Gender-Based Pricing Ban in Health Insurance: Evidence from Chile

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Abstract

Regulation in health insurance aims to reduce inefficiencies while addressing redistribution across demographic groups. We examine a regulation within Chile's health insurance market that mandates plan pricing must not be based on gender. Leveraging administrative data from Chile, we offer empirical insights into the impact of this pricing constraint on consumer welfare. Our analysis sheds light on the discourse surrounding the prohibition of observable-based pricing, driven by considerations of equity and market efficiency. While this pricing ban may benefit some demographic groups, it can also exacerbate adverse selection by increasing prices. To analyze the implications of this regulation, we develop and estimate a discrete choice model of health insurance plans that incorporates the distribution of prospective individual medical costs. We combine the insurance plan demand model with a plan pricing model that accounts for insurer competition. Using this model, we explore counterfactual scenarios to evaluate how insurers might adjust their pricing and plan offerings under alternative regulatory policies. Our results show that after the policy, consumer surplus increased for women and decreased for men. Focusing only on the policy's price effect without accounting for changes in plan characteristics would underestimate the losses experienced by men. These findings highlight the importance of considering both price effects and insurer responses when designing health insurance regulations, providing insights for policymakers seeking to balance efficiency and redistribution.

1 Introduction

Access to quality healthcare is a primary objective for governments around the world. Health insurance systems are highly regulated to have affordable insurance and efficiency. Insurance is a selection market in which high-cost individuals are willing to pay high prices for health insurance plans leading to high average costs and prices that may not align with the willingness to pay of the low-cost individuals, leaving them out of the market. Due to this adverse selection problem, governments may mandate health insurance. On the supply side, insurers seek to attract healthy individuals to have lower costs, or determine price based on medical conditions and individuals characteristics. These risk-rated premiums generate another inefficiency known as reclassification risk, and thus, governments may prohibit pricing on observable characteristics. Yet, this ban on risk-based pricing increases adverse selection which implies higher welfare costs. This tradeoff between adverse selection and reclassification risk is studied by Handel, Hendel, and Whinston (2015), who conclude that reclassification risk from health-based pricing has outcomes five times worse than restricting pricing on observables. The introduction

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of the ACA exchanges in the US put an end to price increases due to new health conditions, as (pre-subsidy) pricing can only depend on age and smoking status in some states (Tebaldi (2023)). Einav and Finkelstein (2011) show that when the risk is directly linked to gender (under no private information, and assuming one insurer), having separate prices for men and women will be efficient, whether pooling the two genders under the same price will generate adverse selection and welfare losses. However, when there is private information not captured by gender, the result after pooling the groups is ambiguous depending on the demand groups of the pooled and the separated groups.

This paper provides empirical evidence on the effects of restricting insurers from pricing on observable characteristics. Using a model that combines demand for health insurance plans with insurer supply-side decisions, we analyze consumer surplus changes across demographic groups and how insurers respond to the policy. Our study focuses on a policy change affecting the pricing of plans in the health insurance private sector in Chile. The regulation prohibited health insurance prices to be based on gender, what was allowed before the second quarter of 2020. It is expected that pooling different risks under a single price will increase adverse selection, potentially driving prices up. However, insurers in Chile operate in an imperfect competitive markets with health plans differentiated by financial and non-financial attributes, and therefore the final results might difer from the expected effects. There are redistributional effects as well; we expect that women and older individuals see relative benefits from the policy, as their prices should be relatively better than before.

Chile has undergone several policy changes that can help to answer questions related to adverse selection and welfare loss that may be theoretically ambiguous. A ban on gender-based pricing could lead to premium hikes if insurers anticipate a higher-risk pool. As women have higher costs on the aggregate, it is conceivable that insurance premiums could rise generating welfare losses. However, insurers are responding to this policy change by reconfiguring the whole menu of contracts and its associated premiums. As a consequence, insurers may be able to attract individuals with better health profiles, potentially leading to a reduction in insurance premiums. The findings presented in this study could offer valuable insights into the ongoing discussions taking place in Chile concerning its healthcare system.

Individuals in Chile choosing a health insurance plan pay a monthly premium, that may vary based on plan coverage, as well as age and gender. Insurers offer plans at a base price, adjusted by risk factors based on age and gender. Before the second quarter of 2020, the risk factor weights were also determined by the insurer. In the second quarter of 2020, the regulatory agency introduced the "non-discrimination" policy, in which it fixed the risk factor weights, giving the same weight for men and women, and decreasing the weights for older people. This policy only affected the purchase of new health insurance plans, but not existing contracts. As a consequence, insurers modified the menu of plans to offer and their prices. This setting offers a unique context to analyze how regulation for equity may inadvertently increase adverse selection and welfare costs, or potentially mitigate adverse selection by attracting healthier enrollees.

The data was supplied by the regulatory agency of the private health insurance system in Chile (*Superintendencia de Salud*). We present descriptive evidence on how are the price differences between women and men that choose a plan for the first time, before and after the policy. Controlling for several plan's characteristics we find that women were paying around 35% more than men for a similar plan, while coinsurance rates showed little change. We also present medical cost across all enrollees, finding aggregate costs are higher for women, though highly variable by age.

We model the choice of the first insurance plan based on Abaluck and Gruber (2011). Numerous papers model health insurance plan choice to estimate taste parameters and risk aversion. Some use conventional discrete choice model (Ho and Lee (2017), Ho (2006), Starc (2014), and Tebaldi (2023)), whereas others use the theory of expected utility under uncertainty. Several studies are based on Cardon and Hendel (2001), who model a two-stage decision, in which first individuals choose their health care plan and then the amount of health care utilization. A number of studies extend this model of consumer choice to include choice inconsistencies and inertia (Abaluck and Gruber (2011, 2016), Atal (2019), Fleitas (2017), Handel (2013), and Handel and Kolstad (2015).

We find that the policy led to a welfare increase among women, while it resulted in a decrease for men. On the whole, the effect is favorable but relatively minor. Furthermore, enrollment in the private sector experienced a substantial increase among women (17%), while it remained steady for men. Using our supply-side model, through counterfactuals, we compute how much are consumers winning from an extended policy where the regulator also fixes weights for the old insurance plans, in which the base price is already determined. We find a positive effect on consumer surplus, but this might be offset by a producer surplus loss, given that we observe they would choose higher prices if they could.

The paper contributes to the health insurance literature that studies adverse selection, regulation, optimal product design, and subsidy design. In order to create the best possible system for different populations, it is important to study in detail how individuals and insurers are responding to new regulations and changes in policy. To analyze policies that are in place and suggest new policies to increase welfare, it is of high significance to know the demand shape of health insurance plans, and what individuals take into account when making these decisions.

Our study adds to research on how price regulation affects welfare. In our paper, the change in regulation is the prohibition to price on certain observable characteristics. Several papers study pricing regulation in the US. Curto, Einav, Levin, and Bhattacharya (2021) compute the surplus of Medicare Advantage compared to Traditional Medicare. Medicare Advantage has a new regulation in which insurers bid a price for their insurance plans and if it is lower than a benchmark established by the CMS, it has to offer the difference in benefits for the enrollee. They combine a nested logit for the demand estimation with a supply side that matches observed market shares. They examine counterfactuals that increase competition and consumer surplus. Curto (2022) compares different regulation structures in the Medigap market. She compares states with community rating, with guaranteed issue, versus states with guaranteed renewability, with open enrollment period, and estimates a boundary regression discontinuity. She finds that community rating, compared to guaranteed renewability, increases adverse selection because there is a reduction in enrollment and a rise in premiums. Another work studying Medigap is Starc (2014) which assesses how insurer´s market power affects premiums paid and analyzes counterfactuals that reduce market power by establishing a pricing rule that equals average costs. Handel, Hendel, and Whinston (2015) evaluate the welfare costs of allowing insurers to price health insurance plans based on observables, like age, gender, and even health status. They find that although restricting pricing on observables leads to higher adverse selection, reclassification risk due to pricing on all observables is even worst (5 times larger than adverse selection). They model a framework in which there is competition between insurers that can offer two classes of plans with two actuarial values. This is different from Einav, Finkelstein, and Cullen (2010) that only consider one insurer in the market. The plans to offer only have financial characteristics. They identify the Riley equilibria of the model using an algorithm with data of workers from one large firm. Bundorf, Levin, and Mahoney (2012), in contrast, find modest welfare losses associated with reclassification risk and compare this to welfare gains from risk-rated incremental premiums, which improves efficiency due to better allocation. Although their data is from an employer-sponsored market, they are small employers. The plans options are different from Handel, Hendel, and Whinston (2015) and the population under analysis is younger and probably healthier. The plans are horizontally differentiated by non-financial characteristics, such as provider network and physician access. Dardanoni and Li Donni (2016) calculate welfare costs of unpriced characteristics, that may be observable but not contractible upon or private information. They use survey data and separate the population into types that present the same residual unpriced heterogeneity, which is the residual of the price regression after conditioning on all variables used to set prices. Then, they compute the inefficiency due to unpriced heterogeneity in the US Long-term Care and Medigap market.

Tebaldi (2023) studies the subsidy design in the ACA Exchanges in California (California Covered). He simulates equilibrium outcomes for the actual regulation and some counterfactuals, including giving higher subsidies to younger enrollees and giving vouchers instead of price-linked subsidies. The equilibrium is given by a demand and supply model, in which he specifies two options: perfectly competitive environment and an oligopoly model. He estimates a mixed logit discrete choice model for different age ranges. The indirect utility depends on price, characteristics, and actuarial value. He finds that providing higher subsidies to the younger population will lower costs and premiums.

