What Can Market Structure Tell Us About Equilibrium Contracts in Healthcare?

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Abstract

This paper quantifies the causal effect of health insurer market structure on the type of contracts that insurers sign with providers. Leveraging exogenous changes in market structure generated by insurer and provider terminations, I find that competitive insurance markets cause increases in the use of retrospective contracts like fee-for-service. Retrospective contracts in turn induce the provision of healthcare in a hospital setting, while prospective contracts induce ambulatory care. Results suggest that equilibrium contracts place the financial risk on insurers in markets where providers have higher bargaining power and that antitrust policies in health insurance can increase the adoption of retrospective contracts.

Keywords: Market structure, Health insurance, Fee-for-service, Capitation.

JEL codes: I10, I11, I13, I18.

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1 Introduction

Analyzing the trade-offs associated with prospective versus retrospective provider payments in healthcare has been a central topic in the health economics literature. Seminal papers characterized the principal-agent problem in the context of an insurer that contracts with providers to deliver healthcare (McGuire, 2000). Despite this theory on how contracts affect the quantity of treatment, empirical evidence on both the determinants of contract choice as well as the causal effect of this choice on outcomes is scant. This question has been difficult to answer in most contexts, since there is typically little variation in how different insurers contract with providers for different services. Large shifts in the adoption of retrospective and prospective contracts are often driven by regulatory decisions that affect all insurers and services, making causal inference challenging.[1]

This paper examines health insurer market structure as a determinant of contract choice, exploiting exogenous changes in market structure generated by insurer and provider terminations. Insurance market concentration has a negative causal effect on the use of retrospective contracts such as fee-for-service (FFS), hence equilibrium contracts place a higher financial risk on insurers in markets that are more competitive. The paper then shows that the choice of FFS affects not just the quantity of treatment as predicted by the seminal theory, but also the type of care that patients receive. FFS induces high treatment intensities as defined by healthcare that is provided in a hospital setting, while prospective contracts like capitation induce healthcare that is provided in an ambulatory care setting.

To study the determinants of contract choice and the impact of this choice on

[1] Examples of these changes in the adoption of retrospective and prospective contracts include the Medicare program in the US which switched to reimbursing all inpatient services prospectively; and the German healthcare system which switched to reimbursing all inpatient services retrospectively.

market outcomes, I use data from the Colombian healthcare system. In Colombia, private insurers provide access to a national health insurance plan through a network of providers. Although all aspects of the insurance plan are closely regulated by the government (premiums, cost-sharing, and benefits), insurers and providers do bargain over the type of contract and its terms for every health service covered in the national plan. Based on government rules, the contract space is limited to four types of contracts: fee-for-service, capitation, fee-for-package, and fee-for-diagnosis, with the first two representing more than 80 percent of claims in a year.

The source of exogenous variation in market structure comes from the termination of the largest health insurer in the country and its hospitals by the end of 2015, called SaludCoop. This insurer covered nearly 20 percent of enrollees and was vertically integrated with 38 hospitals. The government terminated SaludCoop due to its engagement in illegal activities and other political considerations. My data comprises all health claims made by individuals enrolled in Colombia's contributory healthcare system from 2013 to 2019, 4 years before and 4 years after the termination. The contributory system covers the half of the population in the country who pay payroll taxes. The unprecedented nature of this data is that it reports the type of contract (fee-for-service or capitation) and the terms (prices) that insurers sign with in-network providers for every health service. This allows me to study the impact of market structure on contracts, utilization, and spending for specific services.

Using a dynamic difference-in-differences approach, I compare municipalities where SaludCoop operated against those where it did not operate, before and after the termination. The rationale for this approach is that markets where SaludCoop and its hospitals operated saw exogenous changes in both insurer and provider market structure. Findings show that the fraction of services covered under FFS for every incumbent insurer-provider pair increased 2 percentage points on average after the termination. This effect is robust to excluding markets where SaludCoop operated with its own hospitals, suggesting that insurance market structure alone is the main determinant of contract choice. In fact, treatment effects are driven entirely by insurance markets that became more competitive after the termination as measured by relatively low insurer HHIs.

To see how this choice of FFS affects market outcomes, I propose an alternative empirical design that compares insurer-provider-service tuples that are always covered under capitation, against tuples that switch the contract from capitation to FFS, before and after this switch. I find that FFS causes a 7 percentage point increase and a 10 percentage point decrease in the fraction of claims provided in a hospital and in an ambulatory care setting, respectively. Total hospital spending also increases 1.5 log points under FFS, which suggests that contracts affect both the type and quantity of care. In line with findings in Clemens and Gottlieb (2014), most of the increase in utilization and spending after switching towards FFS is explained by services with large scope for over-provision incentives, such as laboratory testing and imaging. However, FFS has no effects on outcomes for complex procedures such as procedures in lungs and cardiac vessels.

If a shift towards providing inpatient healthcare for conditions that would otherwise be treated in an ambulatory setting is a detrimental outcome, then my findings indicate that antitrust policies in health insurance markets may have unintended consequences on the type of care that patients receive. These results extend to other settings and proposed legislation limiting insurer market power, such as those related to mergers and acquisitions.

Related literature. In studying the causal effect of market structure on contract choice, my paper builds on Cooper et al. (2019) who descriptively analyze the variation in hospital prices that is attributable to market structure in the context of the privately insured population in the US.

This paper is also related to the sizable literature that studies provider incentives under different payment schemes. Studies in this area have mostly analyzed provider moral hazard and provider-induced demand from a theoretical perspective when physicians interact with patients (e.g., Acquatella, 2022; Choné and Ma, 2011; McGuire, 2000). Here, I revisit models of provider moral hazard from the perspective of insurers contracting with providers to deliver healthcare to their enrollees.

From an insurer's perspective, Kuziemko et al. (2018) find that capitation contracts induce Medicaid managed care plans to engage in risk selection against costly infants. Ho and Pakes (2014) also find that capitation makes insurers more price sensitive and therefore more likely to steer patients towards cheaper providers. Aizer et al. (2007) link these incentives under capitation to patient health, finding worse outcomes among pregnant women who were forced to switch from Medicaid FFS to Medicaid managed care. While these papers exploit variation in capitation rates across plans, my paper shows how within-plan changes in capitation and fee-for-service contracts affect utilization and spending.

From a provider's perspective, Clemens and Gottlieb (2014) find that exogenous increases in physician payments lead to over-provision of discretionary services in the context of Medicare. Iizuka (2012) also finds that physicians over-prescribe branded drugs when they can attain profits from these prescriptions. By contrast, Einav et al. (2022) show that providers do not necessarily adjust their treatment decisions when they can choose which contracts to participate in. My paper harmonizes these two findings by examining the determinants of contract choice and revealing when can this choice have an impact on provider treatment intensity.

More recently, Einav et al. (2018) and Gaynor et al. (2023) develop structural models to simulate alternative contracts in the context of long-term care and dialysis medications, respectively. Although I do not derive the optimal contract, my empirical application sheds light on how incentives under fully prospective and fully retrospective contracts vary across several insurers and health services. My work also departs from Gaynor et al. (2023) by showing how FFS contracts affect the type of care and not just the quantity of care provided to a patient. Finally, this paper is related to the comprehensive work around the use of FFS and managed care in health care markets both in the economics and in the medical literature (e.g., Somé et al., 2020; Adida et al., 2017; Duggan, 2004; Sørensen and Grytten, 2003; Baker, 1997; Ransom et al., 1996).

2 Background and data

My setting to study the determinants of contract choice in healthcare is the Colombian health insurance system. This system has near-universal coverage, providing access to a national health insurance plan through private and public insurers. The half of the population in the country who pay payroll taxes is covered by the contributory system, while the other half who have low incomes is covered by the subsidized system. Almost every aspect of the national insurance plan is regulated by the government. For example, insurance premiums are zero, cost-sharing rules are a function of the enrollees' monthly income level but are standardized across insurers and providers, and the list of covered services is determined by the government.[2] Health service

[2]For individuals earning less than 2 times the minimum monthly wage (MMW) the coinsurance rate equals 11.5 percent, the copay equals 2,100 pesos, and the maximum expenditure amount in a year equals 57.5 percent times the MMW. This corresponds to an actuarial value of 92 percent. For those with incomes between 2 and 5 times the MMW, the coinsurance rate is 17.3 percent, the copay is 8,000 pesos, and the maximum expenditure is 230 percent times the MMW. The associated actuarial value is 84 percent. Finally, for people with incomes above 5 times the MMW, the coinsurance rate equals 23 percent, the copay 20,900 pesos, and the maximum expenditure amount is 460 percent times the MMW, all corresponding to an actuarial value of 78 percent.

coverage is comprehensive, from basic primary care consultations to complex organ transplants. In 2015, the national plan covered over 12,000 health services.[3]

Insurers do not charge premiums but receive capitated payments from the government at the beginning of every calendar year that are risk-adjusted for sex, age, and municipality of residence. At the end of every calendar year, insurers are also compensated by the government for their enrollees' health based on a coarse list of diagnoses.[4]

To deliver the benefits and health services covered in the national insurance plan, insurers contract with providers to form their provider networks. Insurers and providers establish contracts for each health service in the national plan. These contracts can involve either capitation payments whereby the insurer pays the provider a fixed amount per enrollee, or fee-for-service (FFS) payments whereby the insurer pays the provider for every service delivered.[5] Contracts are typically negotiated at the beginning of every calendar year, but some insurer-provider pairs negotiate mid-year as well.

Although contract negotiations between insurers and providers are unregulated, the government recommends that relatively low-complexity health services such as primary care visits be covered under capitation, while it recommends that relatively high-complexity services such as transplants be covered under FFS. These recommen-

[3]See Ministry of Health and Social Protection's Resolution 4678 of 2015.

[4]The ex-post risk adjustment mechanism is known as the High Cost Account, and compensates insurers for the following diseases: cervical cancer, breast cancer, stomach cancer, colon cancer, prostate cancer, lymphoid leukemia, Myeloid leukemia, Hodgkin lymphoma, non-Hodgkin lymphoma, epilepsy, rheumatoid arthritis, and HIV-AIDS (See Ministry of Health and Social Protection's Resolution 000248 of 2014).

[5]Other types of contracts include fee-for-package whereby the insurer pays the provider a fixed amount per enrollee and group of services associated with a health episode, and fee-for-diagnosis whereby the insurer pays the provider a fixed amount per enrollee and group of services associated with disease management. These alternative contracts have very low take-up, representing less than 6 percent of all health claims in a given year. I exclude claims associated with these contracts from my data.

dations are made in an attempt to control the incentives that providers face under each contract. A prospective contract like capitation incentivizes providers to under-provide care or to choose low treatment intensity, while a retrospective contract like FFS incentivizes providers to over-provide care or to choose high treatment intensity. Nevertheless, insurers and providers do not need to abide by the government's recommendations when designing their contracts, which results in contract variation within insurer-provider pair and across services.

For this paper I use health claims data from the half of the population in the country that is covered by the contributory system from 2013 to 2019. At the end of every year insurers report to the government all the health claims that they paid in-network providers for. The government uses this claims data to calculate and update the risk-adjusted transfers that it makes to insurers. To do so, the government imposes several data quality filters. The filters make it so that not every insurer that reports claims ends up in the final data set. Excluding insurers that are terminated by the government during the sample period, of the 12 remaining insurers that participate in the contributory system, I observe 7 of them during all 7 years, and 9 of them for at least 5 years. I use the subsample of claims associated with the 7 insurers that I observe throughout the sample period, although results are robust to choosing the 9 insurers I observe for at least 5 years as seen in appendix 5.

