Time (2010 - 2045)