Our paper relates to other studies that evaluate policies in the health insurance system. For example, Ericson and Starc (2016) show how a policy of standardization of plans in Massachusetts led individuals to choose plans with higher coverage and higher actuarial value augmenting welfare. They identify two channels: besides price changes, availability, because the number of plans increased, and valuation, which refers to individuals changing their taste parameters for different characteristics due to new plans and more structure and information on how to choose. They estimate a discrete choice model in which the parameters vary after the policy.

Other papers study the private health insurance in Chile, for example, Atal (2019) investigates the trade-off between long-term contracts, in which there is no medical underwriting, and staying in the same provider network for life, even if it will be convenient to change due to a health shock. In Chile, if you want to switch insurers, there is medical underwriting. Using the dataset from the regulatory agency, he estimates a rich structural model in which the demand side is a static discrete choice model following Abaluck and Gruber (2011) which states a linear utility as a function of expected out-of-pocket costs and its variance, plans characteristics, and financial features. He also adds parameters that captures switching to other plans to get access to a different network of providers. He does not allow individuals to choose from the whole choice set of plans that exist in the data but actually defines a choice set for different individuals, which depends on individuals' characteristics, health status, and preexisting health conditions. This will only work for incumbent individuals that may switch plans, but he assumes new individuals choose from the whole choice set. He wants to separately identify autocorrelation from state dependence and state dependence from preference heterogeneity. He also identifies the inertia parameters from switching rates of healthy individuals that can move across insurers. Cuesta, Noton, and Vatter (2024) use the same dataset from the regulatory agency in Chile to study the welfare effects of vertical integration between insurers and hospitals. They use the data on claims to estimate costs and assess how hospital prices are changing. In a different vein, Pardo and Sabat (2023) provide an ex-ante welfare analysis of a similar policy of non-discrimination in Chile. They specify an heterogenous agent model in which the individual chooses consumption, savings and one option for health insurance: private or public. They use survey data for consumption and income by education level, but also use claims data from the regulator (*Superintendecia de Salud de Chile*) to calculate aggregate measures of health shocks. They find women and high-risk people will benefit from a flat premium. The closest paper to ours, Figueroa (2023), simulates the gender-pricing ban in Chile using data from previous years, and finds that women benefited largely from the policy and men decreased their consumer surplus, results that are in line to what we find from analyzing the actual policy. He also looks at the effects across income and find that higher-income individuals were the most benefited from the policy. He presents a supply side to adjust for the prices that would appear after the policy but there is no reoptimization in the characteristics space.

Related to gender based pricing, Finkelstein, Poterba, and Rothschild (2009) study a ban in the annuities market in the UK and find that having differentiated contracts to offer reduces the redistribution from men to women by half, compared to when there is a single contract. Huang and Salm (2020) examine the effect of a gender pricing ban in the private health insurance market in Germany in 2012, and finds that women switch to the private sector from the public sector, but premiums do not decrease.

Following this introduction, the article is organized as follows: In Section 2, we present the Institutional Framework of the health insurance market in Chile, followed by the explanation of the Data in Section 3. In section 4, we show Descriptive Evidence on the differences of prices and some statistics on costs. In section 5 the Demand Model is outlined, and the Estimation details are presented in Section 6. Results are shown in section 7. Section 8 presents Welfare effects from the demand model and in Section 9 we present a Supply Side and a Counterfactual exercise. Finally, we conclude in Section 10.

2 Institutional Framework

The health insurance system in Chile combines a public sector, called *FONASA*, that offers 4 levels of plans depending on the income of the individual, and a private sector, with approximately 13 insurers that compete offering different health care plans with distinct coinsurance rates, characteristics and premiums. Approximately 17% of the population is enrolled in the private sector and the rest in the public sector. Every new employee has to contribute at least with 7% of their income for a health insurance plan in the public or the private sector. In the public sector it is exactly 7%, and in the private sector the premium can be higher to opt for better coverage and additional benefits, or lower and receive back money that can be spend in health services.

In the private sector, each plan has a base price determined by the insurer and the final premium payed by the consumer is the base price weighted by a factor risk, which depends on age, and also gender before the second quarter of 2020. Before the second quarter of 2020, the factor risks were determined by each insurer and each plan could be weighted by difference factor risks. After the second quarter of 2020, the regulatory agency fixed the factor risk weights for all plans and all insurers[1].For more details on the private health insurance sector in Chile, check Atal (2019).

Before being enrolled in a plan, the individual must declare all preexisting conditions, and the person may be denied the plan or part of coverage for some months. In case many insurers deny coverage to a person, this person will end up in the public system. However, once an individual is enrolled in a plan, there is no reclassification, in the sense that new preexisting conditions cannot allow the insurer to give less coverage, pay a higher premium, or let the individual out of the plan. The preexisting conditions will play a role on coverage if the person wants to switch to another insurer.

Risk-rated premiums are not allowed but insurers can change the base price of a health insurance plan, and this will affect the whole pool of enrollees in a certain plan. However, the price changes are regulated and there is a maximum (see Atal (2019) for more details). This changes through the period we observe. Every year, enrollees receive a letter if there will be a change in price for next year.

[1]The weights are: 0.6 from 0-19 years old, 0.9 from 20-24 , 1 from 25-34, 1.3 from 35 to 44, 1.4 from 45-54, 2 from 55 to 64 and 2.4 from 65 or older

The enrollee may accept the change, change plans, or sue the insurer alleging the change in price is higher than the increase in costs. Many people who are suing the insurers win the lawsuit, and their prices do not change. In this article, we only focus on new enrollees, so there is not such change in prices.

In general, the contracts do not have deductibles, and individuals pay a copayment for each medical service that is around 20% of the total cost, but there is a cap to the total cost the insurer will cover which is different for every medical service. Everyone enrolled in the health insurance system, private or public, has access to guaranteed services to treat specific conditions (oncologic treatment, depression, diabetes, etc), with special coninsurance rates (usually 80% or more)[2]. In other cases, part of the paid premium is insurance for catastrophic illnesses that will be activated if the treatment of the illness represent very high costs, and also has a deductible.

Insurers are regulated by *Superintendencia de Salud.* They compete in the private health insurance, in which they offer a menu of plans, which is numerous, to attract consumers and charge a premium. They have to give coverage for different medical services and usually there is some discount in drugs for a specific pharmacy. They also cover sick-leave payments. A number of insurers are vertically integrated with hospitals through holdings (Cuesta, Noton, Vatter (2019)).

To summarize, the private health insurance contracts presents the following: i) are long-term contracts because individuals cannot be forced out of a plan they have if they continue paying for it and the increases in prices should be justified by increases in cost, ii) there is guaranteed renewability (an increase in premium cannot be larger than any other individual increase in premium);iv) there is a certain degree of community rating (premiums cannot be a function of individuals' observable characteristics) with the exception of age and gender before 2nd quarter 2020, and only by age ranges after 2020, but, there is no guaranteed issue, because there can be reduced coverage or even no contract if the individual has preexisting conditions when choosing a plan for the first time, or if he wants to switch to another insurer ; v) there is no medical underwriting or reclassification risk once the individual has a plan. vii) there is an individual mandate, but no regulation on contract space to offer, or subsidies from the government to private insurers, and no general risk-adjustment transfers; iii) There is, only for some specific health conditions, some risk-adjustment transfers across insurers at some points in time. viii) there is reinsurance for "catastrophic illnesses", which are very high-cost illnesses.

3 Data and Sample Selection

This paper uses administrative Data from the health insurance regulatory agency in Chile (*Superintendencia de Salud*). It consists of the universe of enrollees on the health insurance private sector that have a contract with one of the insurers. The data provides details about each insurer's health insurance plans, including features such as coinsurance rates for inpatient and outpatient services, maximum reimbursement amounts, coverage exclusions (typically bariatric surgery), fixed copayment rates, and the type of healthcare providers associated with each plan. The provider types are categorized as follows: open (all providers have same coinsurance rates), preferred provider (better coninsurance rates within a certain network of providers), and closed providers (you can only go to designated providers to get the specified coinsurance rates). It also includes all the enrollees and their characteristics, such as income, age, employment status (working for a company or self-employed), and the contracts with prices payed and medical claims. In addition there is information about the sick-leave payments made by the insurer in cases of illness. The data covers quarterly observations spanning from 2016 to the

[2]There is some risk-adjustment transfers between insurers for these specific illnesses

second semester of 2021. We also have access to data from the public sector, *FONASA* (insurer from the public sector). We include only the people that are in the most expensive level of the public system, and are policyholders. We have information when they joined the system for the first time. Wedding these two databases allows us to model the outside option for the discrete choice model, so it depends on the characteristics of the service offered by the public sector.

In the whole sample there are approximately 3528095 enrollees in the private sector,in which 45% are women. Policyholders account for 42% of the total enrollees, and the rest are dependents. There are around 7000 plans per quarter being sold before 2020, and after 2020, the number of plans is reduced to 2500. There are 13 insurers in the whole sample. Plans are offered throughout Chile, although the system is very centralized in the region of the capital city, Santiago.

Sample selection. In order to evaluate the welfare effects of the non-discrimination policy, we select a subsample of individuals that satisfy some restrictions: individuals choosing a health insurance plan in the private sector for the first time, policyholders with no dependents that are employees and 16 years old or above. We only keep health insurance plans from insurers that sell plans to the general public, as opposed to insurers that only manage health insurance plans for individuals that belong to one or a few companies. Therefore, we only keep six insurers. The individuals of the selected sample present the characteristics shown in Table (A1). In the Appendix we give more details of the selected sample for the estimation of the discrete choice model.