The claims data reports patient identifier, patient's insurer, provider identifier, service code, ICD-10 diagnosis code, negotiated service price, date, contract under which the insurer paid the provider (capitation of FFS), setting under which the claim was provided (hospital care, ambulatory care, urgent care, domiciliary care), and several patient characteristics such as sex, age, and municipality of residence. Service codes are 6-digit codes assigned to each service covered in the national insurance plan. Each digit in the code represents specific anatomical areas and procedures.[6] The richness of the claims data and the fact that it reports contracts and negotiated prices between insurers and providers, which have been difficult to observe so far in the literature, present a unique avenue to study the determinants of contract choice and the causal impact of private contracts on healthcare delivery.

I aggregate the claims data to the insurer, provider, 4-digit service code ("service" hereafter), and semester level. Contracts are negotiated at this level of aggregation for 96.16 percent of observations, that is, conditional on an insurer-provider-service-semester there is no variation in FFS. For the remaining 3.84 percent of observations, I assume the contract is FFS if the total FFS cost is greater than the total capitation cost. For every observation I calculate total number of claims, total healthcare cost, and fraction of claims that are provided in a hospital, ambulatory, and urgent care setting. To describe the complexity of each service, I use the fraction of claims that are associated with the disease categories created by Riascos et al. (2014) using ICD-10 diagnosis codes.[7]

To avoid making inference off of services that very few providers can deliver, I drop service categories with less than 100 insurer-provider pairs during the sample period and keep insurer-provider-services that I observe for more than 6 semesters. All my results are robust to more stringent sample restrictions such as requiring insurer-provider-services to be observed during all 14 semesters or requiring that at least

[6] The first 2-digits represent the anatomic area, the third digit represents the type of procedure, and the fourth to sixth digits give more detailed information on the procedure. For example, service 883220 is a simple thoracic spine magnetic resonance imaging and service 883221 is a thoracic spine magnetic resonance imaging with contrasting liquid. In this example, 88 refers to imaging, 3 to magnetic resonance imaging, and 22 to thoracic spine.

[7] The categorization of ICD-10 codes to diseases can be accessed through `https://www.alvaroriascos.com/researchDocuments/healthEconomics/CLD_xCIE10.tab` and include: genetic anomalies, autoimmune disease, arthritis, arthrosis, asthma, breast cancer, cervical cancer, digestive organ cancer, lymphatic cancer, male genitalia cancer, other cancer, lung cancer, skin cancer, diabetes, cardiovascular disease, pulmonary disease, renal disease, tuberculosis, epilepsy, and HIV-AIDS.

200 insurer-provider pairs have a contract for a given service as seen in appendix 5. Finally, I fill in missing semesters conditional on each insurer-provider-service tuple. For example, if I observe the tuple in 2017-2 and in 2019-1, I fill in observations for 2018-1 and 2018-2 replacing measures of utilization and costs by zero and carrying forward the last observed contract. In the final data set, 11.39 percent of observations correspond to these filled-in values.

3 Descriptive evidence

Table 1 presents summary statistics of my final data set. An observation in this table is a combination of insurer, provider, service, and semester. Column (1) presents summary statistics in the full sample, column (2) in the sample of observations with a FFS contract, and column (3) in those with a capitation contract. The average service for every insurer-provider pair is associated with 371 claims and represents 16 million pesos in healthcare costs. The final data has information on 290 services, 4,717 providers, and 7 insurers. These comprise 9,765 unique insurer-provider pairs.

Consistent with the fact that capitation tends to be used for low-complexity, highly-demanded services, the number of claims associated with capitated services is nearly 100 times greater than the number of claims associated with services covered under FFS. When the service is capitated, 83 percent of claims tend to be delivered in an ambulatory care setting, but only 42 percent of claims are made in this setting when the contract is FFS. Instead, when the service is covered under FFS, 28 percent of claims tend to be delivered in a hospital care setting, and only 3 percent of claims are delivered in this setting under capitation. Total healthcare costs for capitated services equal on average 35.4 million pesos, which is almost 3 times higher than the cost of services covered under FFS. This difference in total costs stems from the substantial utilization of capitated services but not from prices. The average price of a capitated service is around 80 thousand pesos, almost a third of the average price for services under FFS.

TABLE 1: Pooled summary statistics

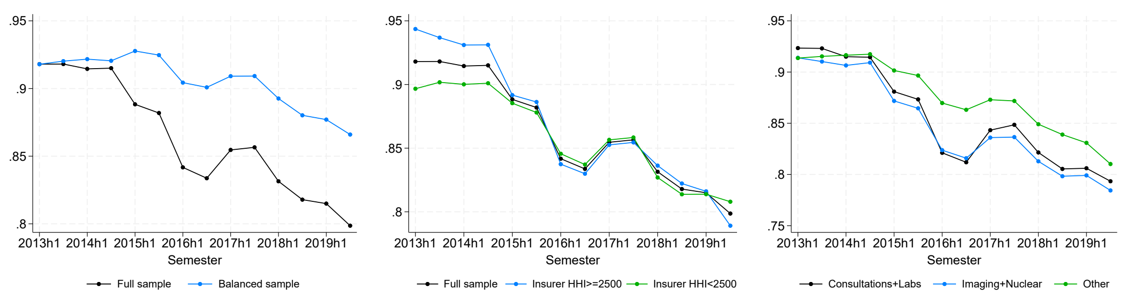
	(1) Full sample	(2) FFS	(3) Capitation
Total claims (100s)	3.71 (46.0)	1.79 (17.9)	15.67 (115)
Total cost (million COP)	15.96 (150)	12.84 (118)	35.44 (274)
Price (million COP)	0.21 (1.11)	0.24 (1.18)	0.08 (0.45)
Fraction claims in hospital care	0.24 (0.39)	0.28 (0.40)	0.03 (0.15)
Fraction claims in urgent care	0.16 (0.32)	0.18 (0.34)	0.03 (0.16)
Fraction claims in domiciliary care	0.003 (0.05)	0.003 (0.05)	0.002 (0.03)
Fraction claims in ambulatory care	0.48 (0.47)	0.42 (0.47)	0.83 (0.36)
FFS	0.86 (0.35)	—	—
Age	35.63 (21.1)	35.81 (21.4)	34.54 (18.7)
Male	0.38 (0.31)	0.38 (0.32)	0.35 (0.26)
Breast cancer	0.02 (0.09)	0.02 (0.09)	0.02 (0.06)
Lung cancer	0.004 (0.03)	0.004 (0.04)	0.004 (0.02)
Skin cancer	0.01 (0.05)	0.01 (0.05)	0.008 (0.03)
Diabetes	0.07 (0.15)	0.07 (0.15)	0.05 (0.11)
Cardiovascular disease	0.23 (0.30)	0.24 (0.31)	0.16 (0.24)
Pulmonary disease	0.05 (0.14)	0.06 (0.15)	0.02 (0.07)
Renal disease	0.04 (0.12)	0.05 (0.13)	0.03 (0.07)
Service categories	290	290	286
Providers	4,717	4,532	2,450
Insurers	7	7	7
Semesters	14	14	14
Observations	1,907,311	1,643,517	263,794

Note: Table shows the mean and standard deviation in parenthesis of main variables in the final dataset. An observation in this table is a combination of insurer, provider, service category, and semester. Total claims are measured in 100s. Total cost and prices are measured in million COP and deflated to 2018 COP.

Figure 1 explores time series variation in the fraction of insurer-provider-services that use a FFS contract to deliver healthcare. The black line in panel A, corresponding to the full sample, shows that this fraction is declining over time, going from around 92 percent in 2013-1 to 80 percent in 2019-2. The large decline between 2015-2 and 2016-1 is potentially explained by the termination of the largest health insurer in the country in this period. The reduction in the use of FFS is mostly due to insurer-provider pairs that negotiate new contracts under capitation. The blue line that excludes these new contracts and conditions on a balanced sample of insurer-provider-services shows that the fraction that uses FFS goes from 92 percent in 2013-1 to 87 percent in 2019-2.

FIGURE 1: Time series of FFS

(A) Type of sample (B) Insurer HHI (C) Type of service



Note: Figure presents time series of the fraction of insurer-provider-services under FFS. Panel A shows the fraction in the full sample in black and in the sample of insurer-provider-services that are observed every semester. Panel B shows the fraction in the full sample, and in the sample of municipalities with insurer HHI above and below 2,500 in 2016. Panel C shows the fraction conditional on service categories such as consultations and laboratory testing, imaging and nuclear medicine, and other services such as procedures in anatomical areas.

Cooper et al. (2019) document that equilibrium contracts tend to place higher financial risk on hospitals in markets with relatively high insurer concentration. If this were the case in my setting, then FFS should be more prevalent in markets with low insurer HHI. Panel B of figure 1 shows that the use of FFS does not differ systematically across concentrated and competitive insurance markets as measured by their HHI.[8] There are two potential explanations for this null correlation. First, contract choice is endogeneous and depends on the relative bargaining power of insurers and providers. Hence, without exogenous variation in market structure we might obtain biased correlations. Second, negotiations happen at the service level and while the government does not regulate them it does recommend which type of services should be covered under FFS to avoid the provider's agency problem. Panel C corroborates

[8] Insurer HHI is calculated based on market shares in the number of enrollees during 2016.

these recommendations by showing that FFS is less prevalent for low complexity services subject to substantial provider discretion such as consultations, imaging, and nuclear medicine, but is more prevalent for complex services such as procedures in different anatomical areas. The decreasing trend in the use FFS therefore suggests a transition from delivering care in a hospital setting to a primary care setting.

4 Insurer Market Structure and Contract Choice

Several studies have concluded that the use of FFS increases healthcare costs and worsens patient health relative to prospective payments (Schroeder and Frist, 2013; Ware et al., 1986; Newhouse et al., 1985). The previous descriptive evidence showed that the use of FFS in Colombia has been declining over the last decade. However, health care costs continue rise and patient health as measured by the incidence of certain diseases is fairly stable over time (see appendix figure 1).

What explains the pattern in the use of FFS? I answer this question from the perspective of market structure. To do so, I leverage exogenous changes in insurer and provider market structure generated by the termination of the largest health insurer in the country, called SaludCoop, and its hospitals during December 2015. The government terminated this insurer because it diverted nearly $250 billion to investments outside of the health care system and because its board of directors engaged in illegal activities. SaludCoop covered 20 percent of enrollees in the country, who were all transferred to an incumbent insurer called Cafesalud during the first three months of 2016. Cafesalud covered on average less than 5 percent of enrollees prior to the termination. After the first three months of 2016, enrollees were allowed to switch. Cafesalud was itself terminated in 2019. Appendix figure 2 presents these first-stage effects on enrollment.[9]

SaludCoop was vertically integrated with 38 hospitals across the country, which were forced to shut down after December 2015. These were relatively large hospitals that accounted for a total of 2,354 beds. Their assets had to be sold to other providers in the market, but in practice this did not happen during my sample period. In markets where SaludCoop hospitals operated, other insurers used to cover these hospitals as well. Vertical integration therefore did not imply complete foreclosure of hospital services to rival insurers.

