Private Contracts to Deliver Healthcare

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February 26, 2024

Abstract

This paper studies the principal-agent problem between health insurers and health care providers. I demonstrate first that provider agency impacts both the type and quantity of treatment, and second that insurance market structure determines contract choice. I test these predictions using an unprecedented data that reports the contracts and terms that insurers sign with providers for every health service. Findings from a difference-in-differences strategy show that fully retrospective contracts induce the provision of health care in a hospital setting, while fully prospective contracts induce ambulatory care. Competitive insurance markets cause increases in the use of retrospective contracts.

Keywords: Health insurance, Provider agency, Fee-for-service, Capitation.

JEL codes: I10, I11, I13, I18.

*e-mail: nserna@stanford.edu. I am deeply grateful to the Colombian Ministry of Health for providing the data for this research. The findings of this paper do not represent the views of any institution involved. All errors are my own.

1 Introduction

In different health systems, health insurers contract with providers to deliver care to their enrollees. Insurers and providers bargain over contracts that induce the latter to choose types and quantities of treatment, which are unobserved to the insurer. This problem of asymmetric information has important implications for health care utilization, spending, and health outcomes. Most prior work studies provider agency arising from interactions with patients when quantity of treatment is unobserved (e.g., Pauly, 1980), but there is limited evidence on the agency problem when providers interact with insurers and choose both the type and quantity of treatment.[1] In the context of bilateral negotiations between insurers and providers, the literature is also scarce as to how contract choice responds to insurer and provider market structure, with a few examples like Cooper et al. (2019).

This paper revisits the wide use of fee-for-service (FFS) and capitation contracts in health care markets to make two contributions: first, it shows that contracts affect the type of care provided and not just the quantity. Fully retrospective contracts like FFS induce high treatment intensities as defined by healthcare that is provided in a hospital setting, while fully prospective contracts like capitation induce healthcare that is provided in an ambulatory care setting. Second, this paper shows that insurance market concentration has a negative causal effect on the fraction of services covered under FFS, a contract that places the financial risk on the insurer.

To study the impact of FFS and the determinants of contract choice 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 regulated by the government (premiums, cost-sharing, and

[1] Dranove (1988) studies the agency problem between providers and patients on the choice of an unobserved type of treatment.

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.

My data comprises all health claims by individuals enrolled in Colombia's contributory healthcare system from 2013 to 2019. 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 evaluate the causal effect of retrospective contracts on utilization and spending, as well as characterize the determinants of contract choice across insurers and services.

The paper starts by presenting a simple theoretical model of provider moral hazard. In the model, the insurer designs a contract profile characterized by a vector of prices and their degree of retrospectiveness to induce a (unobserved) treatment intensity, which the provider can accept or reject. I then extend the model to allow for the possibility that, instead of making take-it-ot-leave-it contracts, the insurer and the provider bargain over the contract profile. Qualitative predictions in the context of TIOLI contracts are maintained when allowing for bargaining. I test these predictions in the data using a dynamic difference-in-differences approach.

I compare 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. Findings show that FFS causes a 7 percentage point increase in the fraction of claims delivered in a hospital setting and a 10 percentage point decrease in the fraction of claims provided in an ambulatory care setting, relative to capitation. These results are consistent with contracts affecting the type of care provided to patients. Results also show that total healthcare spending in a hospital setting increases 1.5 log points, which suggests that contracts affect the quantity of care. Most of the increases in utilization and spending after switching towards FFS are explained by relative discretionary services such as laboratory testing and imaging, but FFS has no effects on outcomes for complex procedures such as procedures in lungs and blood vessels. This goes in line with findings in Clemens and Gottlieb (2014).

In the descriptive section, the paper shows that the use of FFS in Colombia has been declining over the past decade, while healthcare costs continue to rise. Motivated by these descriptive patterns, the last part of the paper studies the determinants of contract choice with a focus on insurance market structure. I leverage exogenous changes in market structure generated by the termination of the largest health insurer in the country by the end of 2015. Using a dynamic difference-in-differences approach, I compare municipalities where the terminated insurer operated against those where it did not, before and after the termination. Findings show that the fraction of services covered under FFS increases nearly 3 percentage points after the termination. This effect is completely driven by insurance markets that became more competitive after the termination as measured by relatively low Herfindahl-Hirschman Indices (HHI). Finally I show that insurance market concentration has been increasing in Colombia during the sample period, which explains why FFS is declining.

