Equilibrium Effects of Health Insurance Selection on the Hospital Market

Wei G. Xiong*

February 17, 2025

Link to the latest version

Abstract

This paper studies how selection outcomes in an individual insurance market shape the hospital market. In a setting with horizontally and vertically differentiated hospitals, consumers who prefer high-quality but expensive 'star' hospitals are costlier to insure. Competitive multi-plan insurers respond by offering tiered- and narrow-network plans to attract consumers less likely to use expensive providers. However, enrollment in these plans reduces the average coverage that insurers assume at star hospitals and weakens insurers' bargaining incentives, creating a feedback loop that elevates star hospital prices and enlarges the premium differences between network policies. Using industry-wide claims and enrollment data from Chile, I estimate that insurers' tiered provider networks explain 18% of the observed three-fold price ratio between high- and low-cost hospitals. Eliminating network choices mitigates both adverse and advantageous selection on hospital preferences, shifts patients toward star hospitals, and reduces profitability disparities across providers.

Keywords: *Hospital Prices; Bargaining; Tiered Network*
JEL Codes: *D43; I11; L14*

*Universidad de los Andes, School of Business and Economics, Santiago, Chile (email: wxiong@uandes.cl). I'm grateful to Juan-Pablo Montero and Carlos Noton for their invaluable guidance and advice. I benefited from the advice of Ignacio Cuesta and Benjamin Vatter and their joint work with Carlos Noton using similar data. I also thank Juan Pablo Atal, Jorge Alé-Chilet, Mariagiovanna Baccara, Pablo Celhay, Cecilia Diaz-Campo, Sebastian Fleitas, Francisco Gallego, Jeanne Lafortune, Claudio Lucarelli, Alexander Olssen, Tatiana Rosá for helpful comments and suggestions. I thank the Chilean Superintendence of Health for making the data public. I gratefully acknowledge financial support from the Chilean National Agency for Research and Development (ANID). ChatGPT recommended alternative phrasing for part of this work. All errors are my own.

1 Introduction

It is widely acknowledged that health insurance markets function as selection markets (Einav, Finkelstein, & Mahoney, 2021) while serving as the gateways to hospital markets. Adverse selection (Rothschild & Stiglitz, 1976) in the insurance market leads to different types of consumers choosing different contracts that vary in coverage (Azevedo & Gottlieb, 2017); consequently, consumers in the hospital market (patients) face different out-of-pocket 'spot' prices, affecting their hospital choices. However, the economic literature tends to evaluate health insurance within the partial equilibrium of the insurance market. Hence, discussions about optimal health insurance seldom consider its impact on the hospital market.[1]

In this paper, I jointly analyze these two healthcare markets and present theoretical and empirical arguments demonstrating that coverage choices inflate both the overall hospital price level and price dispersion. This finding is important because it contradicts the standard economic intuition that coinsurance (i.e., cost-sharing as a fraction of medical bills, where the coinsurance rate is one minus the coverage rate) disciplines hospital markups by making consumers price-sensitive (Lerner, 1934). This conventional wisdom does not hold in the hospital market for two reasons. First, the demand for medical services is highly inelastic. While hospital prices may influence a patient's provider of choice, they have little effect on the extensive margin decision of whether to seek medical care. Second, hospital prices are not set unilaterally but are instead negotiated jointly with insurers. Thus, insurers' bargaining incentives play a crucial role in determining hospital prices.

I model price bargaining with coinsurance following the work of Gowrisankaran, Nevo, and Town (2015) (henceforth, GNT). Using industry-wide claims data from Chile, I estimate that an average coinsurance rate of 27% increases private hospital price level from 3.1 times to 3.4 times the public price, while hospital-specific tiered coverage increases the high/low-cost hospital price ratio from 2.4 to 2.9. The key intuition is that coinsurance reshapes the vertical structure of the two healthcare markets, transforming it into a 'triangle' structure as consumers not only pay premiums for insurance plans but also a fraction of their hospital bills through coinsurance. When a consumer pays coinsurance, her out-of-pocket spending becomes proportional to the hospital prices negotiated by her insurer. As a result, an insurer's price negotiation with hospitals generates a positive externality: the insurer does not fully internalize

[1] For example, see Cutler and Zeckhauser (2000) for a survey on cost-sharing and optimal coinsurance; see Marone and Sabety (2022) for a discussion about the optimality of coverage choices.

that a marginal reduction in hospital price would alleviate consumers' out-of-pocket costs. This misalignment of incentives pushes hospital prices above what they would be in the absence of coinsurance.

The main contribution of this paper is to fill a gap in the literature about insurer-hospital negotiations over tiered provider networks, as Handel and Ho (2021) pointed out in their recent survey. Typically, in an individual insurance market, a multi-plan insurer's tiered network arises from consumers' choice of plans that vary in network policies.[2] In a differentiated hospital market, hospitals that are perceived as of high quality (some known as 'star' hospitals) command high prices (Ho, 2009), so consumers who prefer these hospitals are costly to insure. Since hospital preferences are non-contractable, insurers 'cream-skim' low-cost consumers who are less inclined to use expensive providers by offering options of network policies: full-network (FN) plans with uniform coverage across providers, tiered-network (TN) plans that place star hospitals on the non-preferred tier with reduced coverage (Prager, 2020),[3] and narrow-network (NN) plans that exclude star hospitals from coverage (Shepard, 2022). The proliferation of these plans has sparked intense political debate over whether network choices should be restricted.[4] Previous studies have endorsed these lower-cost plans as a benign approach to control healthcare spending (Gruber & McKnight, 2016). However, little is known regarding how they affect the insurer-hospital negotiation in the equilibrium.[5]

Challenges to empirically studying the equilibrium effects of tiered network negotiation include both setting and data limitations. In the widely studied U.S. setting, private hospitals receive an assortment of patients with employer-sponsored insurance, government insurance, individual insurance, and no insurance, where cross-substitution and price indexation may affect price-setting. Moreover, hospital prices

[2]Individual insurance differs from employer-sponsored insurance in the U.S.. The latter is a tax-subsidized group insurance where cost-sharing is often negligible.

[3]Differential but non-zero coverage at preferred versus non-preferred hospitals is sometimes referred to as in-network versus out-of-network coverage, such as in (Einav, Finkelstein, & Cullen, 2010). I use the term tiered-network to distinguish it from the null coverage of narrow-network plans for out-of-network hospitals.

[4]See Dafny et al. (2017) about the proliferation of narrow-network plans in the ACA marketplace. See Frank et al. (2016) about the popularity of tiered-network plans and their effect on hospital choices. Examples of regulatory proposals include "network adequacy" regulations in the U.S. and "unique plan" regulations in Chile.

[5]See Ho and Lee (2019) for a model of narrow network negotiation with strategic exclusion. See Ho and Lee (2023) for a model of tiered network negotiation with strategic tiering in formulary design. Bargaining agents in these models leverage networks for negotiation, so they are mostly applicable to the menu design problem of large employers.

in the U.S. had not been transparent until recently, so consumers were not responsive to variations in coinsurance due to the difficulty in foreseeing the total price of a hospital admission (Prager, 2020).[6] Most importantly, insurer-hospital transactions in the private sector are rarely observed in the U.S., and available medical claims data often consist of only a subset of insurance companies and their enrollees (see, e.g., Cooper et al. (2019)).

In contrast, private healthcare in Chile offers a clean setting of an individual market, where private hospitals primarily serve patients with private individual plans. Its insurance market is regulated but largely governed by market forces – an arrangement known as managed competition.[7] Multi-plan insurers offer a variety of plan options and negotiate one set of fee-for-service prices with each provider at the firm level. Most insurance plans in Chile follow a simple linear structure, with the coinsurance rate being the primary attribute that differentiates plans.[8] Consumers choose coverage along two dimensions: vertical choice of coverage level (Marone & Sabety, 2022) and tier choice of hospital-specific coverage (Prager, 2020). Hospital prices are transparent, and patients are free to price-shop for all types of medical services. Moreover, the Chilean healthcare regulator collects detailed administrative data on plan enrollment and medical claims from all private insurers.[9]

I begin with descriptive evidence showing that Chile's healthcare markets feature a three-fold price dispersion among similarly sized private hospitals and a majority enrollment in TN insurance plans that divide hospitals into preferred and non-preferred tiers with differential coinsurance rates (henceforth, I consider NN plans as a type of TN plans with null coverage at non-preferred hospitals). At the firm level, claims data indicate that the five insurers provide average coverage that is 10 to 24 percentage points lower for expensive star hospitals compared to their non-star alternatives.

I then present a stylized theoretical model with two hospitals and two insurance policies to disentangle the bidirectional relationship between hospital price differential ($\Delta p = p_{star} - p_{nonstar}$) and plan premium differential ($\Delta P = P_{FN} - P_{TN}$). A key

[6]Hospital price transparency law in the U.S. went into effect in the year 2021.

[7]Chile's individual market resembles the Affordable Care Act (ACA) exchanges in the U.S. Community-risk adjustment in premium is allowed but regulated. Denying coverage or pricing based on pre-existing conditions or child-bearing possibilities is outlawed. Differently, Chile prevents market unraveling á la Akerlof (1970) by mandating one's plan premium to be at least 7% of taxable income. So, participation is largely determined by income rather than choice.

[8]Non-linear contracts with deductibles and out-of-pocket maximums complicate consumption decisions. See Diaz-Campo (2023) for an example.

[9]The administrative data in Chile has been publicly available on the regulator's website since the year 2016.

feature shared by both markets is a continuum of consumers who differ in their star hospital preferences. In the hospital market, an insurer's bargaining externality leads to a Δp that increases with both the overall coinsurance level and the tiered difference in coverage. In the insurance market, consumers with a strong preference for star hospitals tend to choose the FN plan, but they also incur more hospital expenses – adverse selection (Shepard, 2022). A competitive insurer offers a TN plan to attract low-cost consumers who are less likely to use star hospitals – advantageous selection. Competitive ΔP increases with Δp: the more expensive star hospitals are, the greater the cost difference between FN and TN plans, and, consequently, the larger the gap in their competitive premiums. Elevated FN plan premiums propel more insurance buyers to enroll in TN plans, lowering the average star hospital coverage for the insurer. The greater tiered difference in coverage results in more asymmetric bargaining externality, which in turn feeds back to a greater Δp.

When taking the model to the data, I assume perfect competition in the insurance market (i.e., plan premiums equal to plan-specific average costs) to focus on modeling a hospital market that is both vertically and horizontally differentiated.[10] Leveraging micro-data with individual choices, I estimate a discrete hospital choice model that allows for rich heterogeneity in latent hospital preferences (Berry & Haile, 2021). Conditional demand estimates reveal that star hospital preference is not correlated with predictable demographics but rather with unpredictable diagnoses. This pattern sheds light on the empirical discrepancy between ex-ante network choices and ex-post hospital choices, which ultimately shapes an insurer's tiered provider network.

My primary counterfactual simulation examines the effects of mandating uniform coverage across providers. This policy would reduce hospital price dispersion by 18%, reallocate 0.8% of patients toward star hospitals, and narrow profitability disparities across providers. For insurers, uniform coverage for star and non-star hospitals alike increases hospital expenses but also generates higher revenue due to consumers' greater WTP. This leads to the surprising outcome that three of the five insurers become more profitable as a result.

Due to mandatory uniform coverage, TN plan buyers, who were advantageously selected, must now participate in the adversely selected FN plans.[11] Pooling these

[10] Shepard (2022) estimates that the horizontal (e.g., distance) and vertical (e.g., quality) dimensions of preferences each contribute about half to the demand for star hospitals.

[11] Compared to the social optimum, adverse selection results in under-insurance, and advantageous selection leads to over-insurance. See Einav and Finkelstein (2011) and Mahoney and Weyl (2017) for illustrations.

two groups mitigates selection, reduces FN plan premiums, and primarily benefits FN plan buyers. However, it also forces TN plan buyers to switch to a better but more expensive product. Even with community-rated premium adjustments, this pooling creates both winners and losers among consumers.

In summary, regulations that restrict network choices are expected to improve access to star hospitals. However, their social optimality is a more nuanced issue. If star hospitals are medically superior, directing more patients to them enhances hospital market efficiency (Chandra et al., 2016). However, curtailing star hospitals' profits may disincentivize quality improvements in the long run.

Related literature. Beyond the work noted above, this paper contributes to several strands of literature. It builds on the insurer-hospital price bargaining literature and closely follows Gowrisankaran, Nevo, and Town (2015). Another widely used model is Ho and Lee (2017), which includes an employer-insurer bargaining stage but no coinsurance. This paper joins a growing literature that connects insurance networks to bargaining. Narrow network plans leverage network exclusion to reduce hospital prices (Ho & Lee, 2019) (Ghili, 2022). Prescription drug plans use preferred pharmacy networks to reduce drug prices (Starc & Swanson, 2021). Pharmacy benefit managers utilize tiered formulary placement to obtain rebates from pharmaceutical manufacturers (Olssen & Demirer, 2022) (Ho & Lee, 2023). I offer a complementary perspective by highlighting the negotiated prices at non-preferred upstream providers and their welfare implications.

The closest precursor to this paper is Shepard (2022), which examines the adverse selection of network policies. Numerous empirical studies have evaluated various regulatory remedies to address adverse selection in health insurance, including individual mandates (Hackmann, Kolstad, & Kowalski, 2015), government subsidies (Tebaldi, 2024), and pooling segmented markets with differing degrees of adverse selection (Dickstein, Ho, & Mark, 2024). I argue that network regulation mitigates adverse selection by functioning similarly to pooling.

This paper also contributes to a growing trend that uses micro-data for demand estimation (e.g., Berry, Levinsohn, and Pakes (2004)). Healthcare markets differ from other product markets because consumers' demographics and unobservable quality perceptions play a more significant role than product characteristics (Raval, Rosenbaum, & Tenn, 2017). Tebaldi, Torgovitsky, and Yang (2023) developed a nonparametric approach for discrete choice among insurance plans. Although I maintain the

logit choice structure, my model also recovers rich preference heterogeneity through partitioning individual observations into homogeneous groups by age, sex, diagnosis, insurer affiliation and year of admission.

At a high level, my findings relate to a vast literature about the effects of insurance coverage on medical spending. The moral hazard (Pauly, 1968) concern of health insurance argues that generous insurance coverage contributes to the rising medical expenses. There is abundant evidence about the existence of moral hazard (see, e.g., Manning et al. (1987) and Finkelstein et al. (2012)). However, I present an antithesis that more generous insurance coverage better aligns an insurer's incentives with those of its consumers, thereby containing the growth of medical spending.

Additionally, my descriptive evidence adds to a sparse literature on insurer-hospital transacted prices (Cooper et al., 2019) (Craig, Ericson, & Starc, 2021). It is also worth mentioning the broad literature in industrial organizational economics on vertical markets. In the cable television market, Crawford and Yurukoglu (2012) also pointed out that downstream product competition can affect the downstream-upstream bargaining outcomes.

Overview. The paper proceeds as follows. Section 2 describes the setting and the data. Section 3 shows descriptive statistics about the two markets. Section 4 introduces the theoretical framework. Section 5 presents the structural model, its estimates, and welfare calculations in counterfactual scenarios, and Section 6 concludes.