4 Descriptive evidence

As a first step we look at how plan prices change after the policy. For this, we do an event study analysis, in which we compare the prices payed by women and men through time. Given that the offered plans changed after the policy, the comparison is not direct and we can only use insurer fixed effects instead of plan fixed effects, but we also control by some plan characteristics as coinsurance rates. If we normalize the first period of the policy to zero, we expect the difference in prices between women and men to be positive before the policy. We use the sample described in Table (A1).

The estimated equation is:

$$log(price_{ij(s)t}) = \delta_s + + \sum_{k=-17}^{K=4} \beta_k female_i * \mathbb{1}\{k = t\} + \Theta \mathbf{x_{ij(s)t}} + \varepsilon_{ij(s)t}$$

- δ_s insurer fixed effects
- $t = 0$ is event time (policy was implemented)
- $\mathbf{x_{ij(s)t}}$: controls (income, age, plan characteristics of plan j)
- S.E clustered at group of insurer and inpatient coverage. There are 59 groups.

Figure (1) shows women are paying around 35% more than men for similar plans before the policy. We also show how the effect looks for women in maternity ages (Figure (5)) and outside maternity ages (Figure (6)). Figures (4) and (3) show regressions for outpatient and inpatient coverage (in %) separately for men and women controlling for age, income, provider type, and out of pocket (OOP) cap [3]. We observe the mean coinsurance rate is lower for women before the policy, but it is not statistically

[3]The equation is $coins\_rate = \delta_s + \tau_t + \sum_{k=-17}^{K=4} \beta_k \mathbb{1}\{k = t\} + \Theta \mathbf{x2_{ist}} + \varepsilon_{ist}$, clustered at insurer level

Figure 1: Event study of difference in prices between men and women

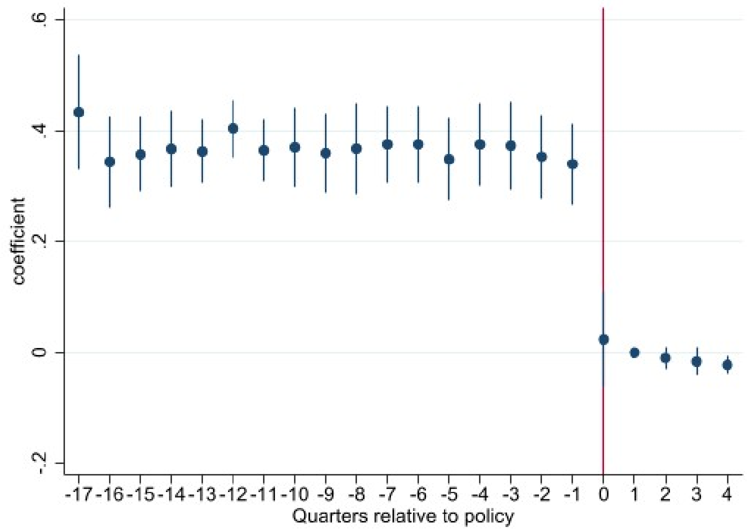
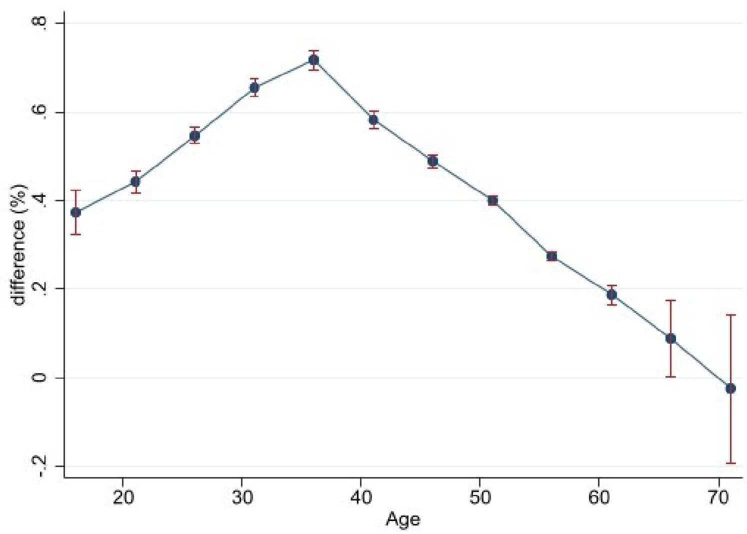


Figure 2: Differences in prices between men and women by age



Note: The graph presents for each age the estimated coefficient of female of different regressions with plan fixed effects. The regression for each age group is :$log(price_{ijt}) = \delta_j + \tau_t + \beta female_i + \Theta \mathbf{x_{ijt}} + \varepsilon_{ijt}$

different from 0. We can conclude that the price differences are not explained by better coinsurance rates for women.

We present the mean coinsurance rates of the plans purchased over time in Figure (7). On average, women purchased plans with lower coinsurance rates for both inpatient and outpatient, but these rates reach the men's coinsurance rates after the policy, which decrease a little. The behavior is similar for the number of plans purchased by men and women in the private sector, as shown in Figure (8). Men

Figure 3: Event study of outpatient coinsurance rate by gender

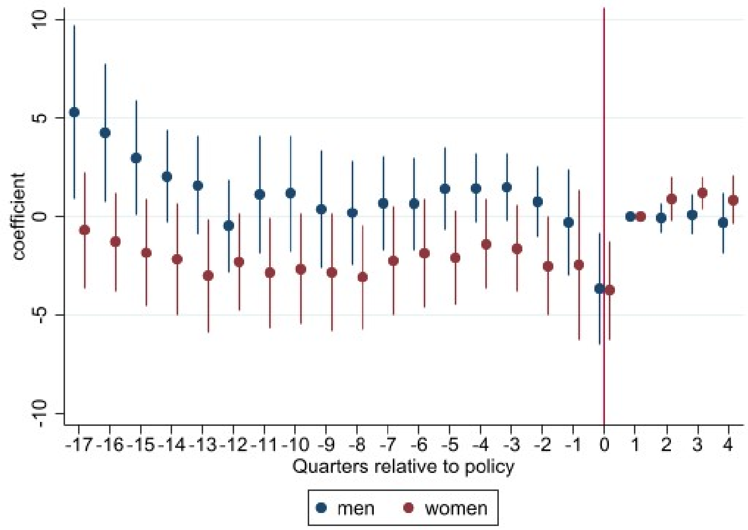
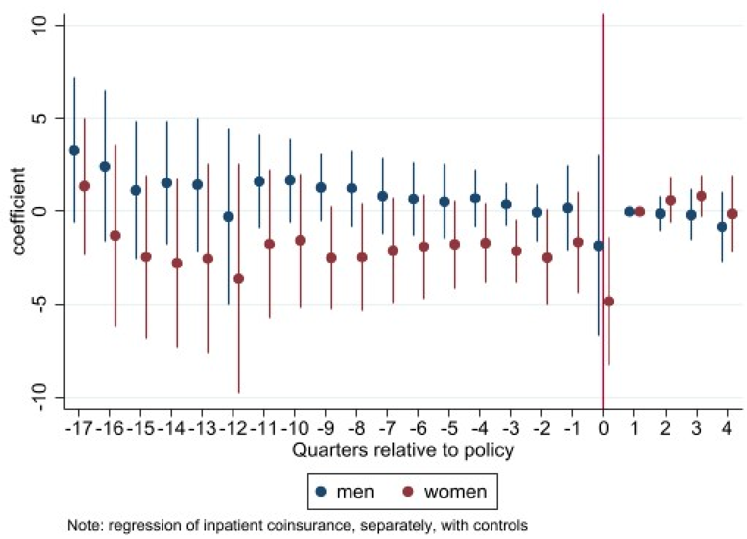


Figure 4: Event study of inpatient coinsurance rate by gender



were buying more plans than women before the policy, but the numbers are similar after the policy. Figure (9) shows the distribution of prices paid and the 7% of income, which is the mandatory amount that should be payed for health insurance.

Figure 5: During Maternity Age (21-50)

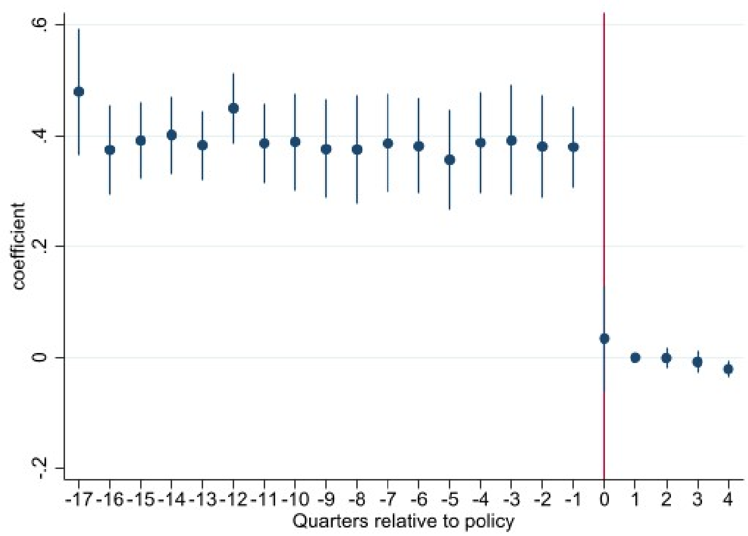


Figure 6: Outside Maternity Age (> 50)