The termination of SaludCoop and its hospitals provides a unique setting to study the impact of insurer and provider market structure on contract choice. My empirical approach consists of comparing municipalities where SaludCoop operated relative to those where it did not operate, before and after its termination in the following dynamic difference-in-differences (*did*) design:

$$f_{jhmt} = \sum_{\substack{k=-6 \\ k\neq -1}}^{7} \beta_k \mathbf{1}\{t - t^* = k\} \times T_m + \alpha_m + \gamma_t + \varepsilon_{jhmt} \tag{1}$$

Here f_{jhmt} is the fraction of services under FFS between insurer j and provider h in municipality m during semester t, t^* is the semester when SaludCoop is terminated (2016-1), T_m is an indicator for municipalities where SaludCoop operated in 2015, α_m is a municipality fixed effect, and γ_t is a semester fixed effect. Standard errors are clustered at the municipality level.

Identification of the causal effect of market structure on contract choice relies on treated and control municipalities being on parallel trends with respect to the fraction of services covered under FFS. Identification can be threatened if SaludCoop chose which municipalities to operate in based on their FFS trends. For example,

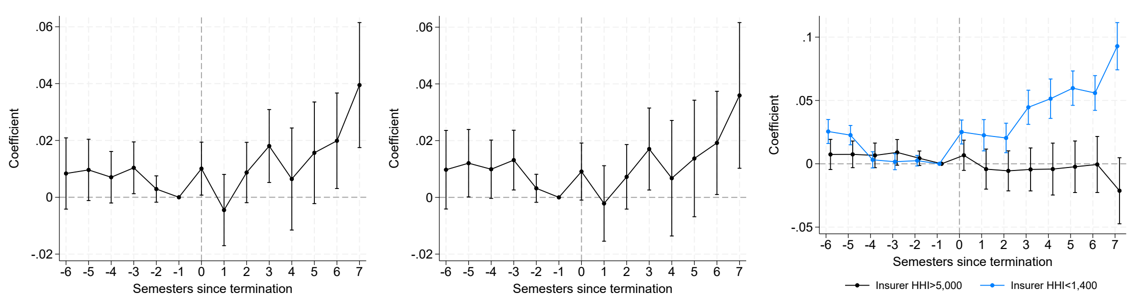
[9] Buitrago et al. (2024) provide a more detailed description of the termination.

if SaludCoop entered markets with a decreasing use of FFS, this would result in estimates of the effect of market structure that are negative and growing over time, as well as in estimates of significant differential trends between treated and control groups prior to the event. Whether this parallel pre-trends assumption holds in my setting can be easily corroborated from the estimates.

Panel A of figure 2 presents point estimates and 95 percent confidence intervals of the dynamic treatment effects. I find that the fraction of services covered under FFS increased between 1 and 4 percentage points after the termination. The impact on the use of FFS is not a result of changes in healthcare provider concentration potentially caused by the closure of SaludCoop's hospitals. Even in markets where these hospitals had less than 1 percent market share in total healthcare costs, depicted in panel B, I estimate a similar effect of the exogenous reduction in the number of insurers after the termination. Because healthcare provider markets in most Colombian municipalities are highly competitive, these results suggest that changes in FFS take-up are explained by changes in insurer market structure.

Figure 2: Impact of insurer market structure on FFS

(A) All markets (B) Low SaludCoop hosp. share (C) By insurer HHI



Note: Figure presents coefficients and 95 percent confidence intervals of a dynamic *did* using as outcome the fraction of services covered under FFS. Treated units are municipalities where SaludCoop operated in 2015. Control units are municipalities where SaludCoop did not operate. Relative time indicators are constructed relative to the first semester of 2016 when all first-stage enrollment effects are observed and are set to -1 to control units. Panel A uses the full sample of markets and panel B uses the subsample of markets where SaludCoop's hospitals had less than 1 percent market share in total healthcare costs during 2014. Panel C explores the heterogeneity of treatment effect by insurer HHI based on the number of enrollees in 2015. Estimates in blue correspond to treated markets where the insurer HHI fell below 1,400 in 2016. Estimates in green correspond to treated markets where the insurer HHI was above 5,000 in 2016.

I explore the role of insurer market structure in determining the choice of contracts in panel C. The effect on FFS take-up is driven entirely by insurance markets that became more competitive after the termination and where healthcare providers likely gained bargaining power. Markets where the insurer HHI fell below 1,400, represented in the estimates in blue, saw an average increase of 5 percentage points in the fraction of services covered under FFS, with effects being as large as 10 percentage points by the end of the sample period. Instead, insurance markets that became more concentrated after the termination and where insurers likely have higher bargaining power than providers saw no changes in the use of FFS as seen in the estimates in green.

Findings of the impact of insurer market structure on contract choice indicate that the decreasing use of FFS in Colombia, illustrated in figure 1, is tied to insurance markets becoming increasingly concentrated and thus to insurers gaining bargaining power relative to providers. Appendix figure 3 which shows the average municipal insurer HHI weighted by the number of enrollees corroborates this increasing trend in insurance concentration in the country during the sample period.

The effect of insurer market structure on FFS also suggests that antitrust policies in health insurance markets can lead to more retrospective payments in equilibrium and to potentially worse health and financial outcomes. There are several papers documenting that FFS is associated with higher healthcare costs or conversely that lower healthcare costs are associated with prospective payments used commonly by HMOs (Baker, 1997; Newhouse et al., 1985). FFS has also been related to higher treatment intensity (Adida et al., 2017) and relatively worse health outcomes among subgroups of patients compared to HMOs (Ware et al., 1986). In the next section, I examine the impact of FFS on different measures of healthcare utilization and spending to get at the possible equilibrium effects of policies targeting insurer market structure.

5 The Impact of Contract Choice on Healthcare

I quantify the relative impact of FFS contracts between insurers and providers on healthcare utilization, spending, and treatment intensity, using a dynamic *did* design. This strategy compares insurer-provider pairs that switch the contract for a particular health service from capitation to FFS (treated) against those that always cover the service under capitation (control), before and after the switch. Appendix table 1 presents pooled summary statistics for this analysis sample. The regression of interest is:

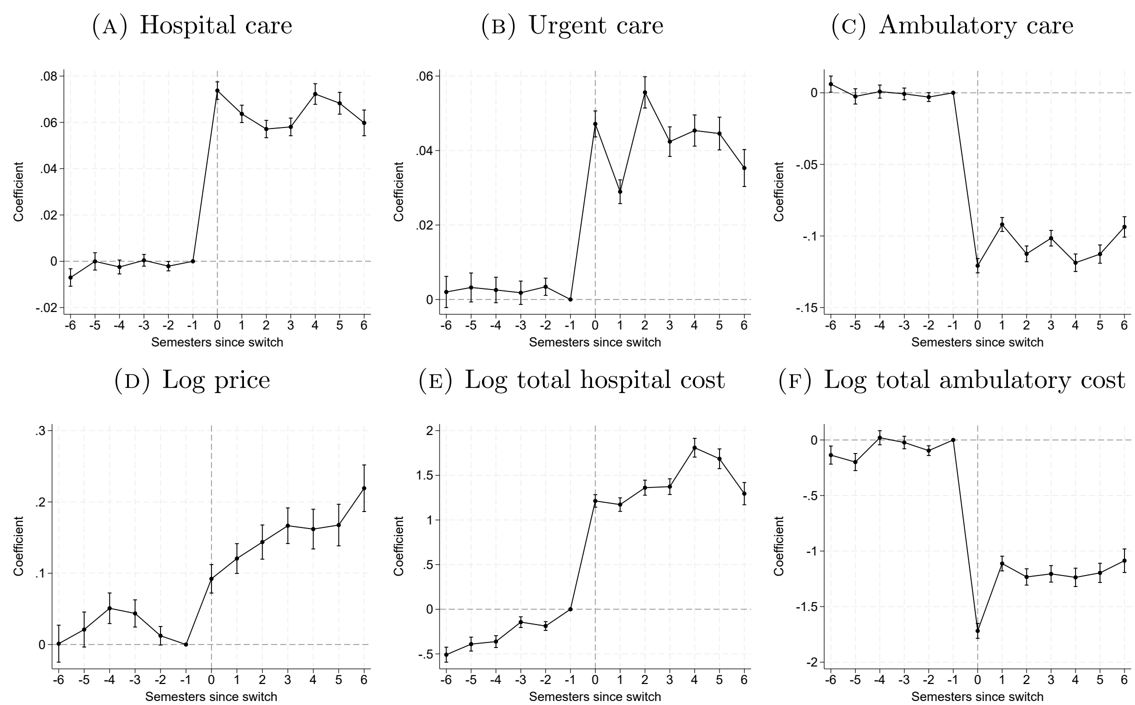
$$y_{jhst} = \sum_{\substack{k=-6 \\ k\neq -1}}^{6} \beta_k \mathbf{1}\{t - t^* = k\} \times T_{jhs} + \alpha_{jhs} + \gamma_t + \varepsilon_{jhst} \tag{2}$$

where y_{jhst} is the outcome of insurer j that contracts with provider h for service s in semester t, t^* is the semester when the insurer-provider pair switches its contract to FFS for service s, T_{jhs} is an indicator for insurer-provider pairs that switch their contract, α_{jhs} is an insurer-provider-service fixed effect, and γ_t is a semester fixed effect. The baseline period is the semester right before the switch. Standard errors are clustered at the insurer-provider-service level, which defines the level of treatment.

While the previous section showed that contract choice depends on insurer market structure, this source of market-level selection bias is accounted for in equation (2) by the insurer-provider-service fixed effects. However, the equation suggests that there may be additional sources of selection bias that change over time and within insurer-provider-services, such as unobserved patient health. For instance, if an insurer has an unobservably sick population of enrollees, providers would be more likely to select into FFS contracts where they bear lower financial risk. This type of selection bias threatens identification of the causal effect of interest since it would result in a positive and upwards trend in utilization and spending differences between treated and control groups prior to the switch of contracts.

Identification of the impact of FFS thus requires that treated and control insurer-provider-services are on parallel outcome trends prior to the switch. Notice that this argument does not require contract choice to be exogenous, which we know not to be true. Instead, it requires that selection patterns based on unobserved health do not differ between treated and control units prior to the switch. Appendix figure 4 explores this parallel pre-trends argument descriptively for my outcomes of interest.

Figure 3: Impact of FFS on intensity of care, utilization, and spending



Note: Figure presents coefficients and 95 percent confidence intervals of the dynamic *did* using as outcomes the fraction of claims provided in a hospital setting in panel A, in an urgent care setting in panel B, and in an ambulatory care setting in panel C, the log of service prices in panel D, the log of total costs in a hospital setting in panel E, and the log of total costs in an ambulatory care setting in panel F. Treated units are insurer-provider pairs that switch to cover the service from capitation to FFS. Control units are insurer-provider pairs that always cover the service under capitation. Relative time indicators are constructed relative to the semester when the switch in contracts occurs and are set to -1 for the control group.

Panels A to C of figure 3 present results of the *did* specification on the fraction of claims delivered in a hospital, urgent care, and ambulatory care setting. I find evidence of parallel pre-trends suggestive of limited selection of insurer-provider pairs into FFS contracts based on these outcomes. In line with previous literature, findings show that FFS induces higher treatment intensity. The fraction of claims provided in a hospital and in an urgent care setting increase on average 7 and 4 percentage points after the switch away from capitation, respectively. By contrast, the fraction of claims provided in an ambulatory care setting declines 10 percentage points on average relative to insurer-hospital pairs that contract under capitation. Appendix 3 reports all associated coefficients and standard errors and appendix 5 reports robustness checks with alternative estimators.