Related literature. This paper is related to the sizable literature that studies provider incentives under different payment schemes. Studies in this area analyzed provider moral hazard and provider-induced demand from a theoretical perspective (e.g., Acquatella, 2022; Choné and Ma, 2011; McGuire, 2000). I revisit models of provider moral hazard from the perspective of price bargaining between insurers and providers rather than focusing on the interaction between patients and physicians.

From an insurer's perspective, Kuziemko et al. (2018) find that capitation induces 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.

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. Einav et al. (2022) also show that hospitals do not necessarily adjust their treatment decisions when they can choose which contracts to participate in. I contribute to this line of work by examining the impact of the degree of payment retrospectiveness in addition to the payment level, and by exploring the incentives on treatment intensity when contract choice is determined via bilateral bargains between insurers and providers. 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. While not deriving 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.

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. Similar to the authors, my findings are suggestive of insurers having higher bargaining power in markets where providers have fewer outside options

(Ho and Lee, 2017). Finally, this paper is also related to the comprehensive work around the use of fee-for-service 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 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

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

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:

$$
\begin{aligned}
S_L &= qw_H + (1-q)w_L \\
S_H &= pw_H + (1-p)w_L
\end{aligned}
$$

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

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

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:

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

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:

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

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.

3 Background and data

My setting to study the impact of private contracts 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. Nearly 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 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, although some insurer-provider pairs negotiate

[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.

[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.

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 recommendations are made in an attempt to control the incentives that providers face under each contract. As shown in the stylized model of section 2, 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. Nonetheless, insurers and providers do not need to abide by the government's recommendations when designing their contracts.

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 figure 7.

The claims data reports patient identifier, patient's insurer, provider identifier, service code, ICD-10 diagnosis code, negotiated service price, date, contract (capitation of FFS) under which the insurer paid the provider, 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 to which the service applies.[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 impact of private contracts on healthcare delivery.

I aggregate the claims data to the insurer, provider, 4-digit service code (service category hereafter), and semester level. I find that contracts are negotiated at this level of aggregation for 96.16 percent of observations. For the remaining 3.84 percent 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, urgent, and domiciliary setting, as well as the average age and fraction of males. To describe the complexity of each service, I use the categorization of ICD-10 codes into diseases created by Riascos et al. (2014) to construct the fraction of claims associated to the following diagnoses: 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.[7]

To avoid making inference off of services that very few providers can deliver, I

[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 in https://www.alvaroriascos.com/researchDocuments/healthEconomics/CLD_xCIE10.tab.

drop service categories with less than 100 insurer-provider pairs during the sample period and keep insurer-provider-service category triplets that I observe for more than 6 semesters. All my results are robust to more stringent sample restrictions such as requiring insurer-provider-service categories to be observed during all 14 semesters or requiring that at least 200 insurer-provider pairs have a contract for a given service as seen in appendix figures 8 and 9. Finally, I fill-in missing semesters conditional on each insurer-provider-service category triplet. For example, if I observe the triplet 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.

4 Descriptive evidence

Table 1 presents summary statistics of my final data set. An observation in this table is a combination of insurer, provider, service category, 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 the sample of observations with a capitation contract. The average service for every insurer-provider pair in the data is associated with 371 claims and represents 16 million pesos in healthcare costs. The final data has information on 290 service categories, 4,717 provider, and 7 insurers, that 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. Similarly, 83 percent of claims for each insurer-provider pair tend to be delivered on an ambulatory care setting when the service is capitated, while only 42 percent are delivered in this setting when the contract is FFS. When the service is covered under FFS, 28 percent of claims for every insurer-provider pair tend to be delivered in a hospital care setting, a relatively more complex type of care relative to ambulatory care. The percentage of claims delivered in a hospital setting when the service is capitated equals only 3 percent.