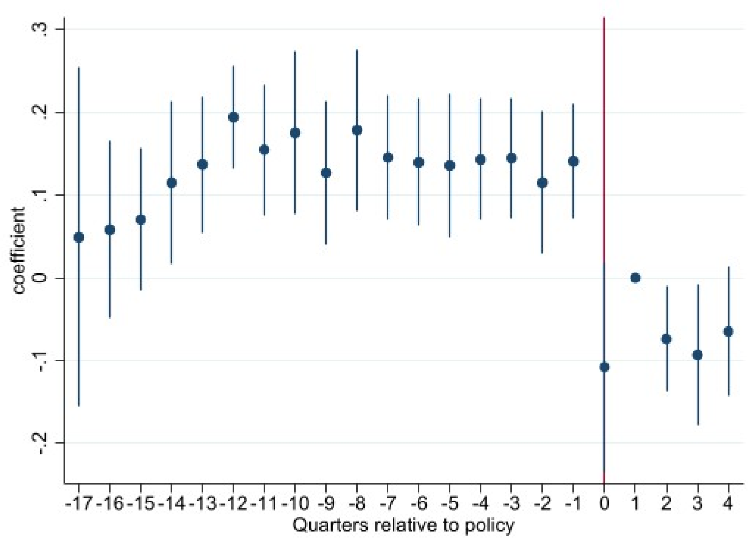


Figure 7: Mean coinsurance rates for new chosen plans

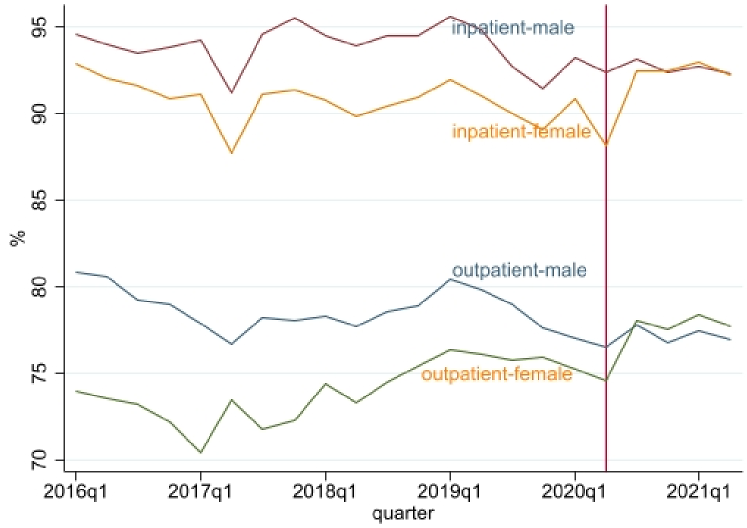


Figure 8: Number of new plans bought

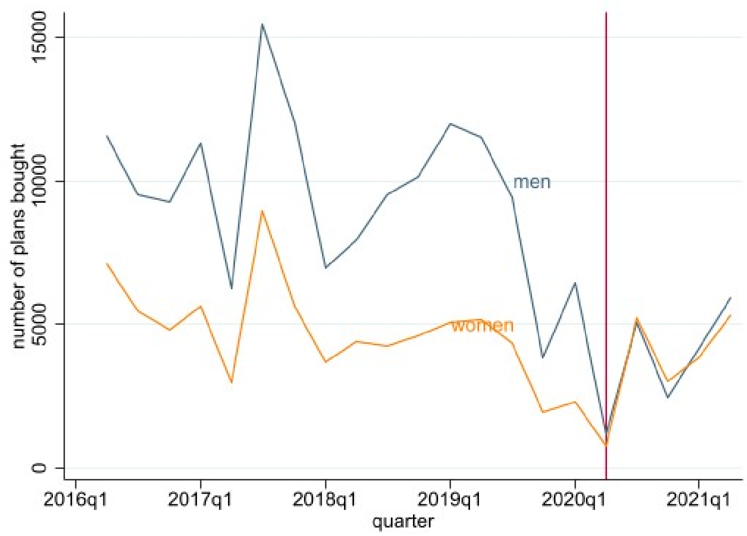
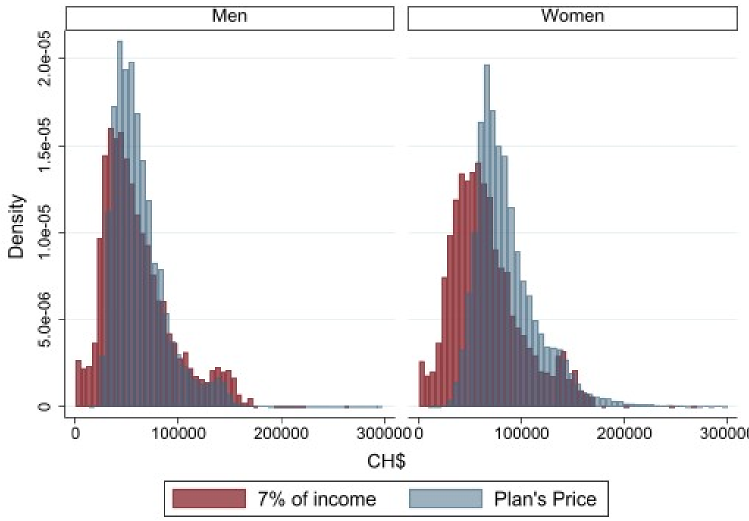


Figure 9: Distribution of Premiums payed

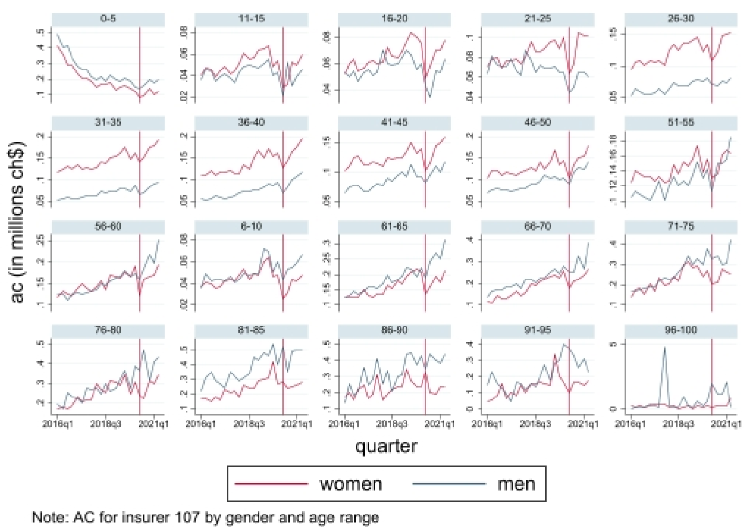


Are gender price differences justified by the expected costs in healthcare? We show some descriptive statistics for the whole set of enrollees [4]. Figure (10) shows total insurer's cost per capita for the whole industry, revealing higher costs for women across all periods. While these elevated costs might suggest that women should pay more for their health insurance plans, this graph masks high levels of significant variations in costs among insurers and across age ranges. In addition, these aggregate statistics do not control for differences in plans' characteristics. Figure (11) provides a more nuanced analysis focusing on one particular insurer and disaggregating the cost heterogeneity by age ranges. The graph shows average costs (AC) by age ranges for men and women. Average costs for women are notably higher than for men between the ages of 26 and 50, while the trend reverses after the age of 61. These findings highlight the need for a better understanding of gender-based pricing in healthcare that considers the underlying complexities and characteristics of the plan.

[4]This is different from the sample used in the event study.

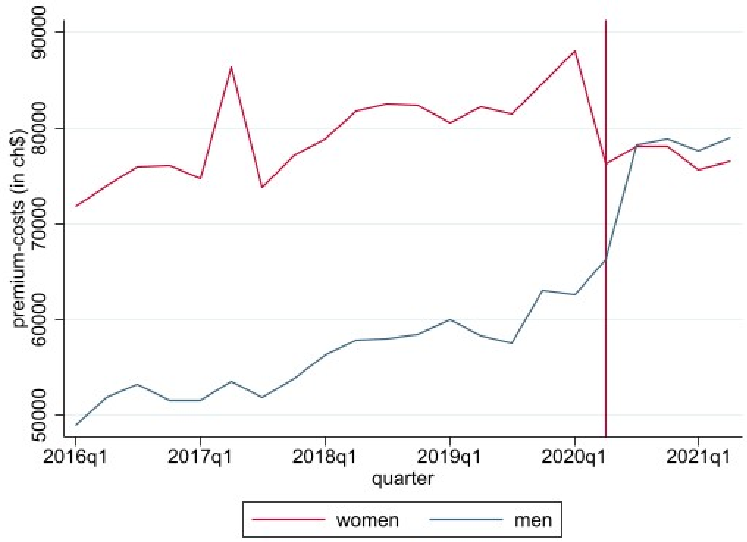
Figure 10: Insurer's costs per capita

Figure 11: AC by age-range



In addition to the previous analysis, we present the insurers' markup (premium-costs) for the people that bought a new plan (same sample as event-study). The markup is calculated by individual, as (monthly) premium minus monthly average cost incurred by the insurer for each person (the sum of costs that are included in the data after the date of the contract). Considered costs come only from claims, and the comparison does not account for increases in premiums through time. Figure (12) shows that markups in levels are higher for women than for men, suggesting insurers profit more for women than for men before the policy. There might be different reasons for this observed pattern, which we do not analyze here.

Figure 12: Markups



Note: Markups per person are calculated as premium minus costs. Premium corresponds to the monthly price of the plan given the date of the contract, while costs is the average costs over all observed periods in the data after the contract (monthly measure). The observation is for the period of the contract.