Utilization and treatment intensity patterns translate into similar healthcare spending patterns in panels D to F. Although it is more difficult to rule out selection into FFS based on rising service prices, panel D shows a substantial price increase equal to 15 percent on average after switching from capitation to FFS. FFS increases healthcare spending in a hospital setting in panel E but decreases spending in an ambulatory care setting in panel C relative to insurer-provider pairs that always use capitation. Because ambulatory claims make up a higher fraction of total utilization and ambulatory services are relatively cheaper, total healthcare costs decrease after the event as seen in appendix figure 5.

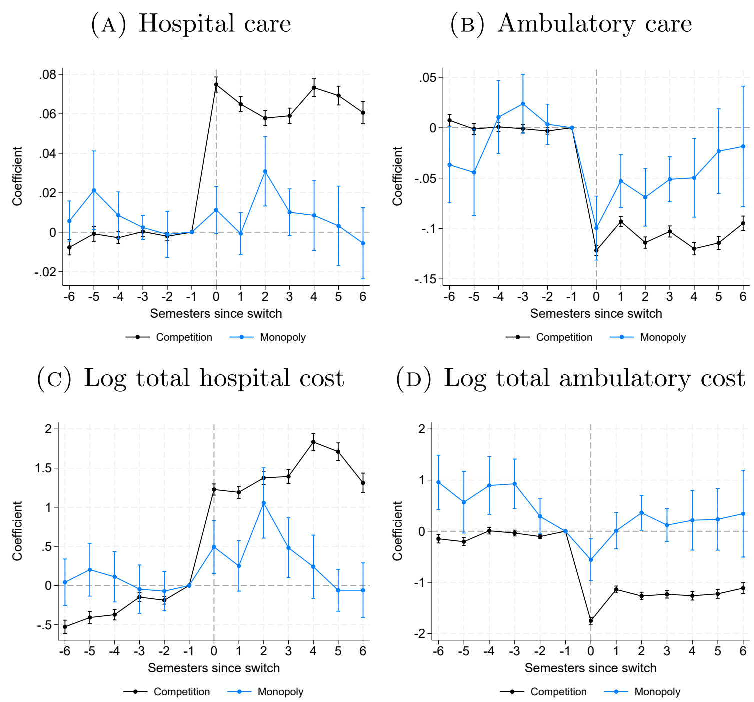
Compatible with results in Clemens and Gottlieb (2014), appendix figure 6 shows that over-provision incentives under FFS are salient only among the set of services for which the provider has discretion to induce demand, such as laboratory testing and imaging. Yet, for services related to treatment of complex health conditions such as procedures in lungs and cardiac vessels, there is no scope for over-provision incentives, which is why treatment effects of FFS are null in appendix figure 7.

Theoretical framework. Appendix 4 shows that the results in this section can be rationalized with a simple principal-agent model where the insurer designs a contract profile to induce a treatment intensity, which the provider can accept or reject. The contract profile is a vector of prices and degree of retrospectiveness that the insurer pays to the provider depending on realized revenue. The model shows (i) that to induce high treatment intensity, the insurer should design a fully retrospective contract like FFS and (ii) that the impact of FFS on healthcare spending is ambiguous and depends on the probability distribution of revenues and marginal costs. The predictions of this simple model are maintained in settings where insurers and providers bargain over contracts rather than the insurer making take-it-or-leave-it offers to the provider.

Market structure, utilization, and spending. As suggested by results in section 4, the effects of FFS on utilization, spending, and treatment intensity are driven by insurer market structure. To see this, in figure 4 I investigate whether treatment effects are heterogeneous across monopoly insurance markets and markets with more than one insurer.

Monopoly markets see smaller declines in the fraction of claims provided in an ambulatory care setting after switching to FFS compared to competitive insurance markets. This is consistent with insurers having higher bargaining power relative to providers in markets with fewer competitors and thus with monopolist insurers being better able to induce lower treatment intensities. For a monopolist insurer the fraction of claims provided in a hospital setting does not change when they switch their contract from capitation to FFS, but in competitive markets this fraction increases nearly 7 percentage points. Results also show that FFS has no impact on total healthcare costs in a hospital and in an ambulatory care setting in monopoly markets, but it induces substantial changes in costs in markets with strong competition between insurers. These results speak to contract choice as the mechanism by which policies that incentivize competition between private insurers can affect downstream healthcare utilization and spending.

FIGURE 4: Impact of FFS by insurance market structure



Note: Figure presents coefficients and 95 percent confidence intervals of the dynamic *did* using as outcomes the fraction of claims provided in a hospital setting in panel A, fraction of claims provided in an ambulatory care setting in panel B, log of total healthcare cost in a hospital setting in panel C, and log of total healthcare cost in an ambulatory setting in panel D. Black lines condition on treated municipalities with more than one insurer in 2016 and blue lines condition on treated municipalities with a monopolist insurer in 2016. Control units are not conditioned to market structure. Treated units are insurer-provider pairs that switch to cover the service from capitation to FFS. Control units are insurer-provider pairs that always cover the service under capitation. Relative time indicators are constructed relative to the semester when the switch in contracts occurs and are set to -1 for the control group.

6 Conclusions

This paper studies health insurer market structure as a determinant of contract choice between insurers and providers and revisits the characterization of provider incentives under retrospective and prospective contracts. The paper uses a unique dataset from the Colombian health care system that reports the type of contract and the terms that insurers sign with providers for every health service. Leveraging exogenous changes in insurer and provider market structure generated by the termination of the largest health insurer in the country and its hospitals, I find that competitive insurance markets cause an increase in the use of retrospective contracts such as fee-for-service (FFS). This finding suggests that in markets where insurers have lower bargaining power relative to providers, equilibrium contracts should be ones that place higher financial risk on insurers.

Comparing insurer-provider pairs that switch their contract from capitation to FFS against those that always use capitation, I find that FFS induces higher treatment intensities as defined by healthcare that is provided in a hospital setting rather than in an ambulatory care setting. These downstream effects of FFS on utilization and spending are seen only in markets where there is competition between private insurers and where these insurers likely have lower bargaining power relative to providers. However, monopoly insurance markets see no changes in outcomes after adopting FFS contracts.

My findings teach two lessons for the regulation of health insurance markets: (1) antitrust policies in health insurance can have unintended consequences on health outcomes by causing the adoption of contracts that incentivize healthcare providers to deliver intensive treatments to patients; (2) given that retrospective contracts do not necessarily increase healthcare spending, even though they shift the composition of care towards a hospital setting, regulation of these contracts may not be strictly necessary.

References

Acquatella, A. (2022): "Evaluating the Optimality of Provider Reimbursement Contracts," Working paper.

Adida, E., H. Mamani, and S. Nassiri (2017): "Bundled Payment vs. Fee-for-service: Impact of Payment Scheme on Performance," *Management Science*, 63, 1606–1624.

Aizer, A., J. Currie, and E. Moretti (2007): "Does Managed Care Hurt Health? Evidence from Medicaid Mothers," *The Review of Economics and Statistics*, 89, 385–399.

Baker, L. C. (1997): "The Effect of HMOs on Fee-for-service Health Care Expenditures: Evidence from Medicare," *Journal of health economics*, 16, 453–481.

Baker, L. C., M. K. Bundorf, A. M. Devlin, and D. P. Kessler (2016): "Medicare Advantage Plans Pay Hospitals Less than Traditional Medicare Pays," *Health Affairs*, 35, 1444–1451.

Buitrago, G., P. Rodriguez-Lesmes, N. Serna, and M. Vera-Hernandez (2024): "The Role of Hospital Networks in Individual Mortality," .

Choné, P. and C.-t. A. Ma (2011): "Optimal Health Care Contract under Physician Agency," *Annals of Economics and Statistics*, 229–256.

Clemens, J. and J. D. Gottlieb (2014): "Do Physicians' Financial Incentives Affect Medical Treatment and Patient Health?" *American Economic Review*, 104, 1320–1349.

Cooper, Z., S. V. Craig, M. Gaynor, and J. Van Reenen (2019): "The Price Ain't Right? Hospital Prices and Health Spending on the Privately Insured," *The Quarterly Journal of Economics*, 134, 51–107.

Duggan, M. (2004): "Does Contracting Out Increase the Efficiency of Government Programs? Evidence from Medicaid HMOs," *Journal of Public Economics*, 88, 2549–2572.

Einav, L., A. Finkelstein, Y. Ji, and N. Mahoney (2022): "Voluntary regulation: Evidence from Medicare Payment Peform," *The Quarterly Journal of Economics*, 137, 565–618.

Einav, L., A. Finkelstein, and N. Mahoney (2018): "Provider Incentives and Healthcare Costs: Evidence from Long-term Care Hospitals," *Econometrica*, 86, 2161–2219.

Gaynor, M., N. Mehta, and S. Richards-Shubik (2023): "Optimal Contracting with Altruistic Agents: Medicare Payments for Dialysis Drugs," *American Economic Review*, 113, 1530–1571.

Ho, K. and A. Pakes (2014): "Hospital Choices, Hospital Prices, and Financial Incentives to Physicians," *American Economic Review*, 104, 3841–3884.

Iizuka, T. (2012): "Physician Agency and Adoption of Generic Pharmaceuticals," *American Economic Review*, 102, 2826–58.

Kuziemko, I., K. Meckel, and M. Rossin-Slater (2018): "Does Managed Care Widen Infant Health Disparities? Evidence from Texas Medicaid," *American Economic Journal: Economic Policy*, 10, 255–83.

McGuire, T. G. (2000): "Physician Agency," *Handbook of Health Economics*, 1, 461–536.

Mooney, G. and M. Ryan (1993): "Agency in Health Care: Getting Beyond First Principles," *Journal of health economics*, 12, 125–135.

Newhouse, J. P., W. B. Schwartz, A. P. Williams, and C. Witsberger (1985): "Are Fee-for-service costs Increasing Faster than HMO Costs?" *Medical Care*, 23, 960–966.

Ransom, S. B., S. Gene McNeeley, M. L. Kruger, G. Doot, and D. B. Cotton (1996): "The effect of capitated and fee-for-service remuneration on physician decision making in gynecology," *Obstetrics & Gynecology*, 87, 707–710.

Riascos, A., E. Alfonso, and M. Romero (2014): "The Performance of Risk Adjustment Models in Colombian Competitive Health Insurance Market," https://ssrn.com/abstract=2489183orhttp://dx.doi.org/10.2139/ssrn.2489183.

Schroeder, S. A. and W. Frist (2013): "Phasing Out Fee-for-service payment," *The New England journal of medicine*, 368, 2029.

Schwartz, A. L., K. Zlaoui, R. P. Foreman, T. A. Brennan, and J. P. Newhouse (2021): "Health Care Utilization and Spending in Medicare Advantage vs Traditional Medicare: A Difference-in-Differences Analysis," *JAMA Health Forum*, 2, e214001–e214001.

Somé, N. H., R. A. Devlin, N. Mehta, G. S. Zaric, and S. Sarma (2020): "Stirring the Pot: Switching from Blended Fee-for-service to Blended Capitation Models of Physician Remuneration," *Health economics*, 29, 1435–1455.

Sørensen, R. J. and J. Grytten (2003): "Service production and contract choice in primary physician services," *Health Policy*, 66, 73–93.