2 Institutional setting and data

2.1 The parallel healthcare system in Chile

The healthcare system in Chile comprises both public and private providers, with the two parallel systems primarily financed through separate insurance schemes.[12] Health insurance is mandatory for all residents. The law requires a minimum contribution of 7% of one's taxable income in either the state insurance fund (called Fonasa) or the purchase of a private plan from private insurance companies (called Isapre). Over 70% of the population is affiliated with the state insurer, whereas about 15% of the

[12]Variations of parallel healthcare systems are common around the globe, especially among Latin American countries (McPake & Noramnd, 2008).

people (the majority of whom are of higher income)[13] opt for private insurance.[14] There is no subsidy in the private insurance market.

The state insurer finances public hospitals. It also allows a subgroup of its beneficiaries to seek care at private hospitals. It does not negotiate prices with private providers. Instead, it sets its administrative fee-for-service price list, and its coverage rate is typically less than 50%. Private providers choose whether to accept reimbursement from the state insurer, and many work exclusively with private insurance. Therefore, private providers receive predominantly private insurance holders.[15]

Private insurance plans cover both public and private hospitals. However, since waiting time is significantly longer at public hospitals, it is rare to observe private insurance enrollees seeking care at public hospitals. Therefore, we can say that the private healthcare markets in Chile are separated from the public system. An insurer refers to a private Isapre company throughout the paper.

Notwithstanding the overall separation, both Fonasa beneficiaries and Isapre enrollees can purchase supplemental insurance that reimburses partially or totally their out-of-pocket expenses.[16] I argue that supplemental insurance is a purely financial instrument because they are offered by a separate group of companies that do not participate in setting hospital prices.[17] In 2015, about 10% of the Fonasa beneficiaries and 45% of the Isapre enrollees hold supplemental insurance.[18] Since the proportion of Fonasa beneficiaries with supplemental insurance is small, their role in private hospitals can be reasonably omitted. However, unobserved supplemental insurance purchases may influence the hospital choices of private insurance holders.

2.2 Enrollment data and plan attributes

I use publicly available administrative data from Chile's healthcare regulator, the Health Superintendent, covering the years 2016 to 2019. The enrollment data is

[13] According to the 2017 national socioeconomic survey, 68% households with top income percentile and 37% with the second income percentile use private insurance. See report www.minsal.cl/wp-content/uploads/2018/10/CASEN-Salud-2017.pdf

[14] The rest of the population is in separate military and police force systems.

[15] In the online appendix, I show the patient composition by insurance affiliation for each hospital based on the national discharge data.

[16] Supplemental insurance is called "seguros complementarios" in Chile.

[17] Agents that offer supplemental health insurance plans include foreign insurance groups, banks, and sometimes private hospitals themselves, among others.

[18] Households with higher income and higher levels of education are more likely to have supplementary insurance. See the regulator's report based on the 2015 national socioeconomic survey at: https://www.supersalud.gob.cl/documentacion/666/articles-15825_recurso_1.pdf.

recorded at the product level, listing all plans with at least one enrollee and providing details on each plan's characteristics and number of enrollees.[19]

Chile's insurance market is an individual insurance market. Five private insurance companies are open to enrollment. Although plans can be purchased collectively as a firm, during my study period, 88% of the insurance buyers were enrolled in individual plans. A few mining companies hire their own 'closed' insurers that are similar to the managed care organizations in the U.S., but their market shares are small.

Insurance contracts in Chile are mostly linear. Figure 1 compares the stylized contract schedule of a typical insurance plan in Chile to that in the U.S.. Notably, plans in Chile do not include deductibles, fixed-amount copays, or out-of-pocket maximums. Instead, the coinsurance rate serves as the primary attribute determining cost-sharing.[20] Represented by a dashed line, a catastrophic coverage law aims to enhance the risk protection of private insurance. However, it requires activation and applies with certain limitations.[21]

There is a substantial variation in the slope of the linear contract due to the lack of standardization in plan design (unlike the four metal-tier plans in ACA exchanges). The five insurers offer a staggering number of plan options. During my study period, there were over 65,000 plans, among which 8,700 were active for sale. Most of these active plans are of distinct combinations of attributes such as premium, coinsurance, network and coverage cap.[22]

[19]Because the data is public, it does not permit cross-linkage to claims data. Cuesta, Noton, and Vatter (2024) used an earlier, non-public version of the data that does allow cross-linkage of claims data and plan data.

[20]Most plans have an annual coverage cap, so the out-of-pocket expenditure is a convex function of total medical expenditure. Once one's annual coverage reaches the cap, the insurer only covers the legal minimum of 25%. The cap is set quite high and rarely binds.

[21]When hospitalization is anticipated to be (financially) catastrophic, the patient can activate the law of catastrophic coverage within the first 48 hours. It kicks in after one's out-of-pocket payment reaches an established deductible and sometimes involves transferring to low-cost hospitals.

[22]It is also common practice for contracts to have coverage exclusions and restrictions, so effective coverage can be lower than the advertised coverage. For example, 83% were enrolled in plans with reduced coverage for specified conditions such as childbirth, psychiatric, bariatric surgery, etc.

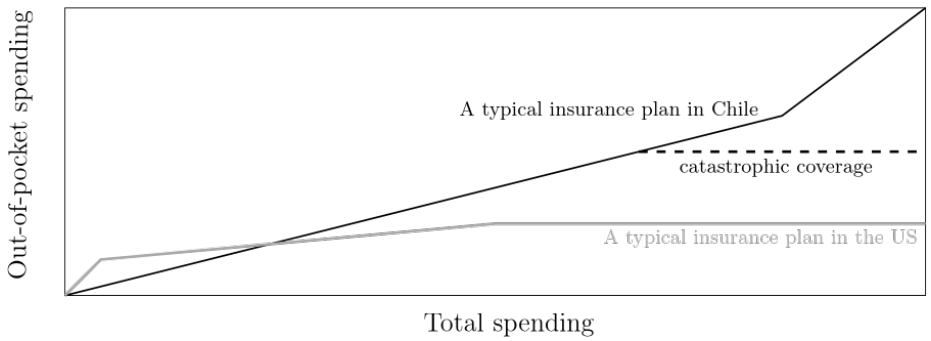


Figure 1: Stylized linear insurance contracts in Chile

Notes: The catastrophic coverage line is dashed because it is a government mandate but its application has timing and network restrictions that are often different from the original plan coverage.

2.3 Claims data and empirical coinsurance rates

The medical claims data is recorded at the service level, encompassing all medical bills from all private insurers. For each patient, I observe age, sex and region of residency. For each hospital visit, I observe the quarter and year, the provider, the insurer, prescribed medical services, the full price of each service, and the composition of payment made by the insurer and the patient. The data provides further information related to the reimbursement of each item, such as whether the provider is on the preferred tier of the patient's plan, whether the coverage cap is exceeded, etc.

I combine service-level claims to construct admission data based on each patient's main diagnosis. I restrict my analysis to the universe of 1.2 million inpatient admissions that involve some form of surgery. There are two advantages to focusing on surgical admissions. First, it emphasizes the choice component in hospital demand, as most surgeries are planned and scheduled rather than emergency care. Second, the conventional 'moral hazard' concern, where patients excessively consume medical services, is minimal for surgeries. Additionally, some patients receive care from multiple providers for a single diagnosis; in such cases, I assign the main provider as the facility where the patient had the longest hospitalization stay.

My measure of coinsurance is based on the observed percentage of out-of-pocket payments from claims data. The median coinsurance rate is 20%, while the mean is 27%. Figure 2 illustrates its distribution, revealing substantial heterogeneity among patients. Coinsurance rates are significantly lower at preferred hospitals, with a median coinsurance rate of 10% compared to 29% at non-preferred hospitals.[23]

[23] I provide evidence in the online appendix that the variation in out-of-pocket coinsurance is not

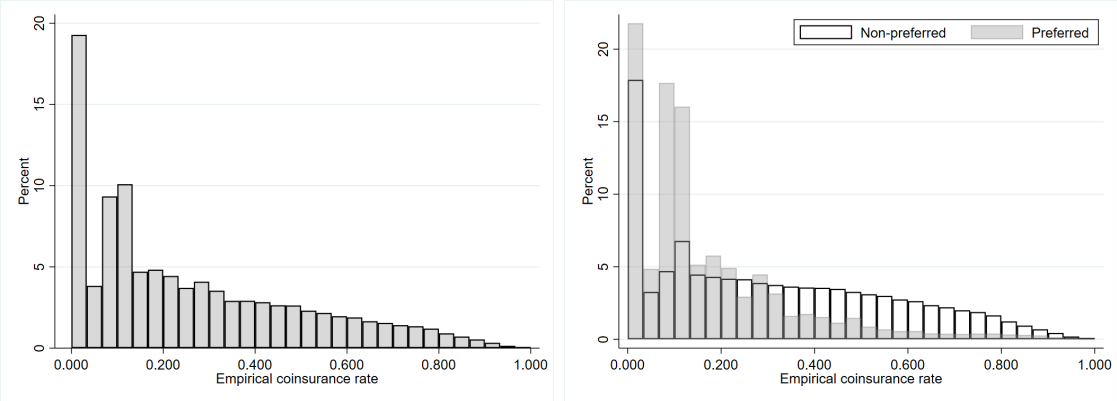


Figure 2: Observed out-of-pocket coinsurance rates

2.4 Vertical integration between insurers and hospitals

Direct ownership of hospitals by insurance companies is outlawed. However, some insurers circumvent the restriction by forming a third party holding that simultaneously owns majority shares of the insurer and some hospitals – an arrangement defined as vertical integration (VI) in Cuesta, Noton, and Vatter (2024)[24]. The authors model VI firms as setting prices to maximize joint profits, though the profits from the two business segments are not equally weighted. Their estimates suggest that VI firms place greater emphasis on the profits of their integrated hospitals.

Notably, none of the star hospitals are VI. For tractability, I take VI-insured consumers' preferences for VI hospitals as given and assume that VI firms negotiate prices in the same manner as other insurer-hospital pairs. For a detailed welfare discussion on VI, I refer readers to Cuesta, Noton, and Vatter (2024).

3 Empirical patterns

3.1 Hospitals: service-level price dispersion

Hospital prices are transparent in Chile. Private hospitals post their annual fee-for-service price lists on their websites. All hospitals post their list prices for the uninsured; some also post the average negotiated prices with private insurers. Moreover, every private hospital has a budget department where consumers can obtain

driven by whether the bill surpassed its coverage cap. Nor are these admissions with high coinsurance concentrated on treatment with reduced coverage, such as childbirth.

[24]Unlike the integrated model of Kaiser Permanente, here a VI insurer and a VI hospital maintain separate balance sheets and conduct transactions based on established fee-for-service prices.

personalized price quotes free of charge. Overall, the price lists reveal that insurers obtain smaller discounts at higher-priced hospitals.[25]

I adopt Cooper et al. (2019)'s exercises to analyze transacted prices between insurers and hospitals. Table 1 presents seven services that are commonly used to gauge price dispersion. In Panel A, unit prices exhibit substantial variation, with coefficients of variation (i.e., the standard error-to-mean ratio) exceeding 0.5. The 90th-to-10th percentile price ratios range from 3 to over 6, a magnitude comparable to that reported in the U.S..

However, unlike in the U.S., price variation across geographical areas and insurers is relatively low, with service-level price dispersion being primarily driven by hospital fixed effects. Panel B decomposes the sources of this price dispersion. Comparing columns (6) to (2), hospital fixed effects explain about 40–60% of the variation. After controlling for hospital fixed effects in column (7), adding insurer fixed effects in column (8) explains only an additional 1–3% of the variation. This decomposition underscores the central role of cross-provider price dispersion in Chile, in contrast to the U.S., where between-payer price variation is of comparable magnitude to between-provider variation (Craig, Ericson, & Starc, 2021).

3.2 Hospitals: admission-level price dispersion

For a more comprehensive understanding of the hospital market structure, I compare transacted prices at the admission level. However, interpreting admission-level prices is less straightforward due to unobservable patient severity. A costly admission may result from a provider charging high prices for basic services, offering luxury services, or delivering resource-intensive treatment. To disentangle these sources of variation, I use the public fee-for-service price list, which specifies the basic services covered and the corresponding price tag set by the state insurer. Private hospitals, in addition to these services, offer off-list services such as luxury rooms, highly specialized tests, and advanced procedures that the state insurer does not reimburse. I refer to these additional offerings as luxury services.

I normalize each admission's price by calculating how much the same service bundle would have cost under the public price list. This normalization ensures that the deviation in observed prices reflects the provider's price level rather than differences

[25]Interested readers may compare the price lists at Clínica Alemana and at Clínica Santa María (accessed September 2023). "Particular" is uninsured, "Fonasa" is the state insurer, and "Isapre" is the collective name for private insurers. I provide an illustrative example in the online appendix.

Table 1: Descriptive service-level dispersion in insurer-hospital transacted prices

Panel A: Summary	**Total price variation**						**Obs**	**Within hospital-year cv**
	mean (in pesos)	s.e. (in pesos)	cv	p10	p90	p90/p10 ratio		
Hip placement	2,071,870	1,154,103	0.56	777,790	3,749,000	4.82	9,971	0.296
Knee placement	1,989,184	1158446	0.58	693,655	3,828,284	5.52	5,086	0.263
Cesarean section	788,031	447,323	0.57	248,940	1,547,108	6.21	27,757	0.282
Vaginal delivery	752,832	369,975	0.49	345,468	1,306,707	3.78	84,132	0.233
PTCA	805,144	478,203	0.59	268,584	1,315,245	4.90	12,161	0.390
Colonoscopy	121,904	96,114	0.79	59,840	186,860	3.12	21,373	0.330
Lower limb MRI	305,625	170,635	0.56	136,710	554,861	4.06	2,723	0.185

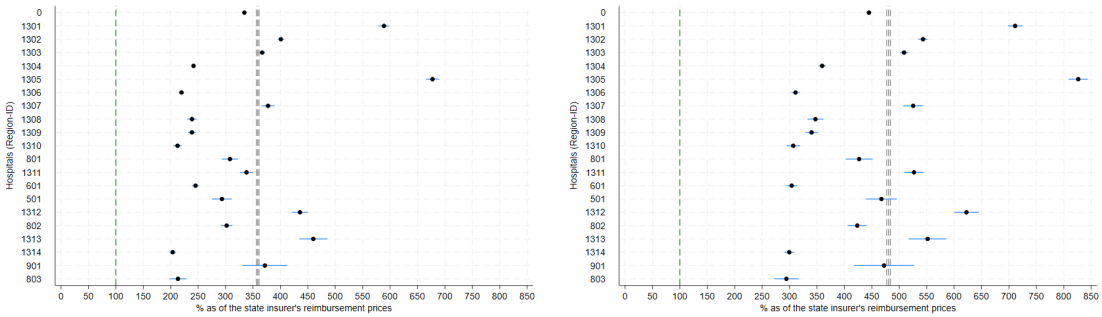
Panel B: Decomposition	**R^2**							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Hip placement	0.012	0.052	0.064	0.163	0.112	0.680	0.681	0.699
Knee placement	0.021	0.090	0.101	0.203	0.142	0.723	0.724	0.753
Cesarean section	0.123	0.137	0.137	0.222	0.191	0.634	0.635	0.676
Vaginal delivery	0.061	0.070	0.076	0.167	0.123	0.720	0.721	0.736
PTCA	0.012	0.028	0.032	0.054	0.094	0.435	0.435	0.440
Colonscopy	0.012	0.017	0.042	0.057	0.054	0.352	0.352	0.357
Lower limb MRI	0.018	0.027	0.035	0.108	0.137	0.704	0.704	0.731
Patient characteristics	✓	✓	✓	✓	✓	✓	✓	✓
Reimburse characteristics		✓	✓	✓	✓	✓	✓	✓
Closed insurer FE			✓	-			✓	-
Insurer FE				✓				✓
Region FE					✓	-	-	-
Hospital FE						✓	✓	✓

Notes: "cv", coefficient of variation. Patient characteristics include age and sex. Reimburse characteristics include reimbursement restrictions and whether it is subject to specific regulations. Closed insurers are managed care organizations of some large mining companies. Over 90% of the insurance buyers are enrolled with the five open insurers. Prices are in Chilean pesos. \$1,000 CLP $\simeq$ \$1.4 USD during the years 2016-2019.

in the quantity or complexity of services provided. Figure 3 plots the price deviation for general hospitals, ranked by market share. Hospital 0 represents the aggregation of smaller or specialized providers and accounts for approximately half of the market share. Each point estimate represents the average per-admission price at a hospital, expressed as a percentage of the public price for the same admission. The vertical lines at 100% indicate the public benchmark. Panel (a) shows that an average admission in private hospitals is 352% of the public price, counting only basic services. Adding luxury services in (b), an average admission in private hospitals is 480% of the public price.