5 Demand-side Model

Individuals have to choose a health insurance plan when they start to work or when they cannot depend anymore on their parents' plan. We model the choice of a health insurance plan for new enrollees in the health insurance private sector. Individuals have to choose one plan from six insurers, who offer a large menu of plans with different coinsurance rates, maximum coinsurance values, and other benefits. As in Cardon and Hendel (2001), we assume individuals choose a health insurance plan in a first stage, and in a second stage they decide how much to spend on medical services (out-of-pocket costs), which will depend on the chosen plan and the health status. Therefore, when deciding what plan to choose, the individual has already decided how much he will spend in the second stage, or at least what are the expected costs. To capture this, we follow Abaluck and Gruber (2011) to derive a linear indirect utility function for each individual from a constant absolute risk aversion (CARA) utility function over expenditures[5]. The indirect utility is a function of the distribution of future expenses, captured by the expectation and the variance of out-of-pocket (OOP) costs.

Each individual i in group g (defined by age and gender) has to choose a health insurance plan j from an insurer, at period t. Each market is a period t. The indirect utility depends on price, observed and unobserved characteristics of the plan, and the average and the variance of expected costs. We specify the price coefficient as a function of observed demographics $z_i = (age_i, income_i)$. This is:

[5]The CARA utility function is $U(C) = -exp(-\gamma(w - C))$ and costs C are normally distributed. It is possible to take the Taylor expansion of the expected value of this utility to arrive to an indirect utility.

$$u_{i(g)jt} = \alpha(z_i)price_{jgt} + \beta x_j + \xi_{jt} + \omega_0(z_i)EOP_{i(g)jt} + \omega_1 VOP_{i(g)jt} + \epsilon_{i(g)jt}$$
$$u_{i(g)jt} = \delta_{gjt} + \mu_{i(g)jt}(z_i) + \epsilon_{i(g)jt}$$

x_j={outpatient coverage rate, inpatient coverage rate, providers}

With $\epsilon_{ijt} \sim$ EVT1 distribution. The individual choice probabilities are given by:

$$s_{ijt} = \frac{exp(V_{ijt}(z_i))}{\sum_{k\in t} exp(V_{ikt}(z_i))} \tag{1}$$

and the total enrollment of product j is give by:

$$s_{jt} = \int \frac{exp(V_{ijt}(z_i))}{\sum_{k\in t} exp(V_{ikt}(z_i))} dF(z_i) \tag{2}$$

Choice sets. There is a large literature studying choice inconsistencies when choosing a health insurance contract. Many document inertia or study its reasons (Handel (2013), Handel and Kolstad (2015), and Heiss, McFadden, Winter, Wuppermann, and Zhou (2021)). Individuals may not know how to make the best decision given these complex financial contracts (Abaluck and Gruber (2011)), or may not study all the plans being offered in a market (Lucarelli, Prince, and Simon (2008), Coughlin (2023), Abaluck and Adams-Prassl (2021)). In Chile, there are a lot of plans to choose from, around 2000 before 2020 and around 1500 plans after 2020. It is clear that individuals cannot study all those plans when making a decision and therefore we have to take a stance to define the choice sets that individuals face when buying their first insurance plan. Atal (2019) defines a choice set for different individuals that already have a plan, which depends on individuals characteristics and health status. He assumes individuals that choose for the first time face the whole choice set. In this paper, we define the choice set of the individual as all the plans that were chosen in a quarter by someone in the group, which means same gender and same age. There are too many available plans in Chile, and this is a very conservative way to define the choice set of the individual, given that if there is a plan that was not chosen in a quarter, although it is officially for sale, it may be not promoted enough to be chosen[6].

Construction of variables. We have information of ages by range of five years for all enrollees. Income is available for some individuals, both for the private sector and the public sector. In the public sector, we impute the missing income as the lowest bound. To define the expected out-of-pocket (OOP) expenditures we build on Abaluck and Gruber (2016) and Atal (2019) who assume rational expectations over the expected out-of-pocket costs that the individual will have in the following year from the start of the contract. In our case, we only have new enrollees so we do not have information on past expenses. We have information of the sum of out-of-pockets costs in the following 4 quarters after the contract started, but only for the chosen plan. Therefore, to determine the out-of-pocket costs that the individual would have had in other plans, we assume the claims (medical services) would have been the same (like Abaluck and Gruber (2016)) but also that the total costs are the same, because we do not have a calculator that can compute what the costs would be [7]. However, we calculate the

[6]A number of methodological papers study how to overcome the problem of unobserved choice set (Abaluck and Compiani (2020), Barseghyan, Coughlin, Molinari, and Teitelbaum (2021), and Crawford, Griffith, and Iaria (2021))

[7]We are assuming no moral hazard because they spend the same in any plan.

out-of-pocket as the total cost the person had by the coinsurance rate (separating on inpatient and outpatient rate) of the alternative plan. To compute the expected out of pocket costs, we regress the out of pocket costs in a year for each enrollee, on many variables that might define the out of pocket costs: previous costs, chronic conditions and demographics. The predicted value from the regression represents the expected out of pocket for each enrollee. With this prediction we can also compute what would be the expected out of pockets if they would have chosen other plans. We approximate the conditional variance as the square of the residuals of the regression. To construct the instrument we compute the amount spent by the insurer in each plan in medical licenses. We use the average sick-leave payment of a plan in a semester (total amount over total number of enrollees).

Outside option specification. We rely on data from the public sector of the health insurance system to construct the outside option. Individuals that are enrolled in the private sector can also choose the outside option, which is to be enrolled in Fonasa but only in the highest level of income, called level D. The premium payed in the public sector is 7% of the income. We assume the inpatient and outpatient coinsurance rates are 60%, although this changes in reality but we would like to capture that the quality is very different from the private sector. We also include individuals that are enrolled in Fonasa as policyholders, at level D. We have information on income, age, and region.

6 Identification and Estimation

For the identification of the parameters related to characteristics of the products, there are multiple plans (products) each period with different financial characteristics: outpatient and inpatient coinsurance rates. Also, different choice sets for individuals helps with identification (this is similar to variation of plans offered by market). We can identify the price coefficient from variation of prices through time for the same plan and price variation across plans. The prices across groups are also different for the same plan. Although there is no simultaneity problem, there are some unobserved characteristics correlated with price. To address this endogeneity problem we use an instrumental variable approach, in which we use the average cost of sick-leave payments in a plan. In Chile, most of the time the insurer is in charge of paying the sick-leave payments when a person gets sick or cannot work due to an accident. This variable can act as a cost shifter but satisfies the exclusion restriction in the main equation: the indirect utility of each individual will not depend on the amount spent on sick-leave payments. This may not be true for other cost variables, for example, expendi- ture on medical services, because it can be related to plan characteristics that the person cares about.

We use a two step method to estimate the coefficients of the model. In the first step we recover δ_{jg} and the coefficients associated with individual heterogeneity using Maximum Likelihood. In the second step, we estimate the rest of the parameters using a linear IV method to tackle the endogeneity of prices due to unobserved characteristics of the plan.

$$u_{i(g)jt} = \beta x_{jt} + (\gamma_0 + \gamma_1 age_i + \gamma_2 income_i)EOP_{jit} + \omega_2 VOP_{jit} + \xi_{jt} + (\alpha_0 + \alpha_1 age_i + \alpha_2 income_i)price_{jgt} + \epsilon_{ijt}$$

$$u_{i(g)jt} = \underbrace{\beta x_j + \xi_{jt} + \alpha_0 P_{jgt}}_{\delta_{jgt}} + \underbrace{(\gamma_0 + \gamma_1 age_i + \gamma_2 income_i)EOP_{jit} + (\alpha_1 age_i + \alpha_2 income_i)P_{gjt} + \omega_2 VOP_{jit}}_{\mu_{ijt}} + \epsilon_{ijt}$$

$$u_{ijt} = \delta_{gjt} + \mu_{ijt}(z_i) + \epsilon_{ijt}$$

$$\beta x_j = \beta^1 outpatient_j + \beta^2 inpatient_j + \beta^3 outpatient_j * inpatient_j + \beta^4 preferedprov_j + \sum_{k=1}^{K} \beta_k^4 \mathbf{1}\{provider_k \in j\}$$

$outpatient_j$ and $inpatient$ correspond to outpatient and inpatient coverage rates (1-coinsurance).

In the first step of the estimation we recover α_1, α_2 and δ_{jgt} maximizing the following likelihood:

$$L(\alpha, \delta_{gjt}) = \sum_i log(s_{ijt})$$

To recover δ_{gjt} we match the observed market shares of the products by market with the theoretical market shares given by s_{jt} and for a fixed α we compute δ_{gjt} through a contraction mapping function. This is done separately by age group and market (semester) because the price is defined at that dimension.

In the second step, we estimate equation (3) by two-stage least squares using the average sick-leave payments as an instrument by plan. The amount spent in sick-leave payments reflects the riskiness of the individuals of the plan, and insurer might choose price considering this information, however, the average sick-leave payment is not correlated with unobserved characteristics of the plan.

$$\delta_{gjt} = \beta x_j + \alpha_0 P_{jgt} + \xi_{jt} \tag{3}$$

7 Results

The estimated parameters of the demand model are shown in Table (A4). The parameters are estimated separately for men and women, before the policy. The estimated parameters of the First Stage are shown in Figure (A3). We find women dislike high prices, but this decreases as income and age goes up.