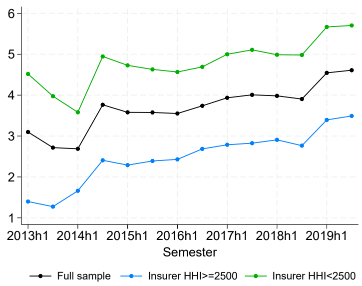
Sun, L. and S. Abraham (2021): "Estimating Dynamic Treatment Effects in Event Studies with Heterogeneous Treatment Effects," *Journal of Econometrics*, 225, 175–199.

Ware, J., W. Rogers, A. Davies, G. Goldberg, R. Brook, E. Keeler, C. Sherbourne, P. Camp, and J. Newhouse (1986): "Comparison of Health Outcomes at a Health Maintenance Organisation with those of Fee-for-service Care," *The Lancet*, 327, 1017–1022.

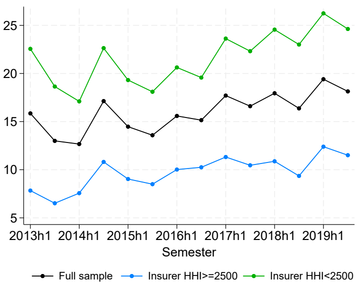
Appendix 1 Determinants of contract choice

Appendix Figure 1: Time series of utilization, spending, and comorbidity incidence

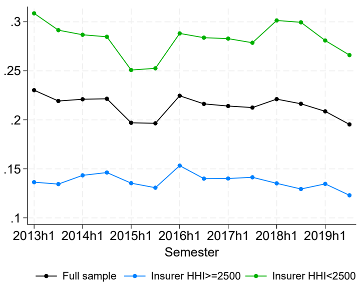
(a) Total claims



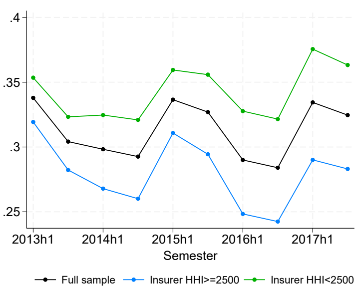
(b) Total spending



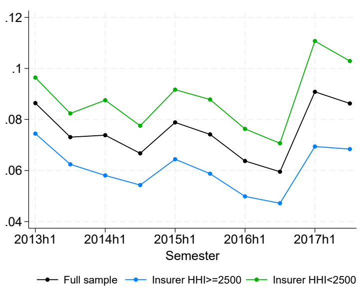
(c) Price



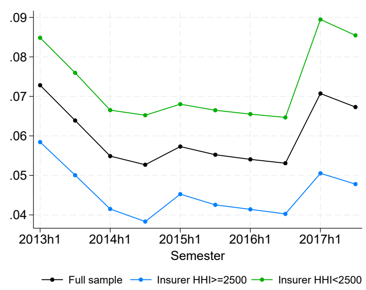
(d) Cardiovascular



(e) Pulmonary



(f) Renal



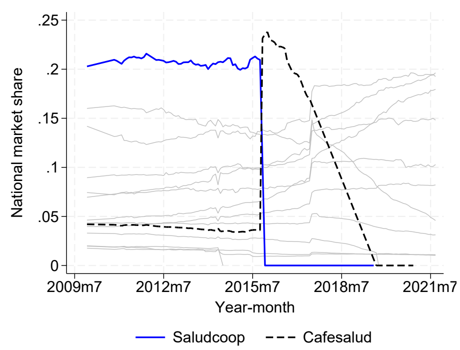
Note: Figure presents time series of total claims (in hundreds), total spending (in million of COP), prices, and fraction of claims associated with ICD 10 codes for cardiovascular disease, pulmonary disease, and renal disease. An observation in an insurer-provider-service tuple. Black lines use the full sample, blue lines the sample of municipalities with insurer HHI above 2,500 in 2016, and green lines the sample of municipalities with insurer HHI below 2,500 in 2016.

This appendix presents additional motivating descriptive evidence for the analysis of insurer market structure as a determinant of contract choice. Appendix figure 1 presents time series variation in total claims, total spending, health service prices, and diagnoses in the full sample. An observation for this figure is an insurer-provider-service. Appendix figure 2 presents national insurer market shares. SaludCoop is depicted in blue, Cafesalud in black, and the rest of insurers in gray. I use SaludCoop's termination as an exogenous shock to insurer and provider market structure.

Appendix figure 3 shows a time series of the average insurer HHI weighted by number of enrollees in each municipality. The rapid increase in concentration during

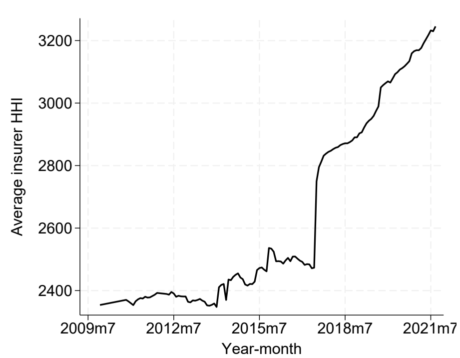
2017 corresponds to the 12 months after SaludCoop's enrollees where reassigned to Cafesalud. By law, this is the minimum enrollment spell length before an enrollee can switch insurers. Enrollees who did not switch out of Cafesalud after the three-month grace period had to remain with this insurer for 12 months. 18 percent of SaludCoop's enrollees switched out of Cafesalud during 2016 after the three-month grace period, and an additional 23 percent switched out in 2017.

Appendix Figure 2: National market shares by insurer



Note: Figure presents the national market share per insurer. The terminated insurer, SaludCoop, is depicted in blue. The reassignment insurer, Cafesalud, is depicted in black. The rest of insurers are depicted in gray.

Appendix Figure 3: Average municipal insurer HHI



Note: Figure presents insurer HHI based on the number of enrollees in the contributory system, averaged across municipalities and weighted by the total number of enrollees in the municipality. Insurers with less that 0.005 percent market share in a municipality are excluded from the sample.

Appendix 2 Impact of FFS on healthcare

This appendix presents additional motivating descriptive evidence for the analysis of section 5. Appendix table 1 presents summary statistics for the sample of treated and control insurer-provider-services used in this analysis. Column (1) uses the full sample, column (2) the sample of treated observations, and column (3) the sample of controls.

Appendix Table 1: Pooled summary statistics for causal analysis sample

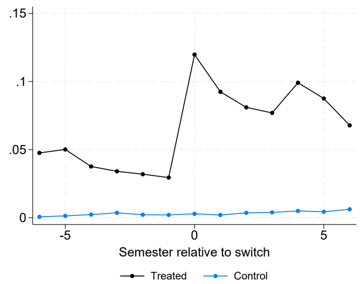
	(1) Full sample	(2) FFS	(3) Capitation
Total claims (100s)	12.94 (103)	4.64 (43.9)	16.9 (121.6)
Total cost (million COP)	29.57 (244)	15.01 (125)	36.53 (283)
Price (million COP)	0.08 (0.52)	0.12 (0.82)	0.06 (0.28)
Fraction claims in hospital care	0.04 (0.17)	0.10 (0.26)	0.01 (0.10)
Fraction claims in urgent care	0.06 (0.21)	0.12 (0.29)	0.03 (0.15)
Fraction claims in domiciliary care	0.002 (0.04)	0.003 (0.05)	0.001 (0.03)
Fraction claims in ambulatory care	0.79 (0.39)	0.65 (0.45)	0.85 (0.34)
FFS	0.32 (0.47)	—	—
Age	33.78 (19.1)	32.98 (20.0)	34.17 (18.6)
Male	0.34 (0.27)	0.34 (0.30)	0.35 (0.26)
Breast cancer	0.02 (0.06)	0.02 (0.08)	0.02 (0.06)
Lung cancer	0.002 (0.02)	0.003 (0.03)	0.001 (0.02)
Skin cancer	0.01 (0.03)	0.01 (0.04)	0.01 (0.03)
Diabetes	0.05 (0.11)	0.05 (0.13)	0.05 (0.11)
Cardiovascular disease	0.18 (0.25)	0.20 (0.27)	0.17 (0.24)
Pulmonary disease	0.03 (0.08)	0.04 (0.10)	0.03 (0.07)
Renal disease	0.03 (0.08)	0.03 (0.10)	0.03 (0.08)
Service categories	279	279	279
Providers	2,014	1,748	2,014
Insurers	7	7	7
Observations	339,789	109,905	229,884

Note: Table shows the mean and standard deviation in parenthesis of main variables for my analysis sample. An observation in this table is a combination of insurer, provider, service category, and semester. Total claims are measured in 100s. Total cost and prices are measured in million COP and deflated to 2018 COP.

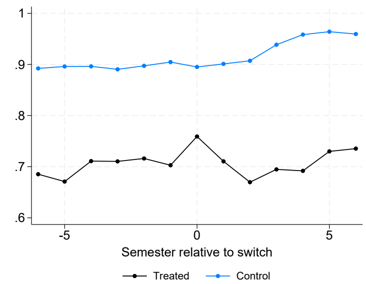
Appendix figure 4 provides descriptive evidence of parallel pre-trends between treated and control insurer-provider-services for my main outcomes of interest. Relative time indicators for the control group in each figure are imputed from treated units in the same insurer-service-municipality combination and are equal to the average relative time indicator among treated units in that cell.

Appendix Figure 4: Descriptive evidence of parallel pre-trends

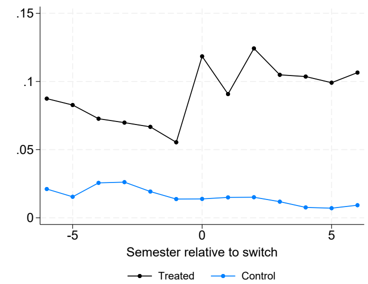
(a) Hospital care



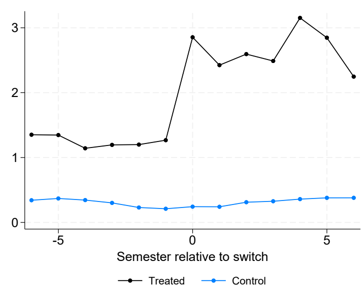
(b) Ambulatory care



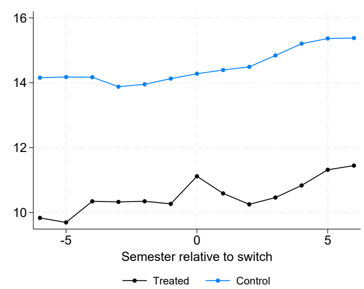
(c) Urgent care



(d) Log total hospital cost



(e) Log total ambulatory cost



Note: Figure presents time trends of outcome variables among treated and control groups. The time variable is the semester relative to when the insurer-provider-service switch the contract from capitation to FFS. For the control group for which relative time is not defined, I impute the average relative time of treated units in the same insurer-service-municipality. Panel A presents the fraction of claims provided in a hospital setting, panel B in an ambulatory care setting, and panel C in an urgent care setting. Panels D and E present the log of total hospital cost and ambulatory cost, respectively, measured in million COP.

Appendix 3 Event study coefficients

This appendix presents coefficients and standard errors associated with each dynamic *did* result in the main text. It also reports coefficient plots for additional outcomes.