Two hospitals stand out with both high prices and high market shares. I thus label hospitals 1301 and 1305 as 'star' hospitals.[26] Broadly speaking, these two star hospitals charge approximately 650% of the public price for basic services and 800% of the public price when including both basic and luxury services.

[26]Hospital 1301 is Clínica Alemana, and hospital 1305 is Clínica Las Condes. Both are widely held as the most prestigious private hospitals in the country. Clínica Alemana often features among the top 3 best hospitals in Latin America (see América Economía).



(a) Percentage as of public prices (only basic services)

(b) Percentage as of public prices (basic + luxury services)

Figure 3: Normalized admission-level price dispersion by hospitals (private general hospitals, ranked by market share)

Notes: All hospitals with non-zero ID are general hospitals ranked by market share. Hospital 0 combines all the rest of the small and specialized ones and accounts for over 50% of the market share. The first one or two digits indicate its region of location. Basic services are services that are included in the public insurer price list; luxury services are those that the public insurer does not reimburse.

The hospital market appears geographically competitive, as the ten largest general hospitals are all located in Region 13, the capital city Santiago.[27] I focus my subsequent analysis on these ten largest private hospitals, which I later label as h_1 - h_{10}. There are three groups of hospitals in terms of price level: h_1^s and h_5^s are high-priced star hospitals, h_2, h_3, h_7 are medium-priced non-star hospitals and h_4, h_6, h_8, h_9 and h_{10} are low-priced non-star hospitals.[28] Among then, h_7 is academic. The price ratio between high-/low-priced hospitals is about three.

3.3 Insurance: network choices and enrollment

The insurance market also appears competitive. Table 2 indicates that no single firm dominates, as the five insurers hold similar market shares. Plan competition is likely intense, given that each insurer offers thousands of plan options.

The insurers offer three types of network policies: FN plans offer uniform coverage at any provider of choice, TN plans divide providers into preferred and non-preferred tiers with differential coverage, and NN plans only cover a subset of providers.[29] Table 2 shows that TN plans are the most popular and every insurer offers it. Within the

[27]The metropolitan region of Santiago has a population of approximately 7-8 million, accounting for about 40% of the national population.

[28]The regulator also divides large private hospitals into the same three groups. See https://www.supersalud.gob.cl/documentacion/666/w3-article-5904.html.

[29]In Chile, FN plans are called "plan libre elección". TN plans are called "plan preferente", and NN plans are called "plan cerrado".

same insurer that sells more than one type of plans, TN plans are 8% (m_1) to 42% (m_3) cheaper than FN plans while NN plans are 55% (m_5) to 61%(m_2) cheaper than FN plans. Hence, it is reasonable to infer that many of these plans save cost by placing more expensive hospitals on the non-preferred tier with lower or null coverage.

Demand for different network policies depends on consumers' hospital preferences. Table 2 shows that the insurance buyers who do not reside in Santiago (where star hospitals are located) are less likely to enroll in FN plans. However, although FN and NN plans are cheaper, network choices do not appear to be correlated with income, which I discuss in the online appendix.

Table 2: Descriptive enrollment and premium of plans with different network policies

		Number of enrollee	Network policy		
			Full-network (FN)	Tiered-network (TN)	Narrow-network (NN)
Market share by network policy					
Overall		3,411,231	38.6%	57.7%	3.7%
Commercial status	Discontinued	2,473,134	32.3%	64.3%	3.4%
	Active	938,097	35.5%	60.3%	4.1%
Region	Santiago	2,872,417	42.8%	53.5%	3.6%
	Other regions	538,814	24.9%	71.5%	3.5%
Insurer	m_1	595,708	70.3%	29.7%	–
	m_2	707,404	36.9%	58.3%	4.8%
	m_3	497,297	67.1%	32.8%	–
	m_4	836,807	1.9%	98.0%	0.1%
	m_5	682,739	47.6%	42.1%	10.3%
Mean(std.) premium (in thousands of Chilean pesos) of active plans					
Insurer	m_1		49(34)	45(30)	–
	m_2		61(31)	43(21)	24(5)
	m_3		83(46)	48(21)	–
	m_4		–	55(21)	34(5)*
	m_5		47(29)	34(16)	21(7)

Notes: Market shares are calculated from all enrollees, while premiums are based on plans that are active for sale. The premiums are base prices for a risk factor of 1. With some variation, insurers typically assign a factor of 2 to a policyholder and a factor of 1 to a dependent, which is further adjusted by community risk factors based on age and sex. 1,000 CLP $\approx$ 1.4 USD during 2016-2019.
*Insurer m_4 does not sell FN plans during 2016-2019 and only sells NN plans in 2019.

There is significant friction in the insurance market. Irrespective of network policy, the majority of the insurance buyers are enrolled in discontinued plans that are no longer open to enrollment. The culprit is that guaranteed renewability leads to contract lock-in: consumers with deteriorated health status must hold on to their original plans because, if they switch plans, their risk-adjusted premiums would be much higher. Atal (2019) provides evidence of decreasing markups over time as in-

dividuals stay enrolled in the same plan, which leads to unprofitable plans becoming inactive. Given the pervasive cross-subsidization across plans, the exceptionally large number of plan offerings[30] and the significant institutional and behavioral inertia (Handel, 2013) in insurance choice, I do not model premium-setting. Instead, I assume perfect plan competition and a one-to-one pass-through from hospital costs to plan premiums.

3.4 Insurer-hospital interaction: hospital-specific coverage

Consistent with the popularity of TN plans, claims data reveal that insurers assume varying levels of average coverage across hospitals. In Table 3, I highlight higher-priced hospitals with darker shades and VI insurer and hospital pairs with underlines. All five insurers have 'complete' networks that include all major hospitals. Panels (a) and (b) suggest a strong correlation between the number of admissions and the percentage of patients with 'preferred' coverage. Although (b) shows that some TN plans place star hospitals on the preferred tier, (c) indicates that all insurers provide lower coverage at the two star hospitals. On a share-weighted average, star hospital coverage is between 10 percentage points lower (m_3) and 24 percentage points lower (m_5) compared to non-star hospital coverage.

However, there is a discrepancy between network choices and actual hospital utilization. While 61% of insurance buyers are enrolled in TN and NN plans, only 38% of patients receive treatment at a preferred hospital. This suggests that TN plan holders frequently opt for non-preferred providers.

4 Theoretical framework

In this section, I introduce a stylized model to capture the key aspects of the two healthcare markets. The model involves one insurer m, two hospitals A and B, and numerous consumers. The insurer is competitive, while the two hospitals are differentiated. Central to both markets is a continuum of consumers who vary in hospital preferences, contributing to imperfect competition in the hospital market and selection through network policies in the insurance market.

Figure 4 presents an overview of the theoretical framework. All consumers are sick and demand medical services. Hospitals A and B are single-product firms that

[30] Modeling plan choice first requires defining the choice set. See Cuesta, Noton, and Vatter (2024) for a plan grouping procedure that relies on cross-walking the plan data to the claims data.

Table 3: Pair-wise patient quantity, preferred coverage and average coverage rates

	Hospitals									
	h_1^s	h_2	h_3	h_4	h_5^s	h_6	h_7	h_8	h_9	h_{10}
Market share	8.2%	7.8%	6.4%	5.9%	4.4%	3.1%	2.8%	2.5%	2.3%	1.8%
Insurers	**Panel (a). number of surgical admissions**									
m_1	31,930	14,974	13,482	6,630	17,143	4,243	10,814	3,180	4,414	2,542
m_2	22,096	13,285	19,474	7,511	6,242	7,913	12,538	5,963	5,588	1,535
m_3	5,856	5,045	17,140	1,437	4,416	1,385	1,856	1,350	632	1,534
m_4	27,923	48,222	15,195	43,592	17,729	4,826	2,412	3,444	3,983	11,970
m_5	1,671	1,856	4,543	4,655	1,156	16,085	2,785	12,905	10,877	2,090
	Panel (b). percentage of patients with "preferred" coverage									
m_1	40.2	53.8	41.3	43.7	12.7	5.9	22.8	21.3	50.9	51.0
m_2	58.1	68.0	71.9	62.6	7.2	66.0	86.8	73.3	73.4	34.7
m_3	11.0	34.4	67.9	4.6	0.1	1.7	20.1	24.3	1.6	56.2
m_4	56.1	89.7	80.1	94.7	24.6	59.7	19.0	26.4	68.0	76.6
m_5	19.0	37.9	44.6	55.7	11.7	52.6	49.2	74.2	53.2	56.7
	Panel (c). average coverage rates									
m_1	0.69	0.78	0.77	0.78	0.60	0.76	0.77	0.78	0.78	0.81
m_2	0.70	0.76	0.78	0.80	0.49	0.81	0.86	0.82	0.83	0.75
m_3	0.88	0.98	0.98	0.93	0.79	0.78	0.85	0.73	0.81	0.97
m_4	0.67	0.79	0.74	0.83	0.57	0.75	0.62	0.71	0.71	0.85
m_5	0.49	0.68	0.71	0.75	0.49	0.74	0.68	0.73	0.75	0.75

Notes: h_1^s and h_5^s are labeled star hospitals. Underlined cells are vertically integrated (VI) through common parent holding.

produce substitutes, so each consumer demands at most one product. Consumers share a common valuation of hospital quality, $v_A > v_B > 0$, but they differ in their horizontal hospital preferences, $\theta \in [\underline{\theta}, \bar{\theta}] \sim F(\theta)$, due to 'distance' to each hospital that is located at opposite ends of a linear city (Hotelling, 1929). I refer to A as the high-quality star hospital and B as the non-star hospital.

Hospital preference is consumers' private information. To screen consumers, insurer m offers a menu of contracts with different combinations of coinsurance rates (c_B, c_A). Contracts differ in coverage level and tiered network. I will refer to $1 - c_B$ and c_B the risk-protecting level of coverage and coinsurance; $x = (1-c_B)-(1-c_A) = c_A - c_B$ the tiered difference in coverage or coinsurance. If hospital A is more expensive than B, competition implies higher premiums for plans with lower coinsurance levels (c_B) and less tiered difference (x).

When consumers choose vertical coverage levels, selection may involve consumers' heterogeneity in medical risk, risk aversion, 'moral hazard' and income (Marone & Sabety, 2022). If price and coverage level were standardized, selection into plans that include or exclude high-quality hospitals may involve both risk and hospital preferences (Shepard, 2022). However, different from Shepard (2022)'s setting, in my

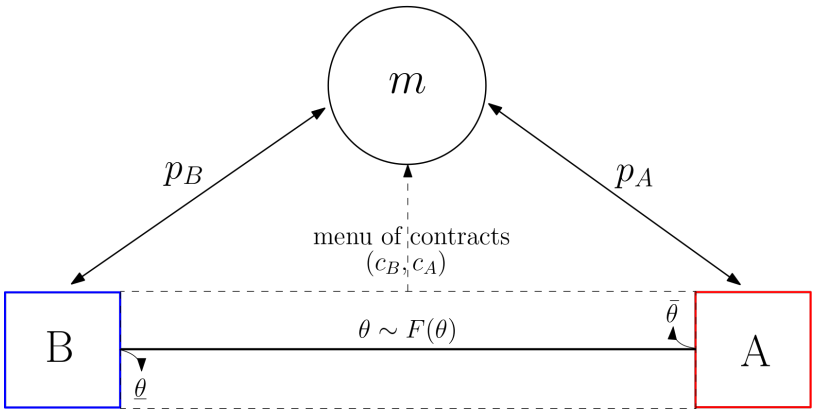


Figure 4: Theoretical model overview

Notes: Consumers have common valuations for hospitals A and B such that $v_A > v_B > 0$. m is the insurer that enrolls all sick consumers and negotiates prices with both hospitals. Consumers differ in their horizontal hospital preference θ. A contract of insurance plan is defined as coinsurance rates (c_B, c_A).

empirical setting, buyers choose both coverage and network.[31] Therefore, I make a simplifying assumption that risk and hospital preference play separate roles in plan choice: consumers make vertical choices in coverage level based on factors such as risk, while their network choices are solely driven by hospital preference. This assumption allows me to focus on a single dimension of private information — star hospital preference — that is orthogonal to the vertical choices.

I separately analyze the two markets. In the hospital market, insurers observe average coinsurance rates $(\bar{c}_A, \bar{c}_B)$ and negotiate prices with hospitals. Average coinsurance rates and their tiered difference $\bar{x} = \bar{c}_A - \bar{c}_B$ are exogenous to hospital prices. In the insurance market, insurers observe hospital prices and offer two network policies: an FN plan with uniform coinsurance $c_A = c_B$ and a TN plan with tiered coinsurance $c_A > c_B$. Hospital prices are exogenous to plan premiums.

4.1 Hospital market

To model a vertically and horizontally differentiated hospital market, I extend the classic Hotelling (1929) model[32] in two aspects: (i) The two hospitals located at opposite ends of the linear city are 'vertically differentiated' (Shaked & Sutton, 1982), as $v_A \geq v_B$, and (ii) bilateral negotiation with the insurer determine hospital prices.

I assume symmetric marginal costs such that $mc_A = mc_B = mc$, allowing me to

[31] Veiga and Weyl (2016) distinguish selection and sorting incentives when only one product feature (referred to as quality) is used to select buyers with multidimensional types.

[32] Precisely, the price competition stage in a Hotelling model, holding fixed location choices.

focus on hospital markups (i.e., surplus). Ho (2009) estimated that star hospitals are more attractive to consumers and command higher markups. At the same time, marginal costs per admission are similar between the star and non-star hospitals.[33] In the hospital industry, quality is primarily determined by fixed costs, which do not directly influence equilibrium prices.