Total healthcare costs under capitated services equal on average 35.4 million pesos, which is almost 3 times 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. The descriptive evidence is compatible with predictions from the stylized model of section 2: (i) capitation (FFS) contracts are associated with low (high) treatment intensity as seen by the type of services, service prices, and health care settings in which these services are delivered and (ii) capitation contracts are not necessarily associated with lower healthcare spending.

In figure 1 I explore 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 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. The reduction in the use of FFS is mostly due to insurer-hospital pairs that negotiate new contracts under capitation. The blue line which conditions on a balanced sample of insurer-hospital-services shows that the fraction that uses FFS goes from 92 percent in 2013-1 to 87 percent in 2019-2.

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

Table 1: Pooled summary statistics

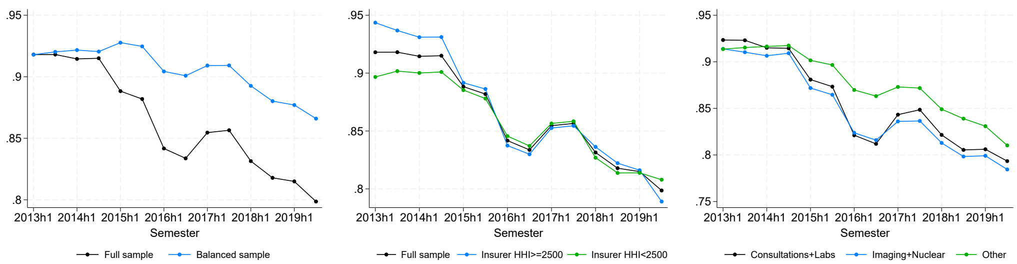
	(1) Full sample	(2) FFS	(3) Capitation
Total claims (100s)	3.71 (46.0)	1.79 (17.9)	15.67 (115)
Total cost (million COP)	15.96 (150)	12.84 (118)	35.44 (274)
Price (million COP)	0.21 (1.11)	0.24 (1.18)	0.08 (0.45)
Fraction claims in hospital care	0.24 (0.39)	0.28 (0.40)	0.03 (0.15)
Fraction claims in urgent 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.

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. The reason why this correlation is null is because 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 hospital's agency problem. Panel C corroborates these recommendations 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.

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.

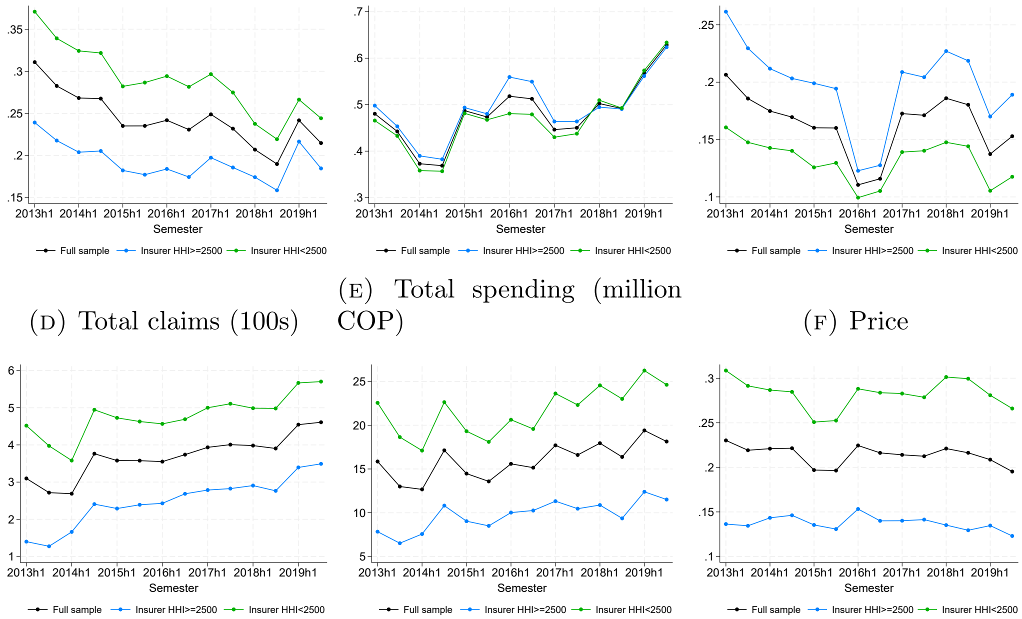
In figure 2 I present time series variation in different outcomes of interest for the full sample in black and for the subsamples of municipalities with relatively concentrated and competitive insurance markets as measured by their insurer HHI based on number of enrollees in 2016. In the full sample the figure shows that the fraction of claims delivered in a hospital setting is declining over time, while the fraction of claims delivered in an ambulatory setting is growing. Despite the shift in the type of care being provided, total claims and total healthcare spending increase consistently during the sample period. For example, total spending among insurer-hospital pairs for the average service goes from 15 million pesos in 2013-1 to nearly 19 million in 2019-2. The increase in spending is driven by higher utilization but prices remain mostly constant during the sample period as seen in panel F.