Appendix Table 2: Dynamic *did* coefficients on the use of FFS

	All markets	Low SaludCoop hospital share	Insurer HHI <1,400	Insurer HHI >5,000
t-6	0.0084	0.0097	0.0074	0.0255
	(0.0064)	(0.0071)	(0.0061)	(0.0048)
t-5	0.0096	0.0121	0.0074	0.0226
	(0.0055)	(0.0061)	(0.0054)	(0.0039)
t-4	0.0070	0.0099	0.0066	0.0031
	(0.0046)	(0.0052)	(0.0049)	(0.0033)
t-3	0.0104	0.0131	0.0090	0.0016
	(0.0046)	(0.0054)	(0.0052)	(0.0032)
t-2	0.0029	0.0032	0.0044	0.0025
	(0.0024)	(0.0025)	(0.0029)	(0.0021)
t+0	0.0101	0.0091	0.0067	0.0251
	(0.0047)	(0.0051)	(0.0061)	(0.0048)
t+1	-0.0045	-0.0022	-0.0042	0.0225
	(0.0064)	(0.0068)	(0.0080)	(0.0063)
t+2	0.0087	0.0072	-0.0056	0.0204
	(0.0054)	(0.0058)	(0.0080)	(0.0059)
t+3	0.0180	0.0170	-0.0044	0.0446
	(0.0065)	(0.0074)	(0.0086)	(0.0069)
t+4	0.0064	0.0068	-0.0042	0.0514
	(0.0091)	(0.0104)	(0.0104)	(0.0079)
t+5	0.0157	0.0137	-0.0023	0.0597
	(0.0091)	(0.0105)	(0.0104)	(0.0069)
t+6	0.0199	0.0192	-0.0006	0.0559
	(0.0086)	(0.0093)	(0.0113)	(0.0070)
t+7	0.0395	0.0359	-0.0213	0.0928
	(0.0112)	(0.0131)	(0.0133)	(0.0095)
N	152,645	125,685	43,242	41,242

Note: Table presents coefficients and standard errors of the dynamic *did* design for the fraction of services covered under FFS. Column (1) uses the full sample, column (2) the sample of markets where SaludCoop hospitals had less than 1 percent market share in total healthcare costs during 2014, and column (3) splits the sample in treated markets where insurer HHI fell below 1,400 in 2016 and those were it was above 5,000 in 2016.

Appendix Table 3: Dynamic *did* coefficients on main utilization and spending outcomes

	Hospital care	Urgent care	Ambu. care	Log price	Log hospital costs	Log ambu. costs
t-6	-0.0070	0.0020	0.0060	0.0496	-0.5090	-0.1360
	(0.0019)	(0.0021)	(0.0029)	(0.0138)	(0.0427)	(0.0415)
t-5	0.0000	0.0032	-0.0025	0.0676	-0.3900	-0.1990
	(0.0019)	(0.0020)	(0.0027)	(0.0134)	(0.0396)	(0.0391)
t-4	-0.0025	0.0026	0.0008	0.0921	-0.3620	0.0202
	(0.0015)	(0.0017)	(0.0023)	(0.0128)	(0.0338)	(0.0324)
t-3	0.0004	0.0018	-0.0008	0.0706	-0.1440	-0.0229
	(0.0013)	(0.0016)	(0.0021)	(0.0122)	(0.0306)	(0.0286)
t-2	-0.0021	0.0034	-0.0030	0.0247	-0.1880	-0.0959
	(0.0010)	(0.0012)	(0.0016)	(0.0083)	(0.0250)	(0.0223)
t+0	0.0737	0.0472	-0.1210	0.1180	1.2130	-1.7180
	(0.0019)	(0.0018)	(0.0025)	(0.0102)	(0.0358)	(0.0343)
t+1	0.0637	0.0289	-0.0920	0.1550	1.1720	-1.1120
	(0.0019)	(0.0016)	(0.0025)	(0.0108)	(0.0386)	(0.0337)
t+2	0.0571	0.0556	-0.1120	0.1850	1.3610	-1.2330
	(0.0019)	(0.0021)	(0.0028)	(0.0126)	(0.0429)	(0.0375)
t+3	0.0580	0.0424	-0.1020	0.2000	1.3730	-1.2050
	(0.0019)	(0.0020)	(0.0028)	(0.0130)	(0.0449)	(0.0378)
t+4	0.0723	0.0454	-0.1190	0.1870	1.8090	-1.2370
	(0.0023)	(0.0021)	(0.0031)	(0.0145)	(0.0536)	(0.0421)
t+5	0.0683	0.0446	-0.1130	0.1890	1.6850	-1.1960
	(0.0024)	(0.0022)	(0.0033)	(0.0151)	(0.0565)	(0.0440)
t+6	0.0598	0.0353	-0.0937	0.2480	1.2950	-1.0870
	(0.0028)	(0.0025)	(0.0037)	(0.0165)	(0.0634)	(0.0540)
N	339789	339789	339789	102622	339789	339789

Note: Table presents coefficients and standard errors of the dynamic *did* design for the fraction of claims delivered in a hospital setting, urgent care setting, ambulatory care setting, and the log of price, total costs in a hospital setting, and total costs in an ambulatory care setting.

Appendix Table 4: Dynamic *did* coefficients conditional on monopoly markets

	Hospital care		Ambulatory care	
	Competition	Monopoly	Competition	Monopoly
t-6	-0.0077	0.0057	0.0073	-0.0368
	(0.0020)	(0.0052)	(0.0029)	(0.0193)
t-5	-0.0008	0.0212	-0.0014	-0.0443
	(0.0019)	(0.0102)	(0.0028)	(0.0219)
t-4	-0.0028	0.0086	0.0009	0.0105
	(0.0016)	(0.0061)	(0.0023)	(0.0185)
t-3	0.0003	0.0024	-0.0010	0.0238
	(0.0013)	(0.0031)	(0.0021)	(0.0149)
t-2	-0.0021	-0.0011	-0.0033	0.0035
	(0.0010)	(0.0060)	(0.0016)	(0.0102)
t+0	0.0748	0.0113	-0.1220	-0.0996
	(0.0020)	(0.0061)	(0.0026)	(0.0162)
t+1	0.0649	-0.0007	-0.0931	-0.0529
	(0.0019)	(0.0054)	(0.0025)	(0.0134)
t+2	0.0578	0.0308	-0.1140	-0.0690
	(0.0019)	(0.0090)	(0.0028)	(0.0146)
t+3	0.0590	0.0101	-0.1030	-0.0512
	(0.0020)	(0.0060)	(0.0028)	(0.0114)
t+4	0.0732	0.0085	-0.1200	-0.0497
	(0.0023)	(0.0091)	(0.0031)	(0.0199)
t+5	0.0692	0.0032	-0.1140	-0.0233
	(0.0024)	(0.0103)	(0.0033)	(0.0214)
t+6	0.0606	-0.0056	-0.0949	-0.0185
	(0.0029)	(0.0092)	(0.0037)	(0.0305)
N	336467	145087	336467	145087

Note: Table presents coefficients and standard errors of the dynamic *did* design for the fraction of claims delivered in a hospital setting and ambulatory care setting, conditional on monopoly markets and markets with more than one insurer.

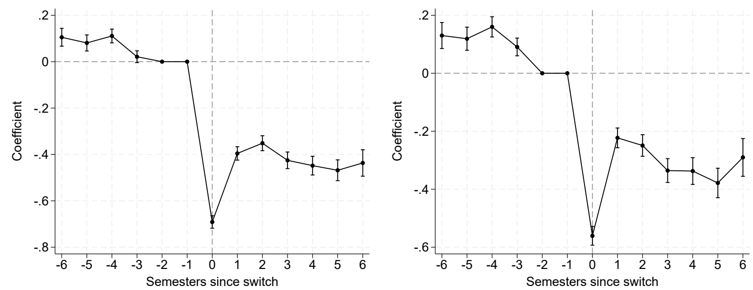
Appendix Table 5: Dynamic *did* coefficients conditional on monopoly markets

	Log hospital costs		Log ambulatory costs	
	Competition	Monopoly	Competition	Monopoly
t-6	-0.5270	0.0421	-0.1480	0.9570
	(0.0434)	(0.1510)	(0.0419)	(0.2700)
t-5	-0.4090	0.2020	-0.2050	0.5670
	(0.0402)	(0.1720)	(0.0394)	(0.3080)
t-4	-0.3720	0.1110	0.0091	0.8940
	(0.0342)	(0.1640)	(0.0326)	(0.2870)
t-3	-0.1470	-0.0462	-0.0360	0.9270
	(0.0309)	(0.1570)	(0.0288)	(0.2470)
t-2	-0.1880	-0.0716	-0.1040	0.2900
	(0.0253)	(0.1280)	(0.0226)	(0.1750)
t+0	1.2260	0.4930	-1.7520	-0.5580
	(0.0363)	(0.1730)	(0.0346)	(0.2090)
t+1	1.1910	0.2500	-1.1390	0.0087
	(0.0392)	(0.1640)	(0.0342)	(0.1800)
t+2	1.3740	1.0550	-1.2670	0.3610
	(0.0435)	(0.2290)	(0.0380)	(0.1740)
t+3	1.3930	0.4810	-1.2330	0.1190
	(0.0455)	(0.1950)	(0.0383)	(0.1640)
t+4	1.8330	0.2400	-1.2630	0.2150
	(0.0541)	(0.2060)	(0.0424)	(0.2980)
t+5	1.7100	-0.0603	-1.2250	0.2320
	(0.0571)	(0.1370)	(0.0443)	(0.3070)
t+6	1.3110	-0.0603	-1.1130	0.3430
	(0.0639)	(0.1780)	(0.0543)	(0.4330)
N	336467	145087	336467	145087

Note: Table presents coefficients and standard errors of the dynamic *did* design for the log of total hospital and ambulatory costs, conditional on monopoly markets and markets with more than one insurer.

Appendix Figure 5: Impact of FFS on total utilization and spending

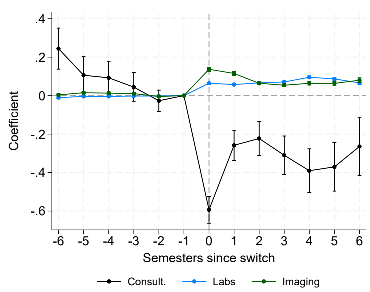
(a) Log total claims (b) Log total cost



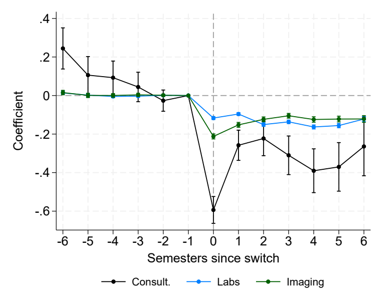
Note: Figure presents coefficients and 95 percent confidence intervals of the dynamic *did* using as outcomes the log of total claims in panel A and the log of total healthcare costs in panel B. Treated units are insurer-provider pairs that switch to cover the service from capitation to FFS. Control units are insurer-provider pairs that always cover the service under capitation. Relative time indicators are constructed relative to the semester when the switch in contracts occurs and are set to -1 for the control group.