4.1.1 Hotelling-style demand

The insurer knows the distribution of θ and assumes that all consumers hold an average plan $(\bar{c}_A, \bar{c}_B)$. Here, I abstract away from consumers' plan heterogeneity. However, when applying the model to the data, price bargaining will incorporate the full spectrum of coverage heterogeneity.

The indirect utility of a consumer is quasi-linear, such that

$$U(v_h; c, \theta) = v_h - \theta - \bar{c}_h p(v_h) \tag{1}$$

I assume standard uniform distributions $\theta \sim U[0,1]$ to simplify the model solution. Denote $\Delta v \equiv v_A - v_B$, the indifferent consumer is therefore located at $\hat{\theta} = (1 - \Delta v + \bar{c}_A p_A - \bar{c}_B p_B)/2$.

4.1.2 Nash-in-Nash bargaining

The insurer m negotiate with each hospital $h \in \mathcal{H} = \{A, B\}$ to maximize their Nash product of gain from trade

$$\max_{\boldsymbol{p}} (V_{m,\mathcal{H}} - V_{m,\mathcal{H}\setminus h})^{b_m} (\Pi_{h,m})^{b_h} \tag{2}$$

where b_m is the bargaining weight of insurer and b_h is the bargaining weight of hospital, normalized to $b_m + b_h = 1$. Note that the disagreement payoff for any hospital is zero, as the model holds insurer choice fixed. A hospital's gain from trade is its profit from insurer m, $\Pi_{h,m} = (p_h - mc_h)s_h$, with s_h being its own market share.

I apply GNT's framework to model the insurer's payoff. They assume that an insurer values the welfare of its enrollees and refers to it as an insurer's 'agency' in the context of employer-sponsored insurance, where an insurer acts on behalf of an employer with employee welfare in mind due to other labor market considerations.

[33] Ho (2009) also noted that constrained capacity at star hospitals enables them to demand higher prices. However, this is not the case in Chile, where private hospitals are known for their quick access. A typical star hospital in Chile operates at approximately 80% of its capacity.

Differently, my empirical setting involves competitive insurers in an individual market, so I interpret such agency as a positive relationship between an insurer's revenue and its enrollees' willingness to pay for its network.

Denote the fraction of patients who choose hospitals A and B as $s_A \equiv 1 - \hat{\theta}$ and $s_B \equiv \hat{\theta}$. The insurer's surplus is the difference between its revenue and hospital expenses

$$V_{m,\mathcal{H}} = \tau \underbrace{\left[\overbrace{(v_A - \frac{1-\hat{\theta}}{2} - \bar{c}_A p_A)s_A + (v_B - \frac{\hat{\theta}}{2} - \bar{c}_B p_B)s_B}^{\text{consumer surplus as patients}} + \overbrace{\Psi}^{\text{value of risk protection}} \right]}_{\text{insurer revenue}} - \underbrace{[(1-\bar{c}_A)p_A s_A + (1-\bar{c}_B)p_B s_B]}_{\text{hospital expense}} \tag{3}$$

where I assume that insurer m's average revenue is proportional to an average consumer's monetized utility with a rate of $\tau \in (0, 1]$, subject to $V_{m,\mathcal{H}} \geq 0$, and Ψ representing the value of risk protection. I assume that the two hospitals are equally capable of meeting medical needs so that the value of risk protection does not vary by hospital choice and is, therefore, independent of hospital prices. If $\tau = 1$, the insurer captures all consumer surplus as revenue. In that case, the insurer's payoff perfectly aligns with patient welfare, $V_{m,\mathcal{H}} = (v_A - \frac{1-\hat{\theta}}{2} - p_A)s_A + (v_B - \frac{\hat{\theta}}{2} - p_B)s_B + \Psi$ and coinsurance plays no role in price bargaining. However, as long as $\tau < 1$, the insurer places more weight on its hospital expenses than consumer welfare.

The standard solution concept for simultaneous bilateral Nash bargaining is the Nash-in-Nash equilibrium à la Horn and Wolinsky (1988). It makes a key assumption that each insurer-hospital pair's bilateral price negotiation takes the agreed-upon prices between other insurer-hospital pairs as given.[34] I further assume that, in the case of disagreement with one hospital, all patients go to the remaining hospital because of inelastic demand for medical care. This assumption maintains the risk protection value of insurance such that the insurer's disagreement payoff is

$$V_{m,\mathcal{H}\setminus h} = \tau(v_{-h} - \frac{1}{2} - \bar{c}_{-h}p_{-h} + \Psi) - (1 - \bar{c}_{-h})p_{-h} \tag{4}$$

[34]The assumption is valid when there are substitute firms in both the insurance market and the hospital market. See Collard-Wexler, Gowrisankaran, and Lee (2019) for the micro-foundation of Nash-in-Nash bargaining and its application to the healthcare markets.

with p_{-h} being the equilibrium price of the remaining hospital. Note that the mean 'distance' to only one hospital is 1/2. Including both hospitals in the network saves consumers' "transportation costs".

The bargaining first-order conditions read

$$p_h = mc - s_h \left[\underbrace{\frac{\partial s_h}{\partial p_h}}_{\Omega} + \underbrace{\frac{b_m}{b_h} s_h \frac{\frac{\partial V_m}{\partial p_h}}{V_{m,\mathcal{H}} - V_{m,\mathcal{H}\setminus h}}}_{\Lambda} \right]^{-1} \tag{5}$$

The conventional consumer price sensitivity Ω is small for several reasons. First, it approximates zero if coinsurance approaches zero.[35] Second, there is no outside option of renouncing medical care, and consumers have horizontal preferences for hospitals, so s_h is little sensitive to prices. However, hospital prices are not infinitely high because insurer bargaining introduces Λ – GNT refers to the sum $\Omega + \Lambda$ as the "effective price sensitivity".

Coinsurance introduces two forces that influence $\Delta p \equiv p_A - p_B$.

(i) **Demand steering with prices** through $\frac{\partial V_m}{\partial p_h}$, as

$$\frac{\partial V_m}{\partial p_A} = -[1 - (1-\tau)\bar{c}_A]s_A + \frac{\bar{c}_A}{2}[(1-c_A)p_A - (1-\bar{c}_B)p_B] \tag{6a}$$

$$\frac{\partial V_m}{\partial p_B} = -[1 - (1-\tau)\bar{c}_B]s_B - \frac{\bar{c}_B}{2}[(1-c_A)p_A - (1-\bar{c}_B)p_B] \tag{6b}$$

As long as $\bar{c}_B > 0$, p_A and p_B enter the first-order condition non-linearly, driving the two prices in opposite directions. As a result, Δp increases with both $\bar{c}_B$ and $\bar{x}$. The intuition stated by GNT is that "as long as coinsurance rates are strictly between zero and one, the insurer uses prices to steer patients toward cheaper hospitals."

(ii) **Relative disagreement payoff** through $V_{m,\mathcal{H}} - V_{m,\mathcal{H}\setminus h}$. Denote the savings in 'transportation cost' as $t = \frac{1}{2} - \frac{1-\hat{\theta}}{2}s_A - \frac{\hat{\theta}}{2}s_B$, the insurer's gain from trade

[35] Absent of coinsurance, the term Ω is non-existent as in many bargaining model applications for employer-sponsored insurance (e.g., Ho and Lee (2017)).

from each hospital is

$$V_{m,\mathcal{H}} - V_{m,\mathcal{H}\setminus A} = \tau \underbrace{\left[(\Delta v - (\bar{c}_A p_A - \bar{c}_B p_B))s_A + t\right]}_{\text{consumers' willingness to pay for A}} - \underbrace{\left[(1-\bar{c}_A)p_A - (1-\bar{c}_B)p_B\right] s_A}_{\text{additional cost of including A}} \tag{7a}$$

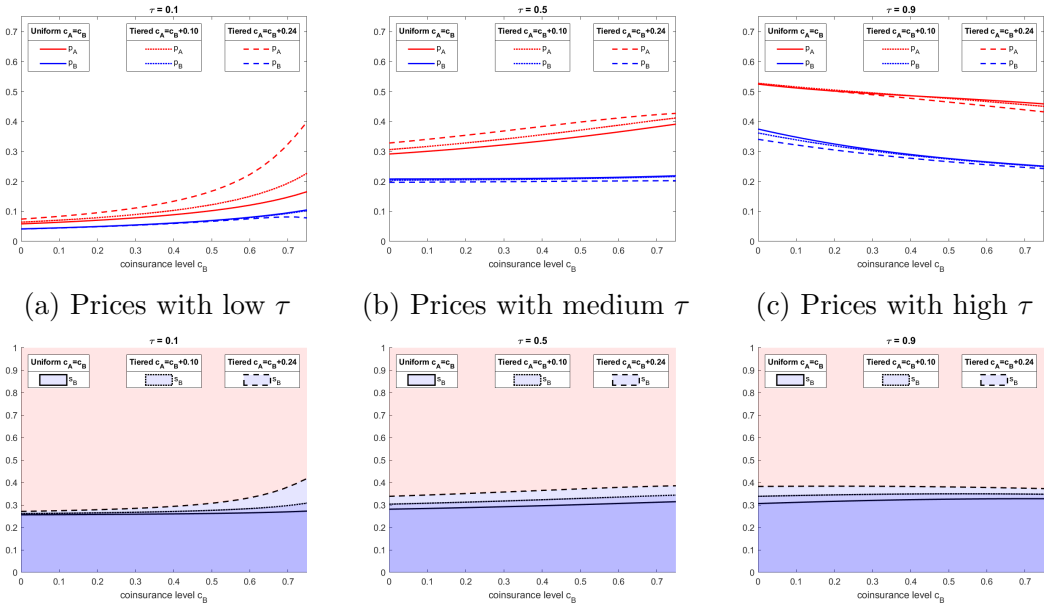
$$V_{m,\mathcal{H}} - V_{m,\mathcal{H}\setminus B} = \tau \underbrace{\left[((\bar{c}_A p_A - \bar{c}_B p_B) - \Delta v)s_B + t\right]}_{\text{consumers' willingness to pay for B}} - \underbrace{\left[(1-\bar{c}_B)p_B - (1-\bar{c}_A)p_A\right] s_B}_{\text{additional cost of including B}} \tag{7b}$$

Because demand for medical care is inelastic, bargaining gain from trade depends on the relative coinsurance for consumers and the *relative* costs for the insurer. Asymmetric coinsurance $\bar{c}_A > \bar{c}_B$ diminishes consumers' willingness to pay for A relative to B while also attenuating insurers' additional costs on A relative to B. If τ is small, a larger $\bar{x}$ and $\bar{c}_A$ implies more cost-saving and greater gain from trade with hospital A, thus higher p_A in equilibrium. But the opposite may occur if τ is large. The intuition is that the greater the value of τ, the more the insurer can internalize its bargaining externality on consumers' out-of-pocket spending through revenue.

4.1.3 Comparative statics

I illustrate how coinsurance shapes hospital market equilibrium with a numerical example. I set $v_A = 1$, $v_B = 0.5$, $mc = 0$, and $b_m = b_h = 0.5$. I plot prices against $\bar{c}_B$ under three scenarios: the benchmark scenario with uniform coinsurance ($\bar{x} = 0$) and the empirical range of tiered difference in average coinsurance from $\bar{x} = 0.10$ to $\bar{x} = 0.24$. Figure 5 shows the equilibrium prices and market shares by different values of τ (the insurer's market power in converting consumer welfare into revenue).

Overall, the hospital price level increases with τ as the insurer has more surplus to share with the hospitals. Also, tiered coinsurance is effective at steering demand from hospital A to hospital B, as common in (d), (e) and (f). However, how coinsurance affects prices depends on τ: in a competitive insurance market, as shown in (a) and (b), Δp increases with both coinsurance level $\bar{c}_B$ and tiered difference $\bar{x}$. The augmenting magnitude is smaller under more intense competition (i.e., $\tau = 0.1$), where the insurer has little surplus to share with hospitals. However, the opposite occurs in a non-competitive market where the insurer captures nearly all consumer surplus (e.g., monopoly), as shown in (c), such that coinsurance hurts consumer surplus as much as the insurer's revenue.



(a) Prices with low τ (b) Prices with medium τ (c) Prices with high τ

(d) Shares with low τ (e) Shares with medium τ (f) Shares with high τ

Figure 5: The role of average coinsurance in hospital market equilibrium

In all scenarios, higher-quality star hospital A obtains a higher markup and commands a higher price than non-star hospital B. In the next section, I analyze the role of a $\Delta p > 0$ in the insurance market.

4.2 Insurance market

4.2.1 Selection on hospital preference

Facing $p_A > p_B$, insurers have a selection incentive to screen consumers who are less likely to use the expensive star hospital A (Shepard, 2022). I follow Handel, Hendel, and Whinston (2015)'s health exchange model to analyze two plan policies: a FN plan that offers uniform coinsurance rate $c_A = c_B$ at any hospital of choice and a TN plan that offers the same coinsurance rate c_B at non-star hospital B but requires a tiered coinsurance rate $c_A > c_B$. Their premiums are P_{FN} and P_{TN}, respectively, and the premium difference is $\Delta P = P_{FN} - P_{TN}$.

The same parameter $\theta \in [\underline{\theta}, \bar{\theta}] \sim F(\theta)$ in the Hotelling model captures consumers' heterogeneous hospital preferences, with larger θ indicating a greater propensity to use the star hospital A. A consumer with $\theta < \Delta P$ prefers the TN plan, one with $\theta > \Delta P$ prefers the FN plan, and one with $\tilde{\theta} = \Delta P$ is indifferent.

The cost of insuring an individual of type θ in plan k is $C_k(\theta)$ for $k \in \{FN, TN\}$.

The average cost of each plan is:

$$AC_{FN}(\Delta P) = E[C_{FN}(\theta)|\theta \geq \Delta P] \tag{8a}$$

$$AC_{TN}(\Delta P) = E[C_{TN}(\theta)|\theta \leq \Delta P] \tag{8b}$$

As long as hospital prices $p_A > p_B$, consumers with larger θ are costlier to insure, so both cost functions $C_{FN}(\theta)$ and $C_{TN}(\theta)$ are continuously increasing. Since the FN plan offers a higher coverage for hospital A, $C_{FN}(\theta) > C_{TN}(\theta)$ everywhere above $\underline{\theta}$. The difference in average costs between the two plans are

$$\Delta AC(\Delta P) = AC_{FN}(\Delta P) - AC_{TN}(\Delta P) \tag{9}$$

which is commonly referred to as the *incremental cost* associated with each individual.

Assuming competition, a unique Riley (1979) equilibrium with positive sales in both FN and TN plans involves the *lowest* break-even ΔP,

$$\Pi_{FN}(P_{FN}, P_{TN}) = [P_{FN} - AC_{FN}(\Delta P)][1 - F(\Delta P)] = 0 \tag{10a}$$

$$\Pi_{TN}(P_{FN}, P_{TN}) = [P_{TN} - AC_{TN}(\Delta P)]F(\Delta P) = 0 \tag{10b}$$

The existence of an equilibrium where both FN and TN policies have positive sales requires a moderate Δp and a sufficient range in θ. If $\Delta AC(\underline{\theta}) < \underline{\theta}$, all consumers purchase FN plans. This occurs either when hospital prices are similar or when all consumers have strong preferences for hospital A. On the other hand, if $\Delta AC(\theta) > \theta$ for all θ, all consumers purchase TN plans because the hospital price dispersion is so large that no consumer is willing to bear the incremental cost of FN coverage. The equilibrium quantity of consumers who choose the TN plan then determines the insurer's tiered difference in average coinsurance $\bar{x}$.