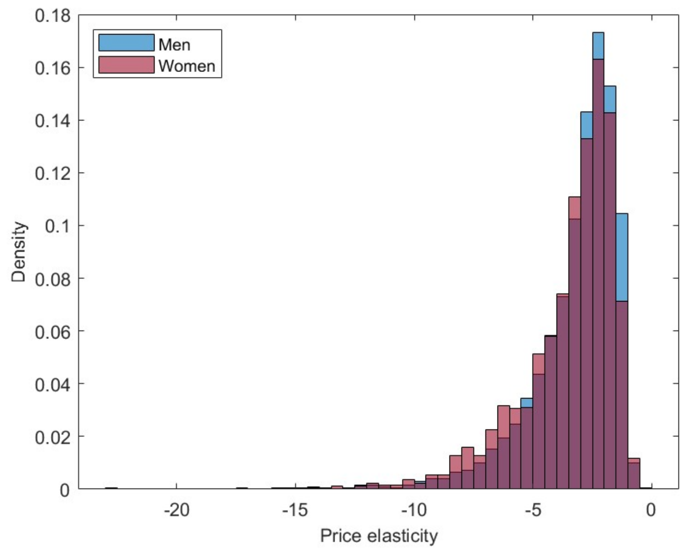
Willingness to pay. We compute the willingness to pay for an increase in coinsurance rates, given by $wtp_i = -\beta_i/\alpha_{ij}$. In Figure (15) we show the willingess to pay for an increase in the outpatient coinsurance rate in 10 percentage points, expressed as a fraction of the premium paid by month. The distribution is over women after the policy. On average, women will pay a 30% of their premium to have a 10 p.p. larger outpatient coinsurance rate.

Elasticities. We compute own-price elasticities for each health insurance plan, as the average over individuals, which is given by:

$$\eta_{ijt} = \int \alpha_{ijt} p_{ijt} (1 - s_{ijt}) dF(z_i)$$

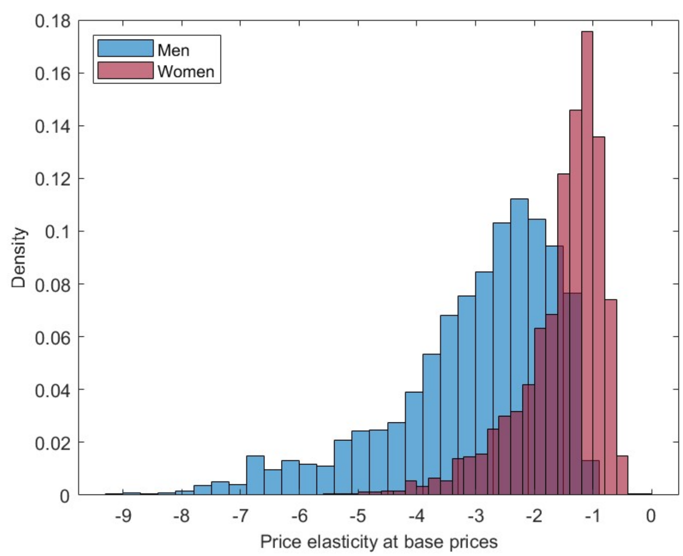
The distribution of own-price elasticities by plan are shown in Figure (13) for men and women before the policy. These are calculated as the average over individuals for each plan. Average price elasticities, before the policy, are -3 for both women and men, however when we look at the elasticities at the base price in Figure (14), to be able to compare the price sensitivities, we find men are more price sensitive than women. These numbers are comparable to price elasticities found in other studies of plan choices in the US. Decarolis, Polyakova, and Ryan (2020), who are studying subsidy design in Medicare Part D, find average elasticities between −12 and −5.9 depending on the risk group. Whether Starc and Town (2019) find elasticities between −5 to −6.3. Tebaldi (2023) computes the price elasticity in the category of Silver plans, when all Silver plans increase the premiums in 1% and find young individuals have an elasticity around −2.

Figure 13: Own-price elasticities: distribution over plans (before the policy)



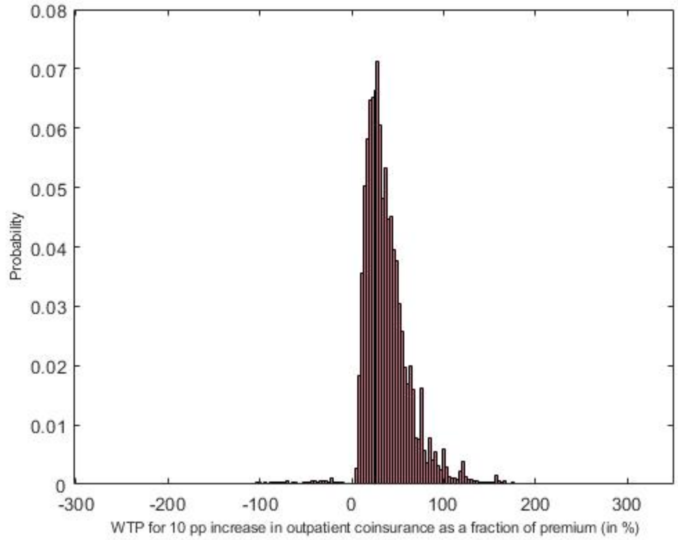
Note: Price elasticities over plans

Figure 14: Price elasticities computed at base prices



Note: Own-price elasticities at base prices to compare price sensitivity between men and women .

Figure 15: Willingness to pay for a 10 pp increase in outpatient coinsurance, for women before the policy



Note: Willingness to Pay for a 10 pp increase in the outpatient coinsurance rate, expressed as a fraction of the premium. The histogram is for women before the policy.

8 Welfare effects

Our measure of welfare is the change in consumer surplus after the policy. We assume there are no behavioral issues when making the decision, and therefore individuals' welfare relevant utility function is the same as the decision utility (see Ericson and Starc (2016) for other welfare measures). We calculate the difference in total consumer surplus as the equivalent variation given by Nevo (2001). We compute the average CS by gender, for before and after the policy and take the difference. The logsum formula is given by [8] :

$$\Delta CS = \frac{1}{\bar{\alpha}}(log(\sum_{j\in\Omega_a} exp(V_{jt}))) - (log(\sum_{j\in\Omega_b} exp(V_{jt})))$$

In which we define Ω_a as the choice set after the policy, and Ω_b as the choice set before the policy. Dividing by $\bar{\alpha}$ allows us to have a measure in monetary terms. Bear in mind that the number of plans are changing before and after the policy, and this may underestimate the welfare changes if we expect that there are less plans before than after. However, there is large heterogeneity in the choice sets that are defined by gender and age.

The results are shown in Table (1). After the policy, women augmented their surplus in 3.5 UF, which corresponds to 140 dollars approximately and it is more than an average monthly premium of 2.9 UF, while men decreased the consumer surplus in -1.98, which are around 79 dollars, and can be compared to a monthly average premium of 1.7. We also compute the extensive margin effect after the policy. The take-up rate for women in the private sector increased from 62% to 73% , which corresponds to a 17% change. For men, the enrollment ratio between the private and the public sector

[8]McFadden (1999) states that this is valid if there are no income effects. Our price coefficient depends on income, however , Train (2009) explains the measure may still be valid if the changes are small.

did not change after the policy.

Table 1: Consumer surplus and Enrollment

	Women			Men		
	Before	After	**Change**	Before	After	**Change**
Share of enrollment in private sector	0.618	0.733	**0.115**	0.626	0.598	**-0.016**
Consumer surplus (Average over individuals)	-33.609	-30.099	**3.509**	-4.414	-6.389	**-1.975**

Note: The share of enrollment is computed as the sum of the predicted choice probabilities of each individual over plans of the private sector (inside options), and taking the average over individuals. The consumer surplus measure is in monetary terms (Chilean UF).

Decomposing Consumer Surplus

Is consumer surplus increasing for women because of better prices or better characteristics? I perform a simple decomposition to justify the changes in consumer surplus due to price or characteristics of the plans. I assume the prices for the post-policy period if there was no policy would have been base prices by the weights given by the policy.

$$\Delta CS = CS^{post}(P^{post}, X^{post}) - CS^{pre}(P^{pre}, X^{pre})$$

$$\Delta CS = \underbrace{CS^{post}(P^{post}, X^{post}) - CS^{pre}(P^{post}, X^{pre})}_{\text{due to characteristics}} + \underbrace{CS^{pre}(P^{post}, X^{pre}) - CS^{pre}(P^{pre}, X^{pre})}_{\text{due to prices}}$$

9 Supply side

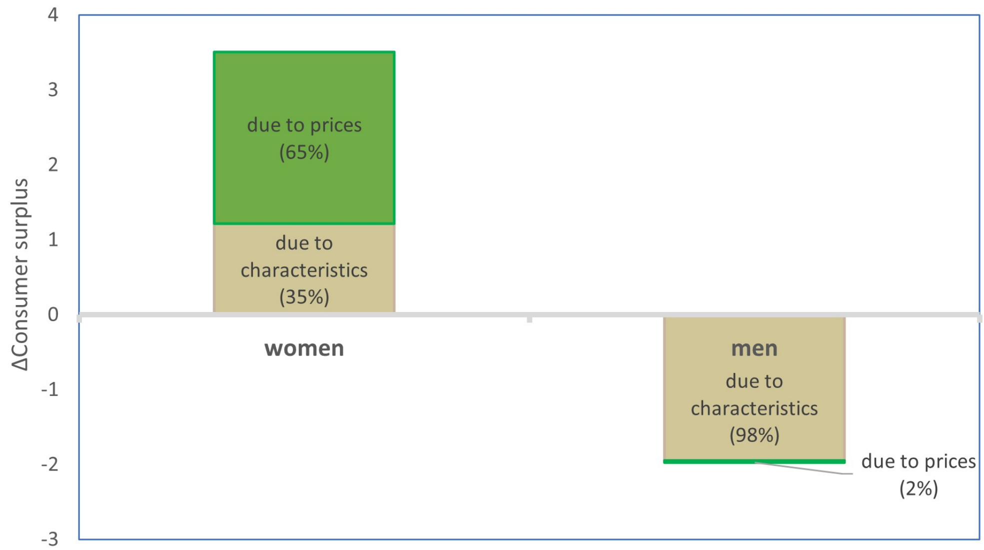
We present a model in which insurers compete to determine health insurance plans prices under a regulatory environment. Insurers are single-product firms and choose prices to maximize profits for each age-gender group g:

$$\Pi_{gj} = \big(P_{gj} - AC_{gj}(P)\big)s_{gj}(P)$$

$$P_{gj} - AC_{gj}(P) = \frac{s_{gj}(P)}{\frac{-\partial s_{gj}}{\partial P_{gj}}}(1 - \frac{\partial AC_{gj}}{\partial P_{gj}})$$