The decomposition of outcome trends by insurer HHI shows that concentrated markets have substantially lower number claims, healthcare spending, and fraction of claims delivered in a hospital setting. These markets also have a relatively higher fraction of claims delivered in an ambulatory setting. Panel F shows that concentrated

Figure 2: Time series of utilization and spending

(A) Claims in hospital care (B) Claims in ambulatory care (C) Claims in urgent care

(D) Total claims (100s) (E) Total spending (million COP) (F) Price



Note: Figure presents time series of the fraction of claims per insurer-provider, service provided in a hospital setting in panel A, fraction of claims provided in an ambulatory care setting in panel B, fraction of claims provided in an urgent care setting in panel C, total claims in panel D, total healthcare spending in panel E, and average service prices in panel F. 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. Spending and prices are measured in million COP and deflated to 2018 COP.

insurance markets tend to have average negotiated service prices that are nearly 150 thousand pesos cheaper than prices in relatively competitive insurance markets. This is consistent with insurers having relatively higher bargaining power in markets with fewer competitors.

The decline in the fraction of insurer-provider pairs that use FFS contracts to deliver care coupled with the increase in ambulatory claims may initially suggest that FFS contracts are associated with lower care intensity. However, the decline in FFS could be explained by a change in the composition of insurers and providers in the market. Studying the impact of FFS contracts thus requires focusing on changes in outcomes within insurer-provider-service. I delve into this empirical strategy next.

5 Empirical design for causal evidence

To quantify the relative impact of FFS contracts between insurers and providers on healthcare utilization, spending, and treatment intensity, I use a dynamic difference-in-differences (*did*) design. I compare insurer-provider pairs that switch the contract for a particular health service from capitation to FFS (treated) against insurer-provider pairs that always cover the service under capitation (control), before and after the switch. Appendix table 1 presents pooled summary statistics of this analysis sample, which show the same patterns as the full sample. My regression of interest is:

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

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 switch towards FFS happens, T_{jhs} is an indicator for insurer-provider pairs that switch their contract for service s, 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 in contracts. Standard errors from this specification are clustered at the insurer-provider-service level, which defines the level of treatment.

Insurers and providers may select into different contracts based on unobserved characteristics of their patients. For example, if an insurer has an increasingly sick population of enrollees, providers would be more likely to select into FFS contracts where they bear lower financial risk and negotiate higher prices relative to capitation contracts. This type of selection bias threatens identification of the causal effect of interest since it would result in an upwards trend in utilization and spending differences between FFS and capitation prior to the switch in contracts.

Identification of the causal effect of FFS relative to capitation thus requires that treated and control insurer-provider-services are on parallel outcome trends prior to the switch. This identification argument does not require that insurers and providers sort into FFS as-if-randomly, instead it requires that these selection patterns do not differ between treated and control units prior to the switch. I explore this parallel pre-trends argument descriptively in appendix figure 3 for my outcomes of interest.