4.2.2 Graphical analysis

I adopt Einav and Finkelstein (2011)'s graphical framework for illustration. Consumers choose whether to pay the extra premium ΔP for uniform coverage. The demand curve D_{FN} in Figure 6(a) is the cumulative distribution function of consumers' willingness to pay for the extra coverage. Consumer $\underline{\theta}$ is the least likely to use star hospital A and is willing to pay zero extra for the FN plan, and the marginal cost of enrolling consumer $\underline{\theta}$ in either FN or TN policy is identical, i.e., $\Delta MC(\underline{\theta}) = 0$.

At higher θ, the marginal cost of FN coverage increases. It is illustrated in Figure 6(a) as a downward sloping ΔMC curve. Since each individual's expected cost of FN coverage is private information, the firm offers a unique incremental ΔP for FN coverage. The competitive equilibrium is thus the intersection of D_{FN} and ΔAC. Consumers with $\theta \in [\tilde{\theta}, \bar{\theta}]$ purchase the FN policy with an extra premium ΔP_{eqm}.

Insurers attract consumers with $\theta \in [\underline{\theta}, \tilde{\theta}]$ by offering a TN policy. FN and TN policies differ in star hospital coverage, creating a discontinuity of average costs around the marginal consumer $\tilde{\theta}$, as shown in Figure 6(b). A marginal increase in θ contributes less to AC_{TN} than AC_{FN}, hence AC_{TN} has a flatter slope. Essentially, a TN plan is a lower quality product than a FN plan, so willingness to pay for it is also lower and *decreases* with θ. At the equilibrium price P_{TN}, the indifferent consumer $\tilde{\theta}$ obtains zero utility buying either FN or TN policy. Inframarginal consumers with $\theta \in [\underline{\theta}, \tilde{\theta}]$ purchase the TN policy.

It is worth noting that, unlike the FN plan, which is adversely selected, the TN plan is advantageously selected. Consumers with lower θ are more willing to pay for a TN plan while being less costly to insure. Consumer $\tilde{\theta}$ is the marginal consumer for both the FN policy and the TN policy.

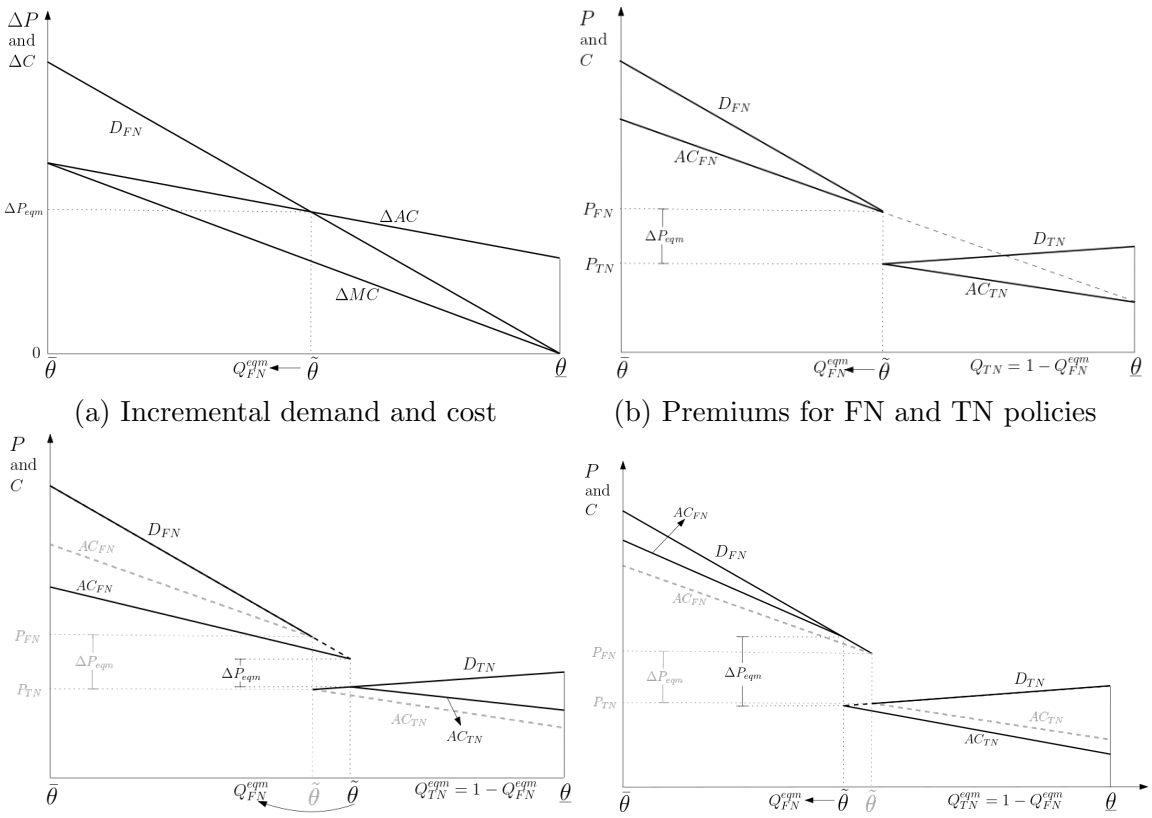
4.2.3 Comparative statics

The role of hospital price dispersion is quite straightforward. Figure 6(c) shows that a smaller price dispersion Δp leads to a counter-clockwise rotation of the average cost curves, increasing the market share of the FN plan and reducing the market share of the TN plan. Assuming a competitive insurance market, fewer consumers enroll in the TN plans, and insurers face less tiered difference $\bar{x}$ on average; thus, more homogeneous bargaining reinforces the smaller Δp. The opposite occurs in (d), as the feedback loop between Δp, ΔP, and $\bar{x}$ is amplifying.

4.3 Need for an empirical model

Whether the theoretical feedback loop between Δp and ΔP is stable is beyond the scope of this paper because I only have four years of data for empirical analysis. I proceed to assume stable markets and estimate a static model to quantify the equilibrium price effects of coinsurance in the hospital market.

An empirical model is necessary because the welfare implications remain unclear. For the two hospitals, coinsurance drives prices and quantities in opposite directions,



(a) Incremental demand and cost

(b) Premiums for FN and TN policies

(c) Smaller hospital price dispersion Δp

(d) Larger hospital price dispersion Δp

Figure 6: Insurance selection on star hospital preference and the role of Δp

so the net effect on profits is ambiguous. On the other hand, if every consumer's hospital choice and network policy choice fully align and they only use hospitals with preferred coverage, the insurer would face no tiered difference in coverage ($\bar{x} = 0$). Regulations that limit TN/NN options may over-provide networks and unnecessarily raise premium expenses, as the case found in Tilipman (2022). Therefore, the source of star hospital preference is critical for the welfare considerations of network choices.

5 Empirical model

My empirical model focuses on the hospital market, following GNT's two-stage game. In the first stage, insurers engage in bilateral negotiations with hospitals to determine the negotiated prices. In the second stage, each patient receives a health status draw and chooses a hospital, facing a predetermined coinsurance rate as a fraction of the negotiated price. I present the two stages in reverse order.

Before specifying the model, I construct the base price index for each insurer-

hospital pair. Similar to the approach in section 3.2, I follow Cuesta, Noton, and Vatter (2024) to decompose prices into a negotiated price component and a resource intensity component using the itemized public price list.

This approach has two key advantages. First, each price index is expressed as multiples of the public price, making interpretation straightforward. Second, it provides resource intensity weights that vary at the individual level, facilitating the identification of hospital demand primitives, particularly the separate identification of coefficient on out-of-pocket prices and latex preference shocks.

I also impute the expected coinsurance for each individual at each hospital using a Tobit model. Table 4 presents the estimated price index, resource intensity and expected coinsurance rates for each insurer-hospital pair. Price indices preserve the three-fold price ratio between high-priced star hospitals and their low-priced non-star competitors. On average, resource intensity shows little variation across insurers or hospitals. The differential coverage also maintains the observed pattern in Table 3, with a slight underestimate of the tiered coinsurance difference. Therefore, my subsequent analysis will be a lower bound of the true effects of tiered coinsurance.

I provide further details on the modeling preparation in the online appendix.

5.1 Hospital demand

In the second stage, sick patients choose hospitals. I define their choice set as the ten largest hospitals plus one outside good. The ten hospitals account for 47% of the market share and 61% of the revenue share for inpatient surgeries. All ten are general hospitals that offer surgeries in all 15 specialties.[36] As a centralized country, it is common for residents of other regions to travel to Santiago to access care, especially for surgeries. Also, all insurers have a complete network that includes all major providers. Therefore, all consumers share the same choice set of hospitals.

I approximate a Hotelling demand model with flexible heterogeneity in hospital preferences for several reasons. First and foremost, insurers' selection incentives arise from the variation in hospital preferences, so understanding these preferences is a first-order concern in this paper. Second, in hospital choice, individual demographics and diagnoses play a more significant role in consumer decision-making, whereas product

[36]The specialty divisions are standardized using the coding system of the state insurer. The 15 specialties are neurology, ophthalmology, otolaryngology, head and neck, plastic and reconstructive, dermatology, cardiovascular, thoracic, abdominal, colorectal (proctology), urological and adrenal, breast, gynecology, obstetrics, and traumatology.

Table 4: Pair-wise price index, resource intensity and expected coverage rates

Insurers	Hospitals									
	h_1^s	h_2	h_3	h_4	h_5^s	h_6	h_7	h_8	h_9	h_{10}
Panel (a). price index as multiples of the public price)										
m_1	5.28	4.02	3.43	2.12	6.25	2.13	3.24	2.18	1.87	2.31
m_2	6.19	3.94	3.09	2.13	6.69	1.95	2.58	1.84	1.87	2.20
m_3	4.07	2.93	3.00	1.89	4.52	2.35	3.21	1.86	2.15	2.10
m_4	6.25	3.88	3.02	2.03	5.97	1.75	2.72	2.01	1.83	1.98
m_5	5.41	3.46	3.05	1.87	5.84	1.86	2.93	1.96	1.83	1.94
Panel (b). resource intensity weights										
m_1	12.8	13.3	13.4	13.2	13.1	13.1	12.9	13.0	13.3	13.2
m_2	13.0	13.3	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.3
m_3	13.2	13.3	13.3	13.4	13.3	13.3	13.5	13.5	13.3	13.3
m_4	13.1	13.3	13.4	13.4	13.3	13.4	13.4	13.5	13.4	13.4
m_5	13.2	13.2	13.3	13.5	13.3	13.5	13.4	13.4	13.3	13.3
Panel (c). expected coverage rates										
m_1	0.63	0.68	0.72	0.75	0.71	0.77	0.75	0.79	0.76	0.79
m_2	0.67	0.70	0.73	0.78	0.59	0.77	0.78	0.79	0.80	0.75
m_3	0.88	0.90	0.90	0.90	0.83	0.79	0.85	0.72	0.83	0.90
m_4	0.66	0.69	0.68	0.78	0.62	0.73	0.69	0.74	0.71	0.83
m_5	0.53	0.64	0.67	0.71	0.54	0.68	0.62	0.68	0.71	0.74

Notes: h_1^s and h_5^s are labeled star hospitals. Underlined cells are vertically integrated (VI) through common parent holding.

characteristics are less informative.[37] Third, latent preference shocks, stemming from unobservable factors such as peer recommendations, prior treatment history, and supplemental insurance purchases, are particularly relevant. Given the multi-dimensional nature of this latent variation, imposing any specific distributional assumption may prove overly restrictive.

My demand estimation leverages individual-level data (i.e., 'microdata') with a large sample size. I partition individuals into groups by insurer, year, demographics and diagnoses, which can be viewed as different 'markets' t. The partition creates a total of 1,824 markets.[38] Nevertheless, fully nonparametric or semiparametric demand

[37] Raval, Rosenbaum, and Tenn (2017) partition patients based on observables and show that nonparametric frequency approach yields more accurate out-of-sample substitution patterns than the canonical parametric logit model, making it attractive for settings where prices are determined by bargaining.

[38] Individual-level out-of-pocket prices provide variation of dimension N_t in each market. I only consider markets with a minimal size of 25 consumers, a threshold suggested by Raval, Rosenbaum, and Tenn (2017). Using Berry and Haile (2024)'s notation, $H = N_t \geq 25$ is greater than the number of hospitals ($J = 10$) in every market, satisfying their core assumptions (iii).

(Raval, Rosenbaum, & Tenn, 2017) alone is not sufficient because I am interested in the *ceteris paribus* effects of prices and coinsurance rates on hospital choice probabilities. Therefore, I specify and estimate a linear functional form for indirect utilities.

5.1.1 Demand model specification and estimation

Upon receiving the health status draw, a utility-maximizing consumer in the market t chooses a hospital. The indirect utility that consumer i receives from choosing hospital h is

$$u_{iht} = \delta_{iht} + \varepsilon_{ih} \tag{11}$$

where δ_{iht} is the expected utility and ε_{ih} is an i.i.d. error term that is distributed Type 1 Extreme Value. Thus, the probability for patient i to choose hospital h given their insurer's network and negotiated prices is

$$s_{iht}(\mathcal{N}_{m(i)}, \boldsymbol{p}_{m(i)}) = \frac{\exp(\delta_{iht})}{\sum_{k \in 0, \mathcal{N}_{m(i)}} \exp\left(\delta_{ikt}\right)} \tag{12}$$

I further specify the conditional demand function as

$$\delta_{iht} = \alpha_t log(c_{ih} w_i p_{mh}) + \beta_t D_{r(i)h} + \xi_{ht} \tag{13}$$

where coinsurance rates c_{ih}, resource intensity weight w_i and base prices p_{mh} were estimated previously;[39] $D_{r(i)h}$ is a "cross-region distance" index based on patients' region of residency.[40] [41] The latent market-level unobservable heterogeneity ξ_{ht} is an eleven-vector (ten large hospitals and one outside good) that captures all other hospital characteristics that are constant across consumers within a market.[42]

Although I do not specify α_t as a random coefficient (Berry, Levinsohn, & Pakes, 1995), it is estimated at the market level, so it varies by insurer, year, consumer demographics and diagnosis. The same is for β_t and ξ_{ht}. Therefore, across markets,

[39] A natural logarithmic transformation is necessary to mitigate the right-skewness of out-of-pocket spending. In practice, I set it as $log(1 + c_{ih} w_i p_{mh})$ to avoid log-zeros.

[40] The public data does not reveal any patient's address. Regions in Chile are divided by simple horizontal borders and numerated (largely) from north to south, with Santiago being located at the center. My distance index is the number of regions between each region and Santiago.

[41] Missing within-region distance may introduce estimating bias. However, all ten hospitals are within 30 minutes of driving distance. The bias is further mitigated by restricting attention to surgeries, for which traveling time is less determinative of hospital choice.

[42] ξ_{ht} absorbs the vertical integration indicator because different insurers are considered separate markets.

variations in the latent preference shock ξ_{ht} capture the heterogeneity in hospital preferences.