The first order condition shows the usual markup of a differentiated products model, but adds a selection term that lowers the markup if there is adverse selection ($\frac{\partial AC_{gj}}{\partial P_{gj}} > 0$) and lowers the markup

Figure 16: Changes in Consumer Surplus



if there is advantageous selection in the market for that product, as explained in Mahoney and Weyl (2017). Before the policy the price is $P_{gj} = \gamma_{jg} P_j$, and the insurer has to choose the base price P_j and also the weights for each group of gender and γ_{jg}. After the policy, the weights are fixed by the regulator and $P_{gj} = \gamma_g P_j$. We recover the expected average costs by group from the first order condition, using $\frac{s_j(P)}{\frac{-\partial s_j}{\partial P_j}}$ from the demand estimation. And estimate $\frac{\partial AC_{gj}}{\partial P_{gj}}$ from regression of average costs on price and insurer fixed effects.

Counterfactual 1: What are the welfare effects if the regulator fixed the weights of the price for old and new plans?

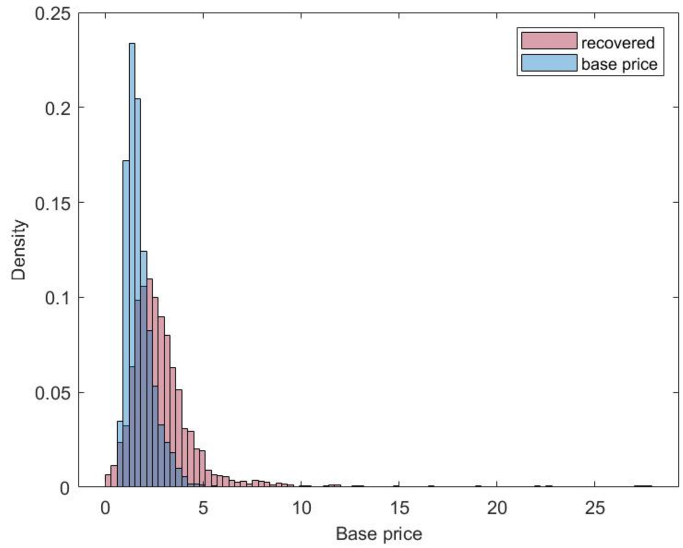
First, we assume insurers cannot react to the policy and they cannot introduce new products, so if individuals have to keep their plans the change in consumer surplus on average is given by [9]

$$CS^{pre}(\gamma_G P^{pre}, X^{pre}) - CS^{pre}(\gamma_{GJ} P^{pre}, X^{pre}) = 1.22UF$$

Second, if we assume insurer can react to the policy by pricing old plans, the recovered prices from the first order condition are shown in Figure 17. Insurers will charge higher prices if they could reoptimize and choose prices for their old health insurance plans.

[9] The case for individuals reoptimizing and being able to switch is in progress.

Figure 17: Observed prices vs recovered prices



Note: Observed base price for different plans in blue. The recovered price is the result of the FOC when the factor weights are fixed in the pre-policy period.

10 Conclusion and Discussion

We provide evidence of the effects of a price regulation policy on the health insurance system in Chile, in which after the second quarter of 2020, men and women of the same age should pay the same for the same plan. The results suggest that the policy was beneficial for women, and a little detrimental for men. Men showed no significant change in the extensive margin after the policy, yet their consumer surplus experienced a reduction. Women exhibit a substantial 17% rise in their enrollment ratio within the private sector after the policy, and their consumer surplus increases, leading to a slight positive net impact. These results are estimated from a discrete choice model, in which individuals choose their first health insurance plan based on characteristics of the plan, expected costs, and demographics. Understanding how individuals choose their health insurance plans and how they react to a policy that changes the choice sets may bring light to design new policies that benefit consumers and the healthcare system.

We present a supply side to recover expected average costs for insurers in each plan. This allows us to simulate what would happen if insurers could reoptimize their prices if the policy also affected the old contracts that were transacted before the policy and show the prices will be significantly higher than the ones we observe.

We have presented how the policy impacts the consumer welfare of those who are choosing a new plan but have not made any assessment about the welfare of all enrollees in the system, who could switch to new plans affected by this policy. To tackle this, another model is needed, that should account for inertia.

Even though the policy also affected the risk weights to determine plan prices through age ranges, as we consider new enrollees who are mainly young, we believe the aggregate effect is mainly due to gender differences.

We focus on static welfare measures because we do not study how individuals switch plans across their lives, and how reclassification risk may affect welfare. For a discussion on dynamic efficiency, see Einav, Finkelstein, and Mahoney (2021).

11 References

Abaluck, J., & Adams-Prassl, A. (2021). What do consumers consider before they choose? identification from asymmetric demand responses*. *The Quarterly Journal of Economics*, *136*(3), 1611–1663. https://EconPapers.repec.org/RePEc:oup:qjecon:v:136:y:2021:i:3:p:1611-1663.

Abaluck, J., & Compiani, G. (2020). *A method to estimate discrete choice models that is robust to consumer search* (Working Paper No. 26849). National Bureau of Economic Research. https://doi.org/10.3386/w26849

Abaluck, J., & Gruber, J. (2011). Choice inconsistencies among the elderly: Evidence from plan choice in the medicare part d program. *American Economic Review*, *101*(4), 1180–1210. https://doi.org/10.1257/aer.101.4.1180

Abaluck, J., & Gruber, J. (2016). Evolving choice inconsistencies in choice of prescription drug insurance. *American Economic Review*, *106*(8), 2145–84. https://doi.org/10.1257/aer.20130778

Atal, J. P. (2019). Lock-in in dynamic health insurance contracts: Evidence from chile. *Working Paper*.

Barseghyan, L., Coughlin, M., Molinari, F., & Teitelbaum, J. C. (2021). Heterogeneous choice sets and preferences. *Econometrica*, *89*(5), 2015–2048. https://doi.org/https://doi.org/10.3982/ECTA17448

Bundorf, M. K., Levin, J., & Mahoney, N. (2012). Pricing and welfare in health plan choice. *American Economic Review*, *102*(7), 3214–48. https://doi.org/10.1257/aer.102.7.3214

Cardon, J. H., & Hendel, I. (2001). Asymmetric information in health insurance: Evidence from the national medical expenditure survey. *The RAND Journal of Economics*, *32*(3), 408–427. Retrieved August 18, 2023, from http://www.jstor.org/stable/2696362

Coughlin, M. (2023). Insurance choice with non-monetary plan attributes: Limited consideration in medicare part d. *Working Paper*.

Crawford, G. S., Griffith, R., & Iaria, A. (2021). A survey of preference estimation with unobserved choice set heterogeneity [Annals Issue: Structural Econometrics Honoring Daniel McFadden]. *Journal of Econometrics*, *222*(1, Part A), 4–43. https://doi.org/https://doi.org/10.1016/j.jeconom.2020.07.024

Cuesta, J. I., Noton, C., & Vatter, B. (2024). Vertical integration and plan design in healthcare markets. *NBER Working Paper*.

Curto, V. (2022). Pricing regulations in individual health insurance: Evidence from medigap. *Working Paper*.

Curto, V., Einav, L., Levin, J., & Bhattacharya, J. (2021). Can health insurance competition work? evidence from medicare advantage. *Journal of Political Economy*, *129*(2), 570–606. https://doi.org/10.1086/711951

Dardanoni, V., & Li Donni, P. (2016). The welfare cost of unpriced heterogeneity in insurance markets. *The RAND Journal of Economics*, *47*(4), 998–1028. https://doi.org/https://doi.org/10.1111/1756-2171.12164

Decarolis, F., Polyakova, M., & Ryan, S. P. (2020). Subsidy design in privately provided social insurance: Lessons from medicare part d. *Journal of Political Economy*, *128*(5), 1712–1752. https://doi.org/10.1086/705550

Einav, L., & Finkelstein, A. (2011). Selection in insurance markets: Theory and empirics in pictures. *Journal of Economic Perspectives*, *25*(1), 115–38. https://doi.org/10.1257/jep.25.1.115

Einav, L., Finkelstein, A., & Cullen, M. R. (2010). Estimating Welfare in Insurance Markets Using Variation in Prices*. *The Quarterly Journal of Economics*, *125*(3), 877–921. https://doi.org/10.1162/qjec.2010.125.3.877

Einav, L., Finkelstein, A., & Mahoney, N. (2021). Chapter 14 - the io of selection marketswe thank the editors for including this chapter in the volume. we are grateful to ignacio cuesta, katja hofmann, and chuan yu for very helpful comments on earlier drafts. In K. Ho, A. Hortaçsu,