Appendix Figure 6: Impact of FFS by low-complexity services

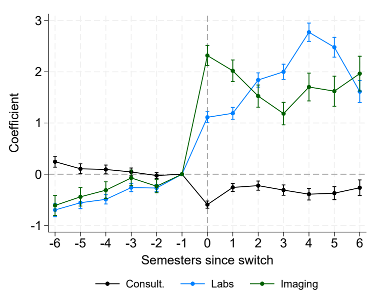
(a) Hospital care



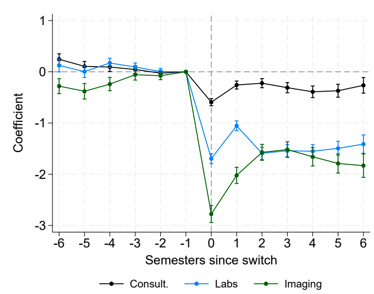
(b) Ambulatory care



(c) Log total hospital cost



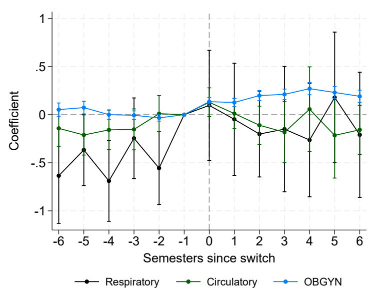
(d) Log total ambulatory cost



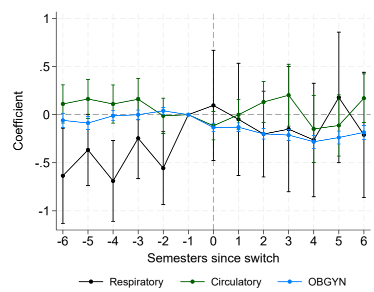
Note: Figure presents coefficients and 95 percent confidence intervals of the dynamic *did* using as outcomes the fraction of claims provided in a hospital setting in panel A, fraction of claims provided in an ambulatory care setting in panel B, log of total healthcare cost in a hospital setting in panel C, and log of total healthcare cost in an ambulatory setting in panel D. Black lines condition treated and control units on consultations, blue lines on laboratory testing, and green lines on imaging services. Treated units are insurer-provider pairs that switch to cover the service from capitation to FFS. Control units are insurer-provider pairs that always cover the service under capitation. Relative time indicators are constructed relative to the semester when the switch in contracts occurs and are set to -1 for the control group.

Appendix Figure 7: Impact of FFS by high-complexity services

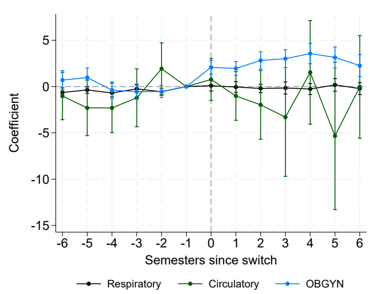
(a) Hospital care



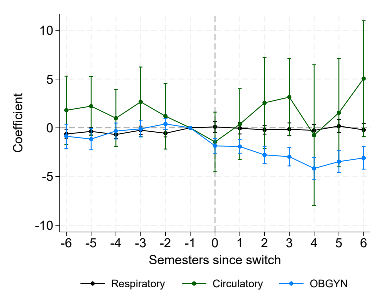
(b) Ambulatory care



(c) Log total hospital cost



(d) Log total ambulatory cost



Note: Figure presents coefficients and 95 percent confidence intervals of the dynamic *did* using as outcomes the fraction of claims provided in a hospital setting in panel A, fraction of claims provided in an ambulatory care setting in panel B, log of total healthcare cost in a hospital setting in panel C, and log of total healthcare cost in an ambulatory setting in panel D. Black lines condition on procedures in respiratory organs, blue lines on procedures in circulatory vessels, and green lines on OBGYN services. Treated units are insurer-provider pairs that switch to cover the service from capitation to FFS. Control units are insurer-provider pairs that always cover the service under capitation. Relative time indicators are constructed relative to the semester when the switch in contracts occurs and are set to -1 for the control group.

Appendix 4 Theoretical framework

Studies about contracts in health care typically focus on settings where the government makes capitated or FFS payments to private insurers to deliver a public health insurance plan. This is case of papers that compare Traditional Medicare versus Medicare Advantage (Schwartz et al., 2021; Baker et al., 2016) or Medicaid FFS versus Medicaid Managed Care (Kuziemko et al., 2018; Aizer et al., 2007; Duggan, 2004). In the Colombian setting, the government makes capitated risk-adjusted transfers to private insurers, but insurers are free to choose whether to contract with a provider using a capitation or a FFS contract. To see how these types of contracts affect the provision of healthcare, consider the following stylized model of moral hazard.

A risk-neutral insurer contracts with a provider whose choice of treatment intensity is unobservable to the insurer. The provider's treatment intensity $e \in \{0, 1\}$ determines the probability distribution of outcomes $x \in \{x_H, x_L\}$ as follows $Pr(x = x_H|e = 1) = p \in (0, 1)$, $Pr(x = x_H|e = 0) = q \in (0, 1)$, with $p > q$. Unlike models of physician agency arising from interactions with patients where contracting on health outcomes is infeasible (as stressed in Mooney and Ryan, 1993), here contracting on insurer revenue is possible.

Assume that $x_H > x_L$, which could be because patients who receive a high treatment intensity represent greater risk-adjusted transfers from the government to the insurer. Insurer profits are given by $x-w$ and provider profits are given by $u(w)-(b+e)$, where $u(\cdot)$ is strictly concave, $u(0) = 0$, and $b > 0$. Suppose the provider's reservation profit equals zero. The insurer offers a contract to the provider, which the provider can accept or reject. A contract is a profile of prices (w_H, w_L) such that $w_H = t+r_H b$ and $w_L = t + r_L b$, where t represents a prospective payment and rb represents a retrospective payment. Moreover, assume $b < q/(p - q)$. The structure of the contract profile follows Acquatella (2022) in allowing payments to have a prospective and a retrospective component.

Suppose the insurer wants to induce low treatment intensity. The insurer's problem is to

$$\begin{aligned}
\max_{w_H, w_L} \quad & q(x_H - w_H) + (1-q)(x_L - w_L) \\
s.t \quad & qu(w_H) + (1-q)u(w_L) - b \geq 0 \quad (IR) \\
& qu(w_H) + (1-q)u(w_L) - b \geq pu(w_H) + (1-p)u(w_L) - b - 1 \quad (IC)
\end{aligned}$$

In this case IR constraint binds otherwise the insurer can offer an infinitesimal smaller w_L. Therefore,

$$\begin{aligned}
qu(w_H) + (1-q)u(w_L) = b \\
w_H = w_L = u^{-1}(b) \iff r_H = r_L = 0, \quad t = u^{-1}(b)
\end{aligned}$$

Now suppose the insurer wants to induce high treatment intensity. The insurer's problem is to

$$\begin{aligned}
\max_{w_H, w_L} \quad & p(x_H - w_H) + (1-p)(x_L - w_L) \\
s.t \quad & pu(w_H) + (1-p)u(w_L) - b - 1 \geq 0 \quad (IR) \\
& pu(w_H) + (1-p)u(w_L) - b - 1 \geq qu(w_H) + (1-q)u(w_L) - b \quad (IC)
\end{aligned}$$

In this case IC binds, IR is slack, and the contract profile is

$$(p-q)(u(w_H)-u(w_L))=1$$
$$w_L=0, \quad w_H=u^{-1}(1/(p-q)) \iff r_L=0, \quad r_H=u^{-1}(1/(p-q))/b, \quad t=0$$

This stylized model shows that an agency problem exists because the insurer does not observe the provider's action. Hence, to induce low treatment intensity, the contract should be fully prospective for both outcomes; while to induce high treatment intensity, the contract should be fully retrospective. The model also shows that expected total spending need not necessarily be higher when the insurer induces high treatment intensity relative to when it induces low treatment intensity. Expected spending S under each scenario is given by:

$$S_L=qw_H+(1-q)w_L$$
$$S_H=pw_H+(1-p)w_L$$

From the assumption that $b<q/(p-q)$, the concavity of u^{-1}, and using Jensen's inequality we get the following:

$$S_L=qw_H+(1-q)w_L=u^{-1}(b)<u^{-1}(q/(p-q))<u^{-1}(p/(p-q))$$
$$S_H=pw_H+(1-p)w_L=pu^{-1}(1/(p-q))+(1-p)u^{-1}(0)\leq u^{-1}(p/(p-q))$$

which suggests that the relation between S_L and S_H depends on the probability distribution of outcomes conditional on treatment intensity and on the marginal cost of providing treatment.

In many health insurance markets, however, insurers and providers bargain over prices rather than the insurer making take-it-or-leave-it offers as in the previous stylized framework. Does price bargaining between insurers and providers solve the agency problem? The answer is no. Suppose the insurer wants to induce low treatment intensity. The optimization problem is now:

$$\max_{w_H, w_L} \ \Pi = \beta \log \Big(q(x_H - w_H) + (1-q)(x_L - w_L) - 0 \Big)$$
$$+ (1-\beta) \log \Big(qu(w_H) + (1-q)u(w_L) - b - 0 \Big)$$
$$s.t \ \ qu(w_H) + (1-q)u(w_L) - b \geq pu(w_H) + (1-p)u(w_L) - b - 1 \ \ (IC)$$

where Π is the log of the Nash surplus and where the insurer's and the provider's disagreement payoffs are zero. In the solution to this problem both IC and IR are slack and the contract profile satisfies $w_H = w_L \iff r_L = r_H = 0, t > u^{-1}(b)$. The prospective payment is higher that in the model with TIOLI contracts otherwise the Nash surplus would be zero.

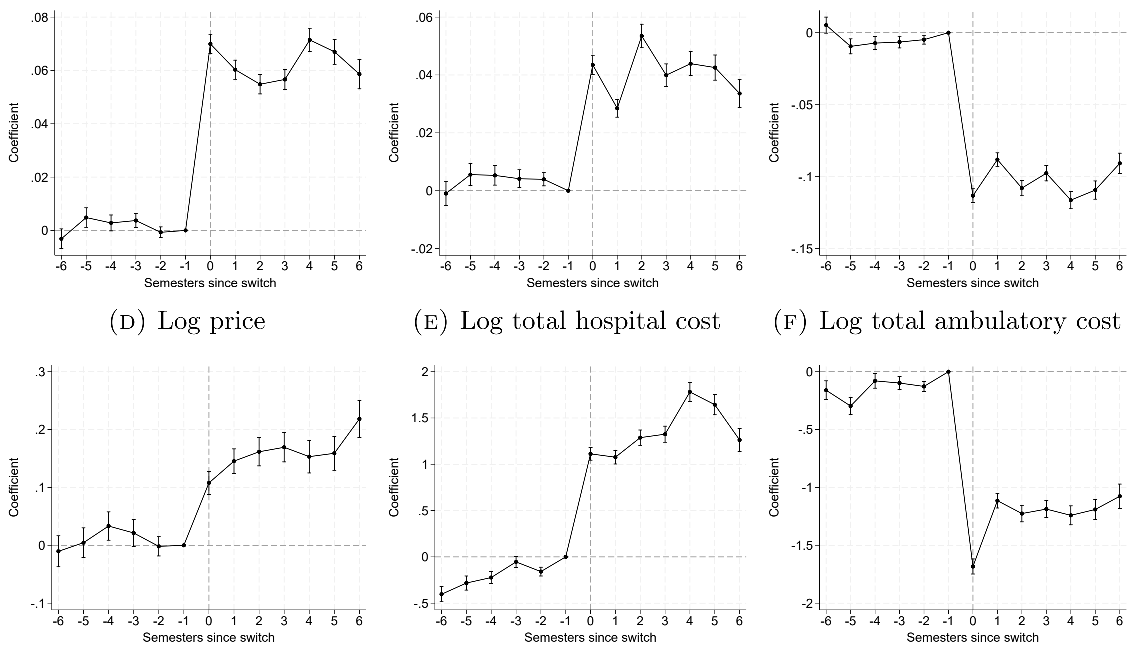
Suppose the insurer wants to induce high treatment intensity. The problem is to:

$$\max_{w_H, w_L} \ \Pi = \beta \log \Big(p(x_H - w_H) + (1-p)(x_L - w_L) - 0 \Big)$$
$$+ (1-\beta) \log \Big(pu(w_H) + (1-p)u(w_L) - b - 1 - 0 \Big)$$
$$s.t \ \ pu(w_H) + (1-p)u(w_L) - b - 1 \geq qu(w_H) + (1-q)u(w_L) - b \ \ (IC)$$

The disagreement payoffs to the insurer and the provider are equal to zero. The equilibrium contract profile in this case satisfies $u(w_H) - u(w_L) = 1/(p-q)$, where for a value of $w_L > 0$ the Nash surplus is higher than when $w_L = 0$. The model with Nash bargaining has a qualitatively similar solution to the model with TIOLI contracts, thus bargaining does not solve the provider's agency problem. The difference from the two models stems from the fact that prices are higher under Nash bargaining than under TIOLI contracts and thus expected insurer profits are lower and expected provider profits are higher.