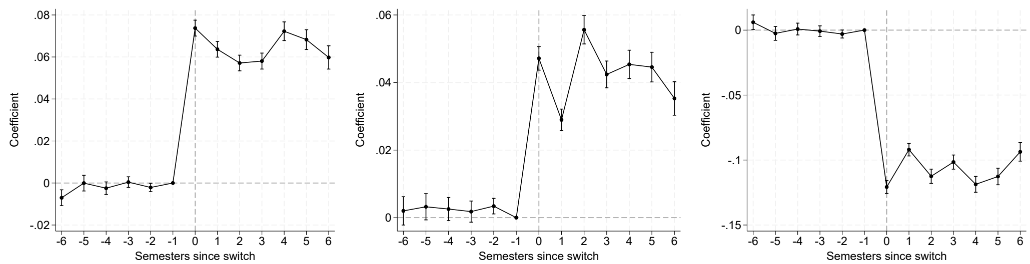
6 The Impact of Contracts on Healthcare

Figure 3 presents results of my dynamic *did* specification on the fraction of claims delivered in a hospital, urgent care, and ambulatory care setting. For the three outcomes, I find evidence of parallel pre-trends suggestive of limited selection of insurer-hospital pairs into FFS contracts based on treatment intensity. In line with the theoretical model, fully retrospective contracts such as FFS induce higher treatment intensities. The fraction of claims provided in a hospital setting and in an urgent care setting increase on average 7 and 4 percentage points after insurer-hospital pairs switch from capitation to FFS, respectively. Instead, the fraction of claims provided in an ambulatory care setting declines 10 percentage points on average after the event relative to insurer-hospital pairs that contract under capitation. Appendix 2 reports all associated coefficients and standard errors.

In figure 4 I explore the causal changes in prices and spending generated by retrospective contracts. Although it is more difficult to rule out that insurer-hospital pairs do not select into FFS based on rising service prices, in panel A I find evidence of a substantial price increase after the event equal to 15 percent on average. Healthcare spending increases in a hospital setting in panel B but decreases in an ambulatory care setting in panel C after switching from capitation to FFS. 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.

Figure 3: Impact of FFS on intensity of care

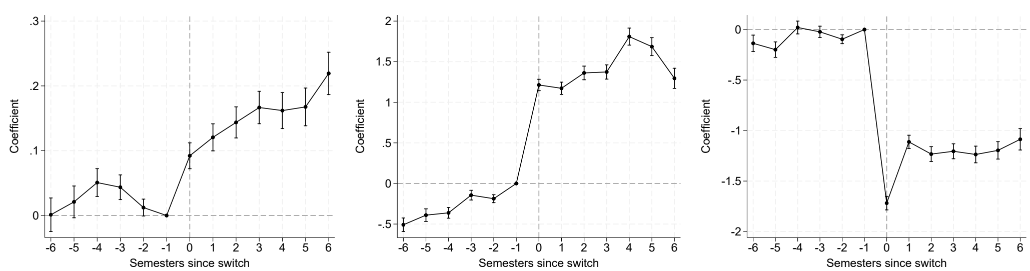
(A) Hospital care (B) Urgent care (C) Ambulatory care



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. 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.

Figure 4: Impact of FFS on spending

(A) Log price (B) Log total hospital cost (C) Log total ambulatory cost

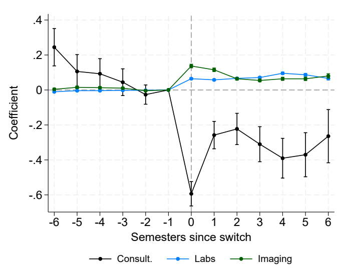


Note: Figure presents coefficients and 95 percent confidence intervals of the dynamic *did* using as outcomes the log of service prices in panel A, the log of total costs in a hospital setting in panel B, and the log of total costs in an ambulatory care setting in panel C. Treated units are insurer-provider 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.

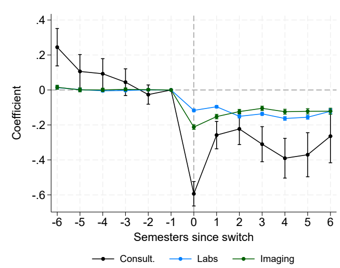
Over-provision incentives under FFS are only salient among the set of services in which the provider has discretion to induce demand, such as laboratory testing and imaging. However, for services related to treatment of complex health conditions such as procedures in lungs, there should not be scope for providers to over-render these services. Figures 5 and 6 test this intuition by estimating the dynamic *did* specification conditional on different sets of services. For services such as laboratory testing and imaging, I find increases in the fraction of claims provided in a hospital setting that are accompanied by substantial increases in hospital-based healthcare costs after switching to FFS. Instead, among doctor consultations which involve mostly primary care visits, results show declines both in the fraction of consultations provided during hospital admissions and the healthcare costs associated with them. For high-complexity services in appendix figure 6 such as procedures in respiratory organs, procedures in blood vessels, and OBGYN services there are no meaningful changes in any of these outcomes after insurer-hospital pairs switch towards FFS, consistent with their less discretionary nature.

FIGURE 5: Impact of FFS by low-complexity services

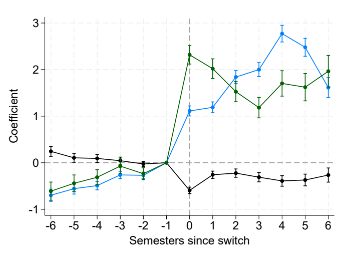
(A) Hospital care



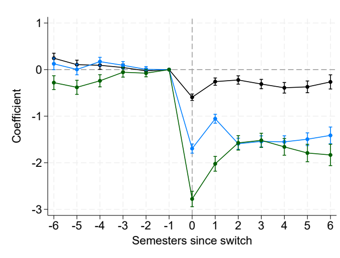
(B) Ambulatory care



(C) Log total hospital cost



(D) Log total ambulatory cost

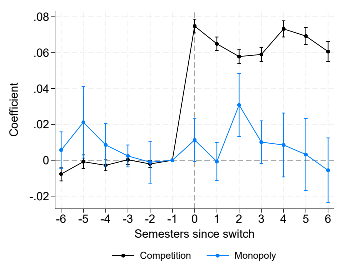


Note: Figure presents coefficients and 95 percent confidence intervals of the dynamic *did* using as outcomes the fraction of claims provided in a hospital setting in panel A, fraction of claims provided in an ambulatory care setting in panel B, log of total healthcare cost in a hospital setting in panel 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.

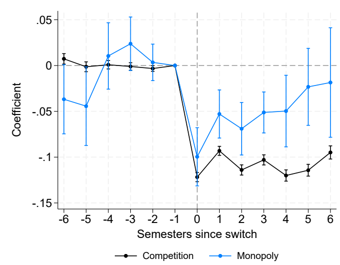
Contracts and Market Structure. Under FFS contracts insurers bear all the financial risk of over-provision of health services, while under capitation contracts the hospital bears all the risk given that costs of treatments that are not covered by the capitation transfer are fully borne by the hospital in my setting. Which contract we observe in equilibrium between an insurer-hospital-service tuple will therefore depend on their relative bargaining power. In this section I investigate the possibility of heterogeneous impacts of FFS contracts by health insurance market structure comparing monopoly insurance markets where the insurer has a higher bargaining power relative to providers, against competitive insurance markets with more than one insurer.

FIGURE 6: Impact of FFS by insurance market structure

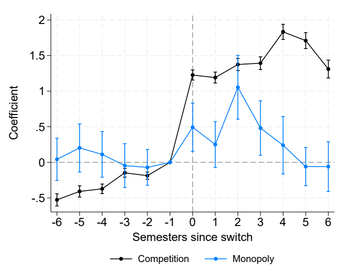
(A) Hospital care



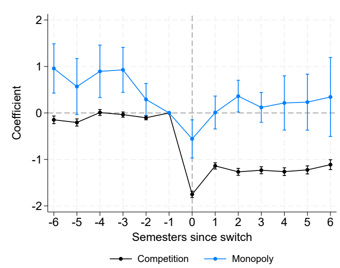
(B) Ambulatory care



(C) Log total hospital cost



(D) Log total ambulatory cost

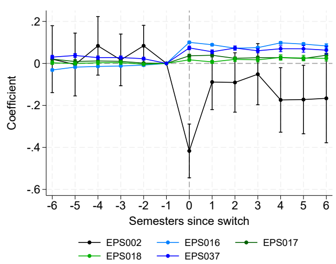


Note: Figure presents coefficients and 95 percent confidence intervals of the dynamic *did* using as outcomes the fraction of claims provided in a hospital setting in panel A, fraction of claims provided in an ambulatory care setting in panel B, log of total healthcare cost in a hospital setting in panel C, and log of total healthcare cost in an ambulatory setting in panel D. Black lines condition on 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.

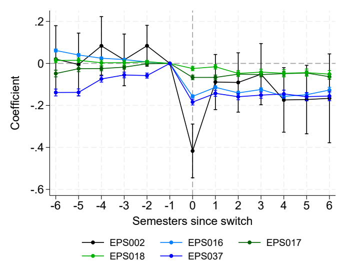
Figure 6 shows that monopoly and competitive insurance markets have heterogeneous effects of FFS across the different outcomes. Consistent with a monopolist insurer having a relatively higher bargaining power, monopoly markets see smaller declines in the fraction of claims provided in an ambulatory care setting, for which prices are relatively low, compared to competitive insurance markets. For a monopolist insurer the fraction of claims provided in a hospital setting does not change when insurer-hospital pairs switch from capitation to FFS, but in competitive markets this fraction increases nearly 7 percentage points. Total healthcare costs in a hospital setting and in an ambulatory care setting are constant in monopoly markets when contracts switch towards FFS but have substantial changes when there is competition between insurers.

Figure 7: The impact of FFS by insurer

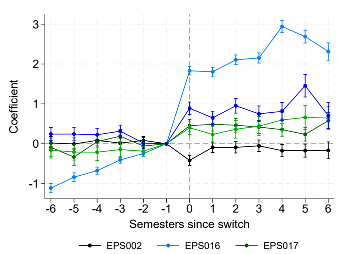
(A) Hospital care



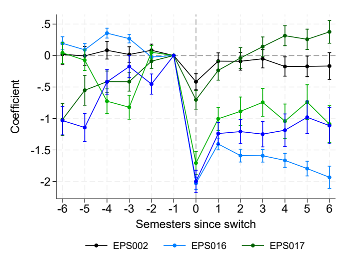
(B) Ambulatory care



(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. In each line treated and control units are conditioned to an insurer. 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.

Insurers' bargaining power may also depend on their unobservable cost structures.

Serna (2024) documents substantial cost heterogeneity across insurers in Colombia that induces some of them to choose broad hospital networks despite risk selection incentives driving networks to be narrow. Competitive insurance markets can therefore mask heterogeneity across insurers. In figure 7 I estimate my dynamic *did* specification conditional on treated units with the 5 largest insurers to investigate these heterogeneous treatment effects. Findings show substantial heterogeneity across insurers both in the magnitude of these effects and their direction. For EPS002, estimates exhibit a decline in the fraction of claims provided in a hospital setting and their associated health care costs in the post-period, but the rest of insurers see increases in these outcomes after they switch their contract from capitation to FFS. Although for the log of total ambulatory costs, I cannot reject the null hypothesis of differential pre-trends, treatment effects across insurers are all negative.

Why is the use of FFS declining? Several studies have concluded that the use of FFS increases health care costs and worsens patient health relative to prospective payments (Schroeder and Frist, 2013; Ware et al., 1986; Newhouse et al., 1985). Descriptive evidence in section 4 showed that the use of FFS in Colombia has been declining over the past decade, with declines being homogeneous across geographies as seen in appendix figure 2. 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 these patterns in the use of FFS? To answer this question I go back to the intuition related to market structure. Figure 6 showed that monopolist insurers are better able to control over-provision incentives under a FFS contract, which explains why downstream outcomes like healthcare spending do not change after contracts switch from capitation to FFS. Here I am interested in whether market structure can explain why some insurer-hospital pairs choose FFS. To do so, I leverage exogenous changes in market structure generated by the termination of the largest health insurer in the county, SaludCoop, and its hospitals in December 2015. The government terminated this insurer because it diverted nearly $300 million to investments outside of the health care system and its board of directors engaged in illegal activities. All of its enrollees were transferred to an incumbent insurer called Cafesalud during the first three months of 2016, after which they were allowed to switch. Appendix figure 4 presents the first-stage effects on enrollment.