& A. Lizzeri (Eds.), *Handbook of industrial organization, volume 5* (pp. 389–426). Elsevier. https://doi.org/https://doi.org/10.1016/bs.hesind.2021.11.014
Ericson, K. M. M., & Starc, A. (2016). How product standardization affects choice: Evidence from the massachusetts health insurance exchange. *Journal of Health Economics*, *50*, 71–85. https://doi.org/https://doi.org/10.1016/j.jhealeco.2016.09.005
Figueroa, C. (2023). Adverse selection and equity in markets with guaranteed renewable contracts: Evidence from chile. *Working Paper*, *99*.
Finkelstein, A., Poterba, J., & Rothschild, C. (2009). Redistribution by insurance market regulation: Analyzing a ban on gender-based retirement annuities. *Journal of Financial Economics*, *91*(1), 38–58. https://ideas.repec.org/a/eee/jfinec/v91y2009i1p38-58.html
Fleitas, S. (2017). Dynamic competition and price regulation when consumers have inertia: Evidence from medicare part d. *Working Paper*.
Handel, B., Hendel, I., & Whinston, M. D. (2015). Equilibria in health exchanges: Adverse selection versus reclassification risk. *Econometrica*, *83*(4), 1261–1313. Retrieved August 18, 2023, from http://www.jstor.org/stable/43616971
Handel, B. (2013). Adverse selection and inertia in health insurance markets: When nudging hurts. *American Economic Review*, *103*(7), 2643–82. https://doi.org/10.1257/aer.103.7.2643
Handel, B., & Kolstad, J. (2015). Health insurance for "humans": Information frictions, plan choice, and consumer welfare. *American Economic Review*, *105*(8), 2449–2500. https://doi.org/10.1257/aer.20131126
Heiss, F., McFadden, D., Winter, J., Wuppermann, A., & Zhou, B. (2021). Inattention and switching costs as sources of inertia in medicare part d. *American Economic Review*, *111*(9), 2737–81. https://doi.org/10.1257/aer.20170471
Ho, K., & Lee, R. S. (2017). Insurer competition in health care markets. *Econometrica*, *85*(2), 379–417. https://doi.org/https://doi.org/10.3982/ECTA13570
Ho, K. (2006). The welfare effects of restricted hospital choice in the us medical care market. *Journal of Applied Econometrics*, *21*(7), 1039–1079. https://doi.org/https://doi.org/10.1002/jae.896
Huang, S., & Salm, M. (2020). The effect of a ban on gender-based pricing on risk selection in the german health insurance market. *Health Economics*, *29*(1), 3–17. https://EconPapers.repec.org/RePEc:wly:hlthec:v:29:y:2020:i:1:p:3-17
Lucarelli, C., Prince, J., & Simon, K. (2008). *The welfare impact of reducing choice in medicare part d: A comparison of two regulation strategies* (NBER Working Papers No. 14296). National Bureau of Economic Research, Inc. https://EconPapers.repec.org/RePEc:nbr:nberwo:14296
Mahoney, N., & Weyl, E. G. (2017). Imperfect competition in selection markets. *The Review of Economics and Statistics*, *99*(4), pp. 637–651. Retrieved November 12, 2024, from https://www.jstor.org/stable/26616146
McFadden, D. (1999). *Computing Willingness-to-Pay in Random Utility Models* (tech. rep. $_0$11). in J.Moore, R.Riezman, J.Melvin, eds, 'Trade, Theory, and Econometrics: Essays in Honour of John S. Chipman', Routledge, London, pp. 253–274. https://ideas.repec.org/p/wop/calbem/_011.html
Nevo, A. (2001). Measuring market power in the ready-to-eat cereal industry. *Econometrica*, *69*(2), 307–342. Retrieved August 31, 2023, from http://www.jstor.org/stable/2692234
Starc, A. (2014). Insurer pricing and consumer welfare: Evidence from medigap. *The RAND Journal of Economics*, *45*(1), 198–220. https://doi.org/https://doi.org/10.1111/1756-2171.12048
Starc, A., & Town, R. J. (2019). Externalities and Benefit Design in Health Insurance. *The Review of Economic Studies*, *87*(6), 2827–2858. https://doi.org/10.1093/restud/rdz052
Tebaldi, P. (2023). Estimating equilibrium in health insurance exchanges: Price competition and subsidy design under the aca. *Review of Economic and Statistics, accepted*.

Train, K. E. (2009). *Discrete choice methods with simulation* (2nd ed.). Cambridge University Press. https://doi.org/10.1017/CBO9780511805271

Appendix

A Descriptive statistics

We show some descriptive statistics on the health insurance plans in Table (A1) and the number of visits and costs of the healthcare providers in Table (A2)

Table A1: Statistics for subsample 2016-2021

	# traded plans	Mean	SD	p25	p50	p90	Min	Max
Men								
Outpatient coverage	179165	78.66	11.67	70	80	90	0	100
Inpatient coverage	179165	93.99	9.16	90	100	100	1	100
OOP cap	179165	4,248.07	1,660.68	3000	4200	6500	0	9000
Premium	179165	62,219.57	27,324.59	42940.93	55689.36	97596.79	9750.074	446191.4
Income	165768	689,564.54	547,086.57	329444	623911	1433371	0	4800000
Women								
Outpatient coverage	97896	74.47	13.40	70	80	90	0	100
Inpatient coverage	97896	91.23	10.53	90	90	100	1	100
OOP cap	97896	4,295.73	1,591.89	3000	4500	6500	0	9000
Premium	97896	86,996.27	34,035.88	64326.69	78960.16	131934.9	9768.107	500108
Income	92183	823,834.02	550,852.66	466781	782528	1582954	0	7000000
Total								
Outpatient coverage	277061	77.18	12.47	70	80	90	0	100
Inpatient coverage	277061	93.02	9.76	90	100	100	1	100
OOP cap	277061	4,264.91	1,636.86	3000	4200	6500	0	9000
Premium	277061	70,974.11	32,131.04	48548.84	64155.04	113800	9750.074	500108
Income	257951	737,547.93	552,196.11	375000	681317	1500000	0	7000000

Table A3: First stage Regression

	Base price of the plan	
	Estimate	SE
Medical leave payments	0.164	0.009
Inpatient cov	5.665	1.062
Outpatient cov	6.124	1.370
Inp*Outp	-4.368	1.486
Expected OOP	0.140	0.020
Var OOP	0.000	0.001
Share claims	-0.377	0.060
Dummy preferred provider	1.240	0.046
Constant	-3.780	0.966
Providers FE	Yes	
Observations	9374	

Clustered standard errors in parentheses.

Significance levels: * 0.10 ** 0.05 *** 0.01

Table A2: Statistics for providers, whole sample

	# providers	p25	p50	p90	p95	p99	Min	Max
2018								
# visits for provider	16710	2.000	6.000	335.500	1523.000	76895.000	1	1.48e+10
$ spent in provider (in MM)	16710	0.080	0.220	2.381	5.052	52.212	.005	1.18e+05
2019								
# visits for provider	15041	2.000	6.000	265.000	1208.000	1.37e+05	1	1.76e+10
$ spent in provider (in MM)	15041	0.075	0.210	2.318	5.004	66.719	.00025	1.40e+05
2020								
# visits for provider	12154	2.000	4.000	159.000	760.000	3.18e+05	1	1.11e+10
$ spent in provider (in MM)	12154	0.066	0.180	1.950	4.682	110.057	.002496	1.34e+05
2021								
# visits for provider	8674	1.000	4.000	132.000	871.000	1.37e+06	1	6.65e+09
$ spent in provider (in MM)	8674	0.060	0.156	1.370	3.478	152.570	.00472	93445.984
Total								
# visits for provider	52579	2.000	5.000	234.000	1154.000	1.88e+05	1	1.76e+10
$ spent in provider (in MM)	52579	0.070	0.200	2.101	4.667	81.899	.00025	1.40e+05

Taken from claims, and matched with all plans.

Table A4: Estimated coefficients Demand Model

	Women		Men	
	Coefficient	SD	Coefficient	SD
price x income	-4.8419		-5.49239	
price x age	1.1094		1.238029	
Eoop	-9.4737		-5.94801	
Eoop x age	5.9943		5.999997	
Eoop x income	-3.1166		-0.43596	
Voop	-0.6089		-1.18167	
price	-0.1639	0.2019	-0.3028	1.2510
inpatient	0.4597	1.1022	-7.1342	0.3938
outpatient	-1.8770	0.2596	-2.8931	1.2557
inpatient x outpatient	-0.5208	0.2353	9.3802	2.7654
(1-dummy_pref)	-0.3304	0.1662	-0.8168	0.627
Dummies providers				

B More details on sample selection for the estimation of the model

Besides taking the sample from 2018 because we have information of the outside option from that year, we keep individuals with information on positive income, and we lose around 22% of the sample for enrollees of the private sector. This rate is lower for the years after the policy. We also eliminate individuals with plans that have coinsurance rates of 0 and 1. We provide a comparison between the two subsamples in Table (A5).

Table A5: Sample selection

	N	Mean	Sd	Min	Max
Selected sample					
Age	201475	31.75396	9.12199	16	91
Female	201475	.3695099	.4826733	0	1
Outpatient coinsurance	201475	78.21908	8.366737	40	100
Inpatient coinsurance	201475	93.02995	9.967097	30	100
sum OOP 4 months after contract	201475	100965.2	254823.6	0	2.00e+07
Total					
Age	257379	31.83006	9.205761	16	91
Female	257379	.3497605	.4768951	0	1
Outpatient coinsurance	257379	77.21286	12.15849	0	100
Inpatient coinsurance	257379	92.93444	9.944031	1	100
sum OOP 4 months after contract	257379	93240.66	251533.9	0	2.08e+07