Appendix 5 Robustness checks

Appendix Figure 8: Robustness on the sample of insurers

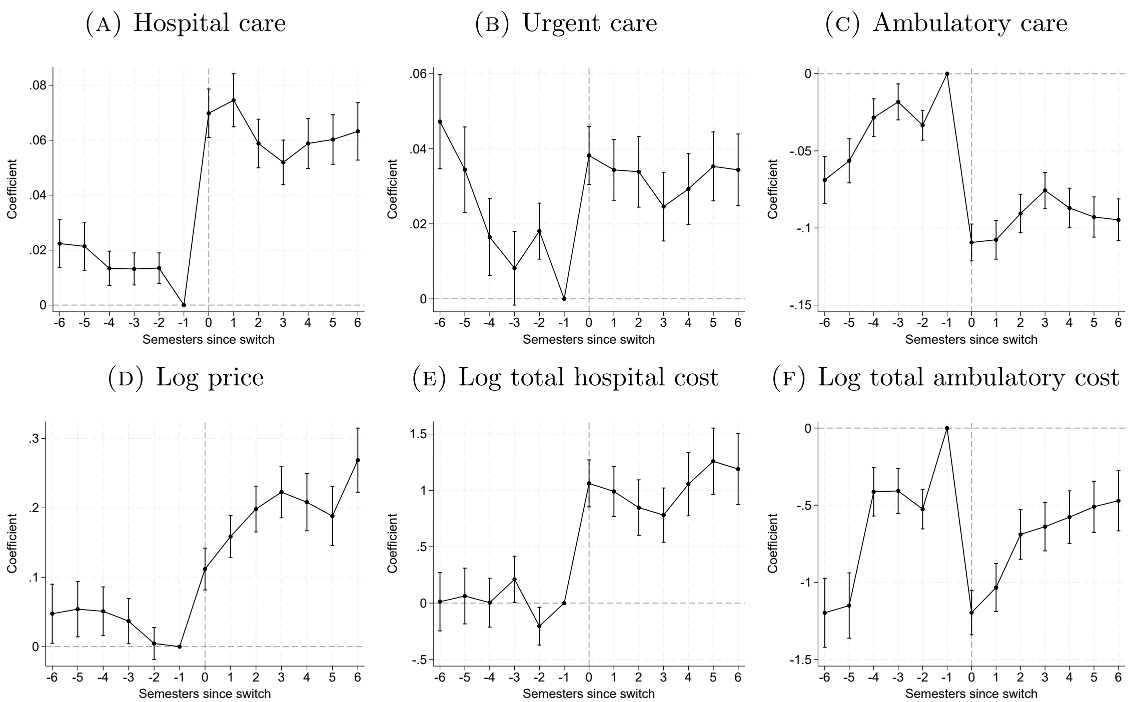


(a) Hospital care (b) Urgent care (c) Ambulatory care

(d) Log price (e) Log total hospital cost (f) Log total ambulatory cost

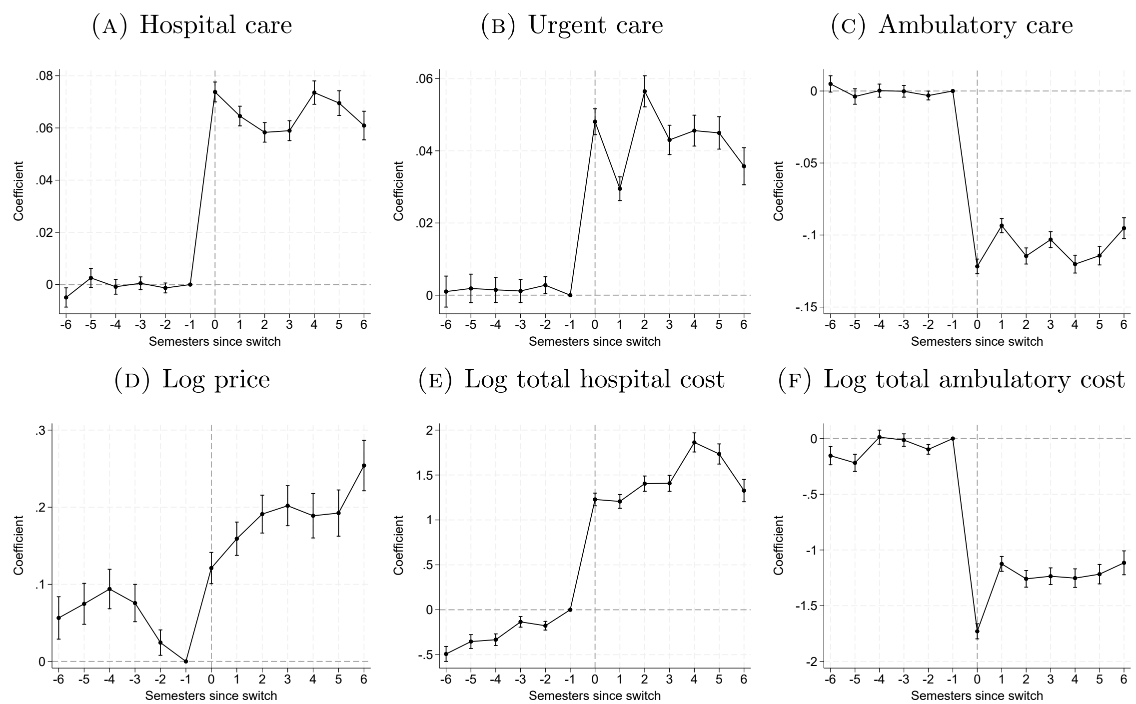
Note: Figure presents coefficients and 95 percent confidence intervals of my main dynamic *did* results using the sample of 9 insurers that I observe for at least 5 years. Treated units are insurer-provider pairs that switch to cover the service from capitation to FFS. Control units are insurer-provider pairs that always cover the service under capitation. Relative time indicators are constructed relative to the semester when the switch in contracts occurs and are set to -1 for the control group.

Appendix Figure 9: Robustness on a balanced panel



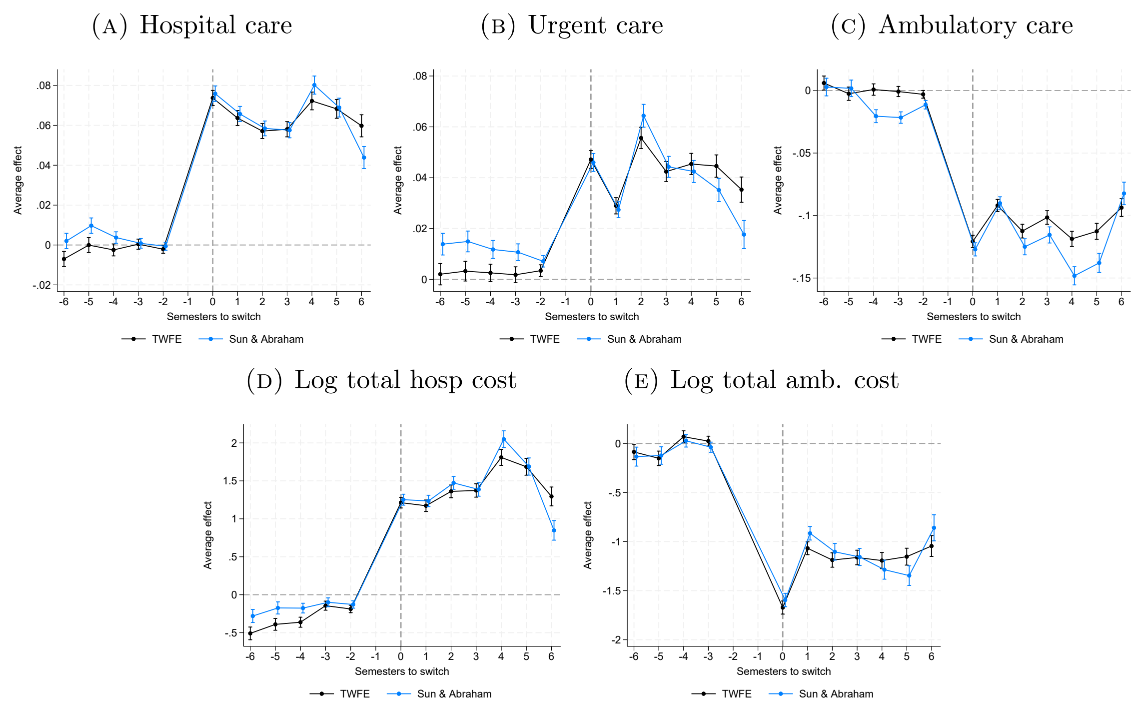
Note: Figure presents coefficients and 95 percent confidence intervals of my main dynamic *did* results using the sample of insurer-provider-services that I observe during all 14 semesters. Treated units are insurer-provider pairs that switch to cover the service from capitation to FFS. Control units are insurer-provider pairs that always cover the service under capitation. Relative time indicators are constructed relative to the semester when the switch in contracts occurs and are set to -1 for the control group.

Appendix Figure 10: Robustness on the sample size for each service



Note: Figure presents coefficients and 95 percent confidence intervals of my main dynamic *did* results dropping services that less than 200 insurer-provider pairs deliver. Treated units are insurer-provider pairs that switch to cover the service from capitation to FFS. Control units are insurer-provider pairs that always cover the service under capitation. Relative time indicators are constructed relative to the semester when the switch in contracts occurs and are set to -1 for the control group.

Appendix Figure 11: Robustness checks with alternative estimators



Note: Figure presents coefficients and 95 percent confidence intervals of the dynamic *did* using as outcomes the fraction of claims provided in a hospital setting in panel A, fraction of claims provided in an urgent care setting in panel B, fraction of claims provided in an ambulatory care setting in panel C, log of total healthcare cost in a hospital setting in panel D, and log of total healthcare cost in an ambulatory setting in panel E. Black lines use a TWFE estimator. Blue lines use Sun and Abraham (2021)'s estimator. Treated units are insurer-provider pairs that switch to cover the service from capitation to FFS. Control units are insurer-provider pairs that always cover the service under capitation. Relative time indicators are constructed relative to the semester when the switch in contracts occurs and are set to -1 for the control group.