I aggregate my data to the insurer-provider-semester calculating the fraction of services that each insurer-provider pair covers under FFS. Because each provider operates in a single municipality, outcomes are also specific to this dimension. Then, I estimate the following dynamic *did* specification:

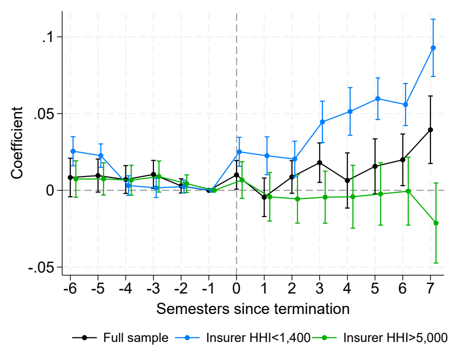
$$f_{jhmt} = \sum_{\substack{k=-6 \\ k\neq -1}}^{7} \beta_k \mathbf{1}\{t - t^* = k\} \times T_m + \alpha_m + \gamma_t + \varepsilon_{jhmt}$$

where 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 the largest health insurer is terminated (2016-1), T_m is an indicator for municipalities where the terminated insurer operated in 2015, α_m is a municipality fixed effect, and γ_t is a semester fixed effect. Standard errors from this specification are clustered at the municipality level.

Results are presented in figure 8. The black line shows results in the full sample, the blue line in the subsample of treated municipalities with insurer HHI below 1,400 in 2016, and the green line in the subsample of treated municipalities with insurer HHI above 5,000 in 2016. Insurer HHIs are calculated based on market shares in the number of enrollees. This is the relevant dimension of heterogeneity rather than provider HHI because the number of providers far exceeds the number of insurers in every municipality. Providers can be either large hospitals or small clinics and physician practices.

In the full sample the fraction of services covered under FFS increases on average 2 percentage points in markets with an exogenous reduction in the number of insurers after the termination. This effect is driven by highly competitive insurance markets with relatively low HHI, where the fraction of services under FFS increases by nearly 5 percentage points after the termination relative to control markets. Instead, in highly concentrated insurance markets where insurers likely have higher bargaining power than providers, I find no changes in the use of FFS after exogenous shifts in market structure.

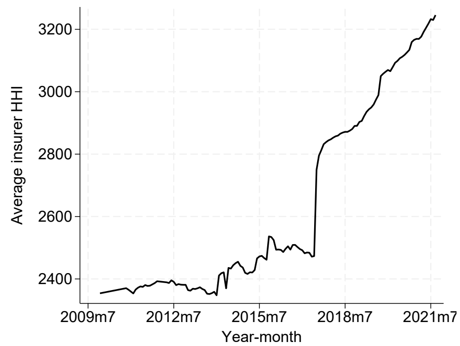
Figure 8: Choice of FFS by Insurer HHI



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 the terminated insurer operated in 2015. Control units are municipalities where the terminated insurer 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.

These findings suggest that the decreasing use of FFS in Colombia is tied to insurance markets becoming increasingly concentrated and to insurers gaining bargaining power relative to providers. Figure 9 which shows the average municipal HHI weighted by the number of enrollees corroborates this increasing trend in insurance concentration in the country. There is a sudden increase in insurer HHI during 2017 because this corresponds to 12 months after SaludCoop's enrollees where reassigned to Cafesalud. While 18 percent of these enrollees switched out of Cafesalud during

Figure 9: 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.

2016, an additional 23 percent switched out in 2017.

7 Conclusions

This paper revisits the characterization of provider incentives under prospective and retrospective contracts using a unique dataset from the Colombian health care system where I observe the type of contract and terms that insurers sign with hospitals for every health service. In a simple model of moral hazard where the insurer makes a TIOLI contract to the hospital who then chooses its treatment intensity, the model predicts that fully retrospective contracts such as FFS induce high treatment intensity, while fully prospective contracts such as capitation induce low treatment intensity. These predictions are maintained if