Normalization. The latent demand shocks ξ_{ht} have no natural location. I assume that the outside good is of $\xi_{0t} = 0$, requires no cross-region travel, but charges a positive price p_{m0}. Since the outside good 0 accounts for about half of the market share, ξ_{ht} is mostly negative for the large hospitals in the choice set.

Identification and estimation. All identification comes from variations in choices of a hospital within a market t, based on individual-level variations in resource intensity weights, coinsurance rates and regions of residency. An instrument for prices is sufficient for demand identification (Berry & Haile, 2024). Following Cuesta, Noton, and Vatter (2024), I use the price index of closed insurers as an instrument.[43] Since consumers in my analysis are not eligible for closed insurers, it can be viewed as a Hausman (1996) instrument. I make the common assumption that patients' region of residence is uncorrelated with hospital preferences. I estimate all parameters jointly using moment conditions that stack the score of likelihood based on individual choices with the orthogonality conditions of the price instrument.

5.1.2 Estimation results

Figure 7 presents histograms of the estimated coefficients, aggregated across all markets and weighted by market size. The coefficient α, which represents the marginal disutility of out-of-pocket price, corresponds to a mean logit price elasticity of -0.21. The elasticity ranges from -0.09 to -0.23 by the hospital and from -0.12 to -0.39 by the insurer.[44] Given the higher levels of coinsurance, it is slightly higher than the estimated elasticity for inpatient care in the U.S., which ranges in $(-0.07, -0.17)$ (Gowrisankaran, Nevo, & Town, 2015) or $(-0.04, -0.16)$ (Prager, 2020). The distribution of β (the disutility of traveling to Santiago) is left-skewed, reflecting that traveling can be prohibitive for those in unstable conditions.

The primary advantage of the market partition is its ability to uncover the underlying factors driving hospital preferences. For example, Figure 8 presents the joint distribution of preferences for the two largest hospitals, intersecting with various market characteristics. The diagonal line in each plot represents the 'indifference' points, where the two hospitals are valued equally, while the shading indicates density."

[43] Closed insurers are employer-sponsored insurance that consists mainly of large mining companies. Only 4.5% of the admissions are paid by closed insurers, but they cover all ten hospitals.

[44] Out-of-pocket payment is log-transformed. Therefore, the logit elasticities are given by $\hat{\eta}_{iht} = \alpha_t(1 - \hat{s}_{iht})$, where $\hat{s}_{iht}$ is the predicted choice probability from the logit choice model.

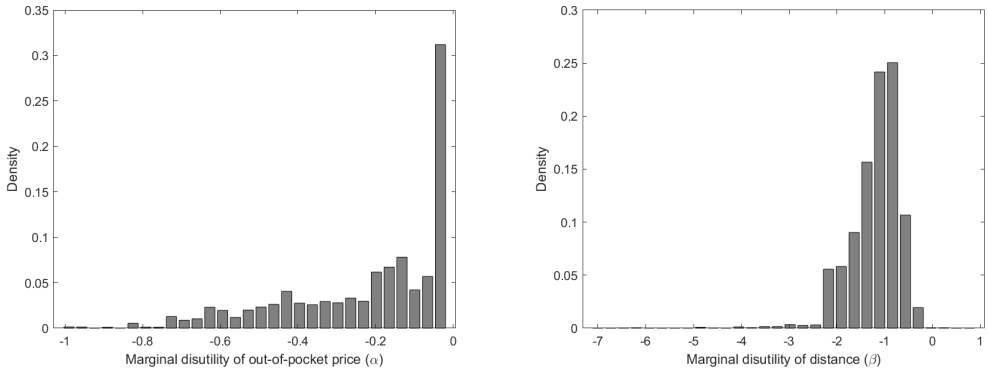
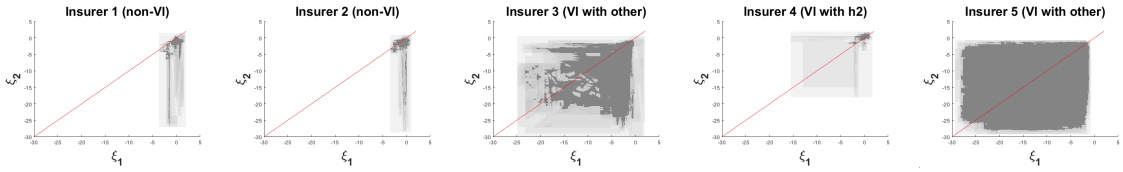


Figure 7: Cross-market distribution of coefficients

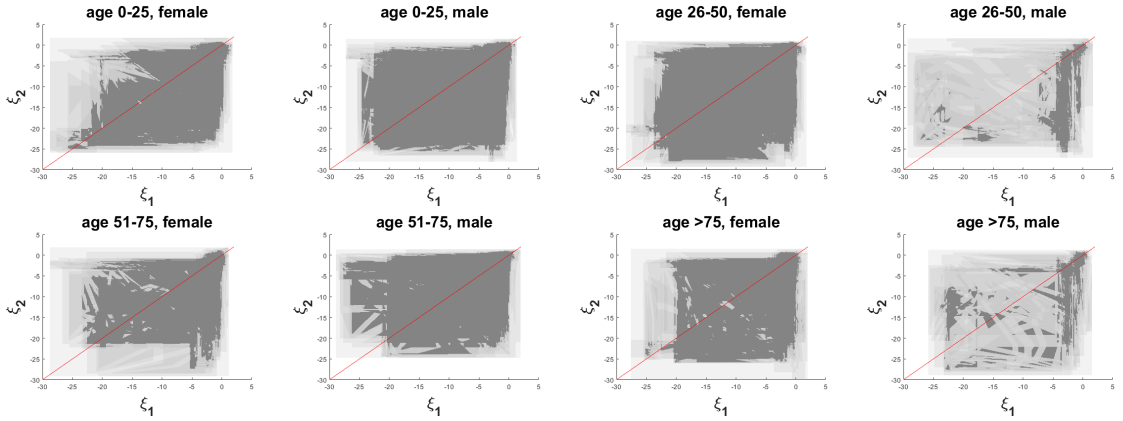
The first dimension of heterogeneity is by the insurer, which reflects a preference for VI hospitals beyond negotiated prices (Cuesta, Noton, & Vatter, 2024). Figure 8(a) shows that enrollees of non-VI insurers mostly prefer the star hospital h_1^s over the non-star hospital h_2. In contrast, enrollees of insurer 4 (VI with h_2) prefer h_2 over h_1^s. Enrollees of insurers 3 and 5 that have other VI hospitals exhibit a lower preference for the two largest hospitals. The second dimension is patient demographics. Figure 8(b) shows little correlation between star hospital preference and demographics. The third dimension is by diagnostic specialty. Figure 8(c) shows that the two hospitals are equally and highly regarded for specialties such as neurology, plastic and reconstructive surgery and traumatology, but less so for specialties such as ophthalmology, head and neck, dermatology, cardiovascular surgery, colorectal surgery, urology, gynecology and obstetric care. Moreover, h_1^s is clearly favored over h_2 for otolaryngology, abdominal and breast surgeries, while h_2 appears more favorable for thoracic care.

Figure 8 also provides empirical evidence of a sufficiently wide range of horizontal preferences to sustain positive enrollment in TN plans (discussed in section 4.2). Moreover, the correlation between star hospital preference and diagnosis is welfare-relevant, as the specific disease one may develop is *ex-ante* unpredictable at the time of purchasing an insurance policy, unlike demographic characteristics. This helps explain why a significant number of patients with TN plans choose a non-preferred hospital, incurring higher out-of-pocket coinsurance costs. It also sheds light on the unpopularity of NN plans, which exclude coverage for certain hospitals specializing in diseases that an insurance buyer may encounter in the future.

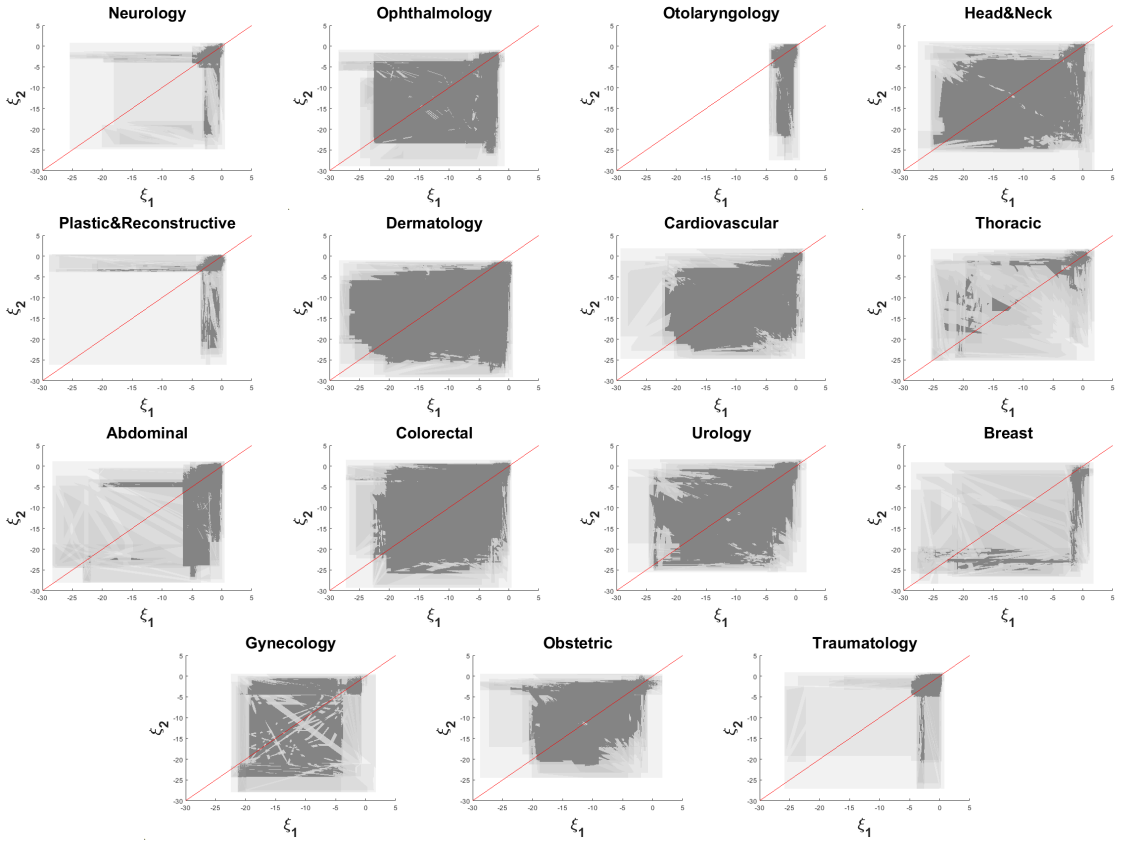
Model fit. I evaluate model fit using a hold-out sample. I re-estimate the model with a random sample of 80% of the observations and predict hospital choices for the



(a) By insurer



(b) By demographics



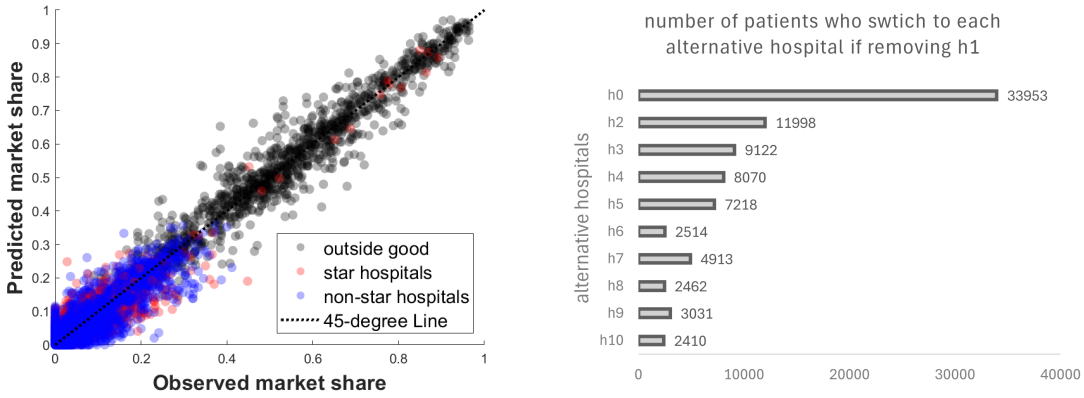
(c) By diagnostic specialty

Figure 8: Joint distributions of preference for a star hospital and a non-star hospital

Notes: Shades in each graph represents density. The diagonal line is a 45-degree line where the two hospitals equal in ξ.

remaining 20% individuals. Figure 9(a) shows that the predicted market shares well match the observed market shares of each hospital in the hold-out sample.

Substitution pattern. I assess substitution between hospitals by removing the star hospital h_1. Figure 9(b) shows the number of h_1's patients who would switch to other hospitals. Clearly, not all alternatives are equal, and a large fraction of patients switch to the outside good h_0. High- and medium-priced hospitals are closer alternatives than low-priced hospitals, indicating greater proximity in quality. The model allows for flexible substitution patterns, which are crucial for accurately computing disagreement payoffs in the bargaining stage.



(a) Out-of-sample prediction, by market

(b) Substitution pattern

Figure 9: Validity of the hospital demand model

5.2 Nash-in-Nash price bargaining

In the first stage, each insurer and hospital pair engages in bilateral negotiation, anticipating consumers' willingness to pay (WTP) (Capps, Dranove, & Satterthwaite, 2003) for each insurer m's network, which is derived from the ex-post utility in the second stage of hospital choice. Extending the theoretical model in section 4.1.2, the set of insurer $\mathcal{M}$ and the set of hospitals $\mathcal{H}$ forms a network represented by $\mathcal{N} \subseteq \{0,1\}^{|\mathcal{H}|\times|\mathcal{M}|}$. For each pair of $mh \in \mathcal{N}$, hospital price p_{mh} is determined by maximizing Nash product of gains from trade

$$p_{mh} = \underset{p}{argmax}[V_m(\mathcal{N}, \boldsymbol{p}_m) - V_m(\mathcal{N}\backslash mh, \boldsymbol{p}_{-mh})]^{b_m}\Pi_h(\mathcal{N}, \boldsymbol{p}_m)^{b_h} \tag{14}$$

My model deviates from GNT in two aspects. First, my hospital demand model

normalizes utilities so that the outside good, which accounts for over half of the market share and charges a positive price, has $\xi_{0t} = 0$ in all markets. Therefore, even though the estimated coefficient α converts 'utils' into monetary terms, I still need a scale factor (denoted as γ) to rationalize the level of consumer WTP. As a result, the parameter τ that indicates the competitiveness of the insurance market is not identifiable. An insurer m's empirical surplus reads

$$V_m(\mathcal{N}_m, \boldsymbol{p}_m) = \underbrace{\tau\gamma}_{\kappa} \left[\frac{1}{\alpha_m} \sum_{i=1}^{I} \mathbf{1}\{m(i) = m\} W_i(\mathcal{N}_m, \boldsymbol{p}_m) \right] - TC_m(\mathcal{N}_m, \boldsymbol{p}_m) \tag{15}$$

where W_i is each enrollee's WTP, and TC_m is the insurer's total cost on hospitals. I provide details about the computation of each component in the online appendix.

The fact that insurer m_3 pays hospital h_5 at its marginal cost uniquely pins down the value of κ for this pair. I then apply the same κ to other insurer-hospital pairs. The drawback of this simplification is that, in reality, insurers may have different values of τ, reflecting imperfect competition. Nevertheless, a constant κ is consistent with the assumption of perfect competition in the insurance market maintained throughout this paper.

Second, I impute hospital marginal costs mc_h, calculated based on observed average service costs from hospitals' financial reports.[45] Considering that resource intensities are similar across enrollees from different insurers, as shown in Table 4, I assume a constant mc_h for each hospital, irrespective of the insurer.

Given the scale factor and marginal costs, pairwise bargaining weights solve the bargaining first-order conditions between the five insurers and ten hospitals.

$$\boldsymbol{p} = \boldsymbol{mc} - [\boldsymbol{\Omega} + \boldsymbol{\Lambda}(\boldsymbol{b})]^{-1}\boldsymbol{q} \tag{16}$$

where both $\boldsymbol{\Omega}$ and $\boldsymbol{\Lambda}$ are scalars under the assumption of no horizontal nor vertical integration in price negotiation. Table 5(a) presents the marginal costs and (b) the bargaining weights. Although similarly priced, star hospital h_1^s has a higher profit margin than h_5^s. As expected, these two hospitals also have stronger bargaining weights (i.e., lower b_m values) than their non-star competitors. I provide further details about the bargaining model specification and validity in the online appendix.

[45] Cuesta, Noton, and Vatter (2024) collected average service costs manually and computed profit margins. I then recover the marginal cost from profit margins because my sample only considers surgical admissions. I assume the same profit margins for all four years.

Table 5: Cost data and pair-wise bargaining weights

	Hospitals									
	h_1^s	h_2	h_3	h_4	h_5^s	h_6	h_7	h_8	h_9	h_{10}
	Panel (a). Observed profit margins and marginal costs									
profit margins	0.283	0.255	0.294	0.206	0.169	0.238	0.264	0.253	0.184	0.238
mc_h	3.57	2.65	2.16	1.51	4.52	1.49	1.96	1.47	1.51	1.51
Insurers	**Panel (b). Estimated insurer's bargaining weight** ($b_m = 1 - b_h$)									
m_1	0.81	0.80	0.81	0.89	0.76	0.89	0.81	0.87	0.93	0.86
m_2	0.88	0.92	0.94	0.95	0.89	0.96	0.96	0.97	0.97	0.95
m_3	0.46	0.81	0.60	0.78	0.50	0.61	0.40	0.81	0.68	0.69
m_4	0.64	<u>0.87</u>	0.86	<u>0.93</u>	0.74	0.94	0.67	0.88	0.95	<u>0.91</u>
m_5	0.75	0.86	0.90	0.93	0.85	<u>0.96</u>	0.90	<u>0.92</u>	<u>0.96</u>	0.94

Notes: h_1^s and h_5^s are labeled star hospitals. Underlined cells are vertically integrated (VI) through common parent holding.

5.3 Counterfactual analysis

I conduct counterfactual analyses to assess the role of coinsurance in shaping the hospital market equilibrium. Specifically, I consider two counterfactual scenarios: (i) uniform coinsurance, which simulates a 'network adequacy' regulation, and (ii) zero coinsurance, which simulates mandatory full coverage across all plans. In these scenarios, I hold constant the model structure and all estimated parameters, including patient severity (as captured by resource intensity weights) and hospital preferences. Importantly, I also assume that the number of insurance buyers remains unchanged, effectively holding insurance market participation constant.

5.3.1 Hospital price effects

I simulate uniform coinsurance by increasing every patient's star hospital coverage to match the coverage level of non-star hospitals. Figure 10 is the empirical counterpart of the theoretical Figure 5. Under uniform coinsurance, star hospital prices would decrease from 5.6 times the public price to 5.1 times, representing an 8% reduction. Medium-priced non-star hospitals would also experience a slight price decline, from 3.2 times the public price to 3.1 times. By contrast, low-priced non-star hospitals would see their prices increase from 1.9 times the public price to 2.1 times. The high-to-low-cost hospital price ratio would decrease from 2.9 to 2.4 – by 18%. Under zero coinsurance, star hospitals' prices would decrease further to 4.8 times the public price. While the high-to-low-cost hospital price ratio would remain at 2.4, the overall price level would decline from 3.4 in the baseline to 3.1 times the public price.

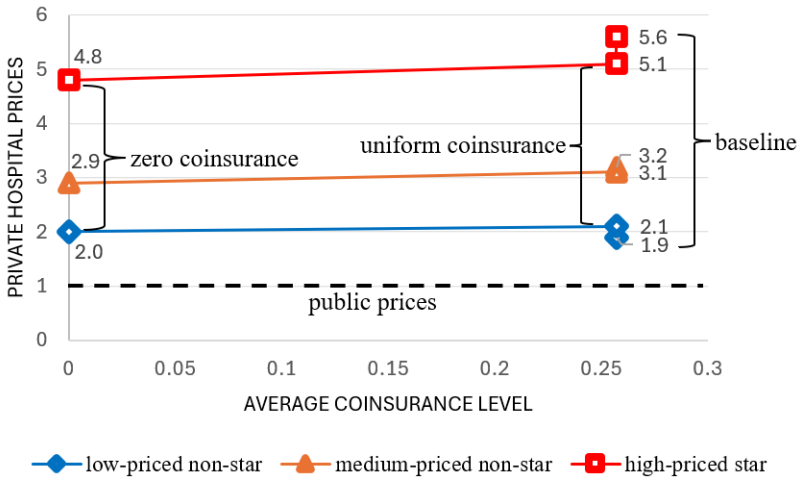


Figure 10: Empirical price effects of coinsurance

5.3.2 Welfare effects on hospitals and insurers

Table 6 presents the impact on hospitals and insurers. With uniform coinsurance, high-priced hospitals lower their prices and earn lower profits despite receiving more patients. The opposite occurs for low-priced hospitals. The changes under zero coinsurance are in the same direction but more pronounced in magnitude. This suggests that reducing coinsurance reduces profitability disparities across hospitals.

The cream-skimming competition to attract low-cost consumers does not benefit every insurer. Without competing on network choices, three insurers would experience revenue gains that exceed their increased hospital expenses. The biggest winners, m_1 and m_2 are non-VI insurers whose enrollees exhibit a stronger preference for star hospitals (as shown in Figure 8). By contrast, VI insurers m_4 and m_5 would fare worse. However, since VI firms primarily include low-priced non-star hospitals, which would become more profitable, their losses on the insurer side would be partially (m_4) or fully (m_5) compensated by gains from their hospital operations.

Competitive selection tends to disadvantage every insurer in equilibrium, resembling a prisoner's dilemma. This effect becomes even more pronounced in the case of zero insurance. Without coverage choices, every insurer is expected to generate more revenue than its hospital expenses, driven by consumers' high WTP for full coverage. However, attracting (selecting) low-risk, low-cost consumers remains a profitable deviation, preventing full coverage from becoming a stable equilibrium.

Table 6: Welfare effects on the two healthcare markets

		Hospitals									
		h_1^s	h_2	h_3	h_4	h_5^s	h_6	h_7	h_8	h_9	h_{10}
price index	baseline	5.4	3.5	3.1	1.9	5.8	1.9	2.9	2.0	1.8	2.0
	uniform coinsurance	5.0	3.4	2.9	2.1	5.3	2.2	2.7	2.1	2.2	2.1
	%Δ	-8%	-3%	-4%	12%	-8%	17%	-6%	6%	20%	7%
	zero coinsurance	4.7	3.2	2.8	2.0	5.1	2.0	2.6	2.0	2.	2.0
	%Δ	-14%	-8%	-9%	7%	-12%	8%	-10%	0%	13%	4%
quantity	baseline	85,656	79,431	66,328	61,021	43,564	32,800	29,237	25,772	24,525	19,057
	uniform coinsurance	90,038	78,420	66,272	59,070	47,181	32,068	29,386	25,433	23,950	18,596
	%Δ	5%	-1%	0%	-3%	8%	-2%	1%	-1%	-2%	-2%
	zero coinsurance	97,301	79,786	57,612	49,776	52,990	30,704	28,439	26,133	23,458	14,222
	%Δ	14%	0%	-13%	-18%	22%	-6%	-3%	1%	-4%	-25%
profit (in billion pesos)	baseline	117	77	58	23	64	15	20	12	9	8
	uniform coinsurance	101	69	51	33	53	23	17	14	15	10
	%Δ	-14%	-9%	-12%	42%	-17%	52%	-18%	19%	79%	22%
	zero coinsurance	93	60	38	25	50	18	13	12	12	7
	%Δ	-21%	-22%	-35%	7%	-22%	19%	-34%	1%	45%	-14%

		Insurers				
		m_1	m_2	m_3	m_4	m_5
revenue (in billion pesos)	baseline	6516	25946	1434	6232	12158
	uniform coinsurance	6543	25962	1435	6242	12156
	Δ	27	16	0.7	10	-3
	zero coinsurance	9379	28452	2744	9362	14298
	Δ	2863	2506	1310	3130	2140
hospital expenses (in billion pesos)	baseline	450	396	225	511	257
	uniform coinsurance	463	400	224	536	256
	Δ	13	5	-1	25	8
	zero coinsurance	608	544	248	741	419
	Δ	158	148	23	230	162

Notes: h_1^s and h_5^s are labeled star hospitals.

5.3.3 Welfare effects on consumers

I interpret uniform coinsurance as a restriction on network choices, effectively mandating FN plan enrollment for all consumers, regardless of their preference for star hospitals. Theoretically, pooling FN and TN plan buyers alleviates the adverse selection of an FN plan and *reduces* its premium. Figure 11(a) shows a counter-clockwise rotation of the average cost curve for an FN plan, and the marginal consumer becomes the one with $\underline{\theta}$. The pooling leads to lower premiums for FN plan buyers, whereas higher premiums for TN plan buyers.

Figure 11(b) shows the empirical magnitude of changes in WTP and premiums. At the aggregate, mandatory uniform coverage reduces FN plan buyers' premiums by 4% but increases TN plan buyers' premiums by 13%, exceeding their increase in WTP.

In individual insurance, it is common to adjust premiums based on enrollee demographics – a practice known as community rating. Since hospital preferences are

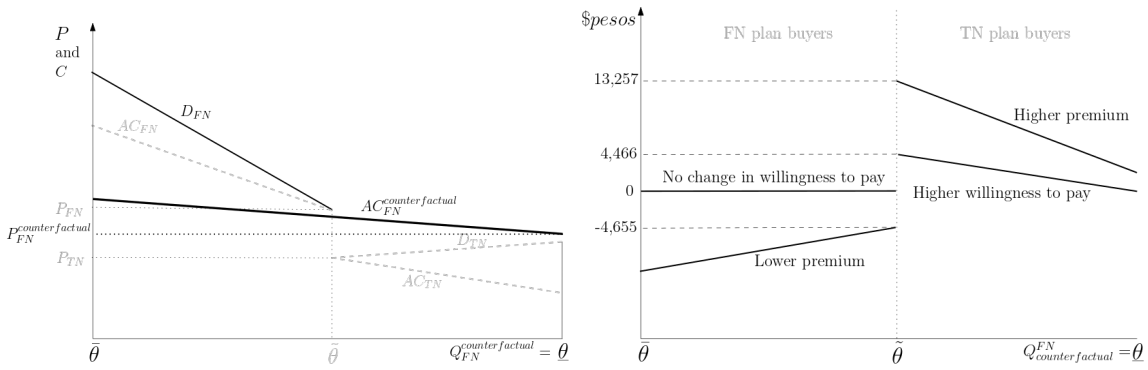
largely orthogonal to consumer demographics (as shown in Figure 8), community-rated premiums also involve pooling FN and TN plan buyers. Figure 11(b) shows that mandatory FN plan enrollment increases both WTP and premiums for most insurance buyers, though the relative magnitude of these effects varies across groups.

Taking the regulatory counterfactual to an extreme, in Figure 11(c), mandating full coverage significantly benefits all consumers, as their WTP for full coverage far exceeds the increase in premiums. However, two key assumptions underlie this conclusion. First, I assume a one-to-one pass-through from average costs to premiums. If market frictions lead to a larger pass-through, the benefits would be dampened. Second, I assume no change in extensive margin participation in health insurance despite higher premiums. This implies that for coverage choice regulations to benefit consumers effectively, they must be implemented alongside a participation mandate, which often necessitates government subsidies.

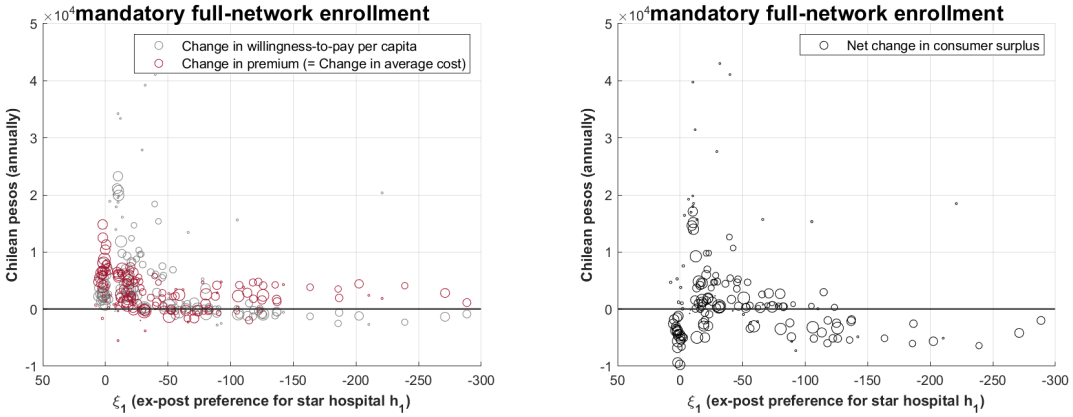
5.4 Limitation: what does hospital quality mean, actually?

To draw meaningful conclusions about the desirability of network regulations, we must understand the nature of hospital quality. In this paper, hospital quality is inferred from patient preferences. However, the social optimality of shifting patients to star hospitals critically depends on whether their higher quality is medically relevant (Chandra et al., 2016). The clinical quality of healthcare providers is notoriously difficult to assess due to patient selection (Geweke, Gowrisankaran, & Town, 2003). A recent study that uses quasi-experiment identification reports a positive relationship between higher price and lower mortality, but it is present only in unconcentrated markets (Cooper et al., 2022). So, determining the correlation between price and clinical quality requires a case-by-case evaluation.

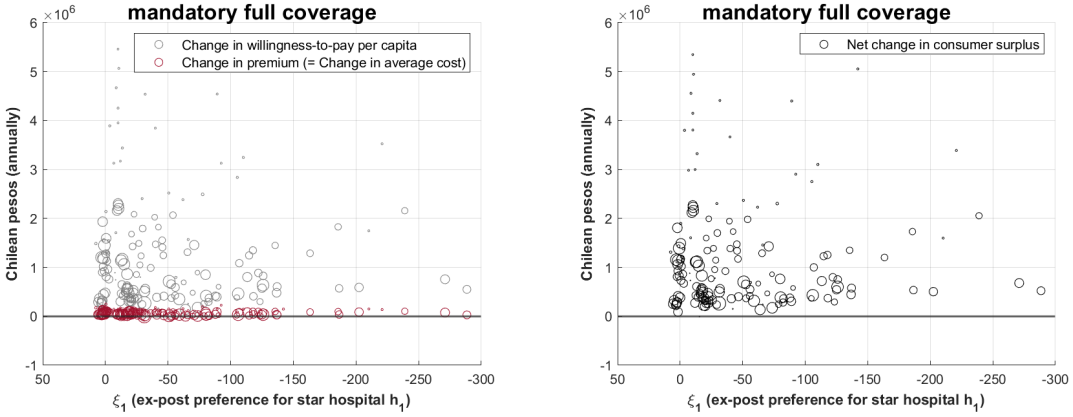
Hospital quality is also multi-dimensional. Consumers' perceived quality may reflect clinical quality, such as physician quality, technology adoption and risk-adjusted mortality, but also non-clinical quality, such as amenities and consumer experience (Garthwaite, Ody, & Starc, 2022). If restricting network and coverage choices reduces the profitability of star hospitals, it discourages quality investment in the long run. Future research is needed to explore hospitals' quality investment decisions over a longer time horizon.



(a) Theoretical and empirical effects of uniform coinsurance



(b) Empirical effects of uniform coinsurance with community-rated premiums



(c) Empirical effects of zero coinsurance with community-rated premiums

Figure 11: Welfare effects on consumers

Notes: Each circle is a unique combination of insurer-agegroup-sex-year. That is, the premium setting allows for community rating (risk adjustment based on observable demographics). The circle size represents the number of enrollees.

6 Conclusion

In this paper, I highlight the importance of accounting for hospital market responses when evaluating insurance market regulations. The stylized model provides a valuable framework for understanding how changes in health insurance are expected to influence price-setting for differentiated hospitals.

Variation in hospital prices incentivizes insurers to screen consumers based on hospital preferences. However, paradoxically, differential coverage contributes to the very hospital price dispersion that drives these selection incentives. Cost-sharing through coinsurance misaligns incentives, as insurers prioritize cost containment while patients prioritize the value of their medical services. From a partial equilibrium perspective, heterogeneous plan choices may seem cost-saving, but in general equilibrium, they may ultimately lead to higher aggregate medical spending.

References

Akerlof, G. A. (1970). The Market for "Lemons": Quality Uncertainty and the Market Mechanism. *The Quarterly Journal of Economics*, *84*(3), 488–500 (cit. on p. 4).

Atal, J. P. (2019). *Lock-in in dynamic health insurance contracts: Evidence from chile* [Working Paper]. (Cit. on p. 15).

Azevedo, E. M., & Gottlieb, D. (2017). Perfect competition in markets with adverse selection. *Econometrica*, *85*(1), 67–105 (cit. on p. 2).

Berry, S., & Haile, P. (2021). Foundations of demand estimation. In K. Ho, A. Hortaçsu, & A. Lizzeri (Eds.), *Handbook of industrial organization, volume 4* (pp. 1–62, Vol. 4). Elsevier. https://doi.org/10.1016/bs.hesind.2021.11.001 (cit. on p. 5).

Berry, S., & Haile, P. (2024). Nonparametric identification of differentiated products demand using micro data. *Econometrica*, *92*(4), 1135–1162. https://doi.org/https://doi.org/10.3982/ECTA20731 (cit. on pp. 28, 30).

Berry, S., Levinsohn, J., & Pakes, A. (1995). Automobile prices in market equilibrium. *Econometrica*, *63*(4), 841–90 (cit. on p. 29).

Berry, S., Levinsohn, J., & Pakes, A. (2004). Differentiated products demand systems from a combination of micro and macro data: The new car market. *Journal of Political Economy*, *112*(1), 68–105 (cit. on p. 6).

Capps, C., Dranove, D., & Satterthwaite, M. (2003). Competition and Market Power in Option Demand Markets. *RAND Journal of Economics*, *34*(4), 737–763 (cit. on p. 33).

Chandra, A., Finkelstein, A., Sacarny, A., & Syverson, C. (2016). Health care exceptionalism? performance and allocation in the us health care sector. *American Economic Review*, *106*(8), 2110–44. https://doi.org/10.1257/aer.20151080 (cit. on pp. 6, 38).

Collard-Wexler, A., Gowrisankaran, G., & Lee, R. S. (2019). "Nash-in-Nash" Bargaining: A Microfoundation for Applied Work. *Journal of Political Economy*, *127*(1), 163–195. https://doi.org/10.1086/700729 (cit. on p. 20).

Cooper, Z., Craig, S. V., Gaynor, M., & van Reenen, J. (2019). The price ain't right? hospital prices and health spending on the privately insured. *The Quarterly Journal of Economics*, *134*(1), 51–107 (cit. on pp. 4, 7, 12).

Cooper, Z., Doyle, J., Joseph J, Graves, J. A., & Gruber, J. (2022, February). *Do higher-priced hospitals deliver higher-quality care?* (No. 29809) [Working Pa-

per], National Bureau of Economic Research. https://doi.org/10.3386/w29809 (cit. on p. 38).

Craig, S. V., Ericson, K. M., & Starc, A. (2021). How important is price variation between health insurers? *Journal of Health Economics*, *77*, 102423. https://doi.org/https://doi.org/10.1016/j.jhealeco.2021.102423 (cit. on pp. 7, 12).

Crawford, G. S., & Yurukoglu, A. (2012). The welfare effects of bundling in multichannel television markets. *American Economic Review*, *102*(2), 643–85. https://doi.org/10.1257/aer.102.2.643 (cit. on p. 7).

Cuesta, J. I., Noton, C., & Vatter, B. (2024). *Vertical integration and plan design in healthcare markets* [Working Paper]. (Cit. on pp. 9, 11, 16, 27, 30, 31, 34).

Cutler, D. M., & Zeckhauser, R. J. (2000). Chapter 11 - the anatomy of health insurance. In A. J. Culyer & J. P. Newhouse (Eds.), *Handbook of health economics* (pp. 563–643, Vol. 1). Elsevier. https://doi.org/10.1016/S1574-0064(00)80170-5 (cit. on p. 2).

Dafny, L., Hendel, I., Marone, V., & Ody, C. (2017). Narrow networks on the health insurance marketplaces: Prevalence, pricing, and the cost of network breadth. *Health Affairs*, *36*(9), 1606–1614. https://doi.org/10.1377/hlthaff.2016.1669 (cit. on p. 3).

Diaz-Campo, C. (2023). *Dynamic moral hazard in nonlinear health insurance contracts* [Working Paper]. (Cit. on p. 4).

Dickstein, M. J., Ho, K., & Mark, N. (2024). Market segmentation and competition in health insurance. *Journal of Political Economy*, *132*(1), 96–148. https://doi.org/10.1086/725707 (cit. on p. 6).

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 (cit. on pp. 5, 24).

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 (cit. on p. 3).

Einav, L., Finkelstein, A., & Mahoney, N. (2021). Chapter 14 - the io of selection markets. In K. Ho, A. Hortaçsu, & A. Lizzeri (Eds.), *Handbook of industrial organization, volume 5* (pp. 389–426, Vol. 5). Elsevier. https://doi.org/10.1016/bs.hesind.2021.11.014 (cit. on p. 2).

Finkelstein, A., Taubman, S., Wright, B., Bernstein, M., Gruber, J., Newhouse, J. P., Allen, H., Baicker, K., & Group, O. H. S. (2012). The Oregon Health Insur-

ance Experiment: Evidence from the First Year. *The Quarterly Journal of Economics*, *127*(3), 1057–1106. https://doi.org/10.1093/qje/qjs020 (cit. on p. 7).

Frank, M. B., Hsu, J., Landrum, M. B., & Chernew, M. E. (2016). The impact of a tiered network on hospital choice. *Health Services Research*, *50*(5), 1628–1648. https://doi.org/10.1111/1475-6773.12291 (cit. on p. 3).

Garthwaite, C., Ody, C., & Starc, A. (2022). Endogenous quality investments in the u.s. hospital market. *Journal of Health Economics*, *84*, 102636. https://doi.org/https://doi.org/10.1016/j.jhealeco.2022.102636 (cit. on p. 38).

Geweke, J., Gowrisankaran, G., & Town, R. J. (2003). Bayesian inference for hospital quality in a selection model. *Econometrica*, *71*(4), 1215–1238. https://doi.org/https://doi.org/10.1111/1468-0262.00444 (cit. on p. 38).

Ghili, S. (2022). Network Formation and Bargaining in Vertical Markets: The Case of Narrow Networks in Health Insurance. *Marketing Science*, *41*(3), 501–527. https://doi.org/10.1287/mksc.2021.1331 (cit. on p. 6).

Gowrisankaran, G., Nevo, A., & Town, R. (2015). Mergers when prices are negotiated: Evidence from the hospital industry. *American Economic Review*, *105*(1), 172–203. https://doi.org/10.1257/aer.20130223 (cit. on pp. 2, 6, 30).

Gruber, J., & McKnight, R. (2016). Controlling health care costs through limited network insurance plans: Evidence from massachusetts state employees. *American Economic Journal: Economic Policy*, *8*(2), 219–50. https://doi.org/10.1257/pol.20140335 (cit. on p. 3).

Hackmann, M. B., Kolstad, J. T., & Kowalski, A. E. (2015). Adverse selection and an individual mandate: When theory meets practice. *American Economic Review*, *105*(3), 1030–66. https://doi.org/10.1257/aer.20130758 (cit. on p. 6).

Handel, B., Hendel, I., & Whinston, M. D. (2015). Equilibria in Health Exchanges: Adverse Selection versus Reclassification Risk. *Econometrica*, *83*(4), 1261–1313 (cit. on p. 23).

Handel, B., & Ho, K. (2021). Chapter 16 - the industrial organization of health care markets. In K. Ho, A. Hortaçsu, & A. Lizzeri (Eds.), *Handbook of industrial organization, volume 5* (pp. 521–614, Vol. 5). Elsevier. https://doi.org/10.1016/bs.hesind.2021.11.016 (cit. on p. 3).

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 (cit. on p. 16).

Hausman, J. A. (1996). Valuation of new goods under perfect and imperfect competition. In T. F. Bresnahan & R. J. Gordon (Eds.), *The economics of new goods* (pp. 209–248). University of Chicago Press. https://doi.org/10.7208/9780226074184-007 (cit. on p. 30).

Ho, K., & Lee, R. (2017). Insurer competition in health care markets. *Econometrica*, *85*, 379–417 (cit. on pp. 6, 21).

Ho, K., & Lee, R. (2019). Equilibrium provider networks: Bargaining and exclusion in health care markets. *American Economic Review*, *109*(2), 473–522. https://doi.org/10.1257/aer.20171288 (cit. on pp. 3, 6).

Ho, K., & Lee, R. (2023). *Contracting over rebates: Formulary design and pharmaceutical spending* [Working Paper]. (Cit. on pp. 3, 6).

Ho, K. (2009). Insurer-provider networks in the medical care market. *American Economic Review*, *99*(1), 393–430. https://doi.org/10.1257/aer.99.1.393 (cit. on pp. 3, 19).

Horn, H., & Wolinsky, A. (1988). Bilateral monopolies and incentives for merger. *RAND Journal of Economics*, *19*(3), 408–419 (cit. on p. 20).

Hotelling, H. (1929). Stability in competition. *The Economic Journal*, *39*(153), 41–57 (cit. on pp. 17, 18).

Lerner, A. P. (1934). The Concept of Monopoly and the Measurement of Monopoly Power. *Review of Economic Studies*, *1*(3), 157–175 (cit. on p. 2).

Mahoney, N., & Weyl, E. G. (2017). Imperfect Competition in Selection Markets. *The Review of Economics and Statistics*, *99*(4), 637–651. https://doi.org/10.1162/REST_a_00661 (cit. on p. 5).

Manning, W. G., Newhouse, J. P., Duan, N., Keeler, E. B., & Leibowitz, A. (1987). Health insurance and the demand for medical care: Evidence from a randomized experiment. *The American Economic Review*, *77*(3), 251–277 (cit. on p. 7).

Marone, V. R., & Sabety, A. (2022). When should there be vertical choice in health insurance markets? *American Economic Review*, *112*(1), 304–42. https://doi.org/10.1257/aer.20201073 (cit. on pp. 2, 4, 17).

McPake, B., & Noramnd, C. (2008). Parallel systems. In *Health economics: An international perspective* (pp. 245–257). Routledge. (Cit. on p. 7).

Olssen, A. L., & Demirer, M. (2022). *Drug rebates and formulary design: Evidence from statins in medicare part d* [Working Paper]. (Cit. on p. 6).

Pauly, M. V. (1968). The economics of moral hazard: Comment. *The American Economic Review*, *58*(3), 531–537 (cit. on p. 7).

Prager, E. (2020). Healthcare demand under simple prices: Evidence from tiered hospital networks. *American Economic Journal: Applied Economics*, *12*(4), 196–223. https://doi.org/10.1257/app.20180422 (cit. on pp. 3, 4, 30).

Raval, D., Rosenbaum, T., & Tenn, S. A. (2017). A semiparametric discrete choice model: An application to hospital mergers. *Economic Inquiry*, *55*(4), 1919–1944. https://doi.org/https://doi.org/10.1111/ecin.12454 (cit. on pp. 6, 28, 29).

Riley, J. (1979). Informational equilibrium. *Econometrica*, *47*(2), 331–59 (cit. on p. 24).

Rothschild, M., & Stiglitz, J. (1976). Equilibrium in competitive insurance markets: An essay on the economics of imperfect information. *The Quarterly Journal of Economics*, *90*(4), 629–649 (cit. on p. 2).

Shaked, A., & Sutton, J. (1982). Relaxing price competition through product differentiation. *Review of Economic Studies*, *49*(1), 3–13 (cit. on p. 18).

Shepard, M. (2022). Hospital network competition and adverse selection: Evidence from the massachusetts health insurance exchange. *American Economic Review*, *112*(2), 578–615. https://doi.org/10.1257/aer.20201453 (cit. on pp. 3, 5, 6, 17, 23).

Starc, A., & Swanson, A. (2021). Preferred pharmacy networks and drug costs. *American Economic Journal: Economic Policy*, *13*(3), 406–46. https://doi.org/10.1257/pol.20180489 (cit. on p. 6).

Tebaldi, P. (2024). Estimating equilibrium in health insurance exchanges: Price competition and subsidy design under the aca. *The Review of Economic Studies*, *92*(1), 586–620. https://doi.org/10.1093/restud/rdae020 (cit. on p. 6).

Tebaldi, P., Torgovitsky, A., & Yang, H. (2023). Nonparametric estimates of demand in the california health insurance exchange. *Econometrica*, *91*(1), 107–146. https://doi.org/10.3982/ECTA17215 (cit. on p. 6).

Tilipman, N. (2022). Employer Incentives and Distortions in Health Insurance Design: Implications for Welfare and Costs. *American Economic Review*, *112*(3), 998–1037. https://doi.org/10.1257/aer.20181917 (cit. on p. 26).

Veiga, A., & Weyl, E. G. (2016). Product Design in Selection Markets. *The Quarterly Journal of Economics*, *131*(2), 1007–1056. https://doi.org/10.1093/qje/qjw007 (cit. on p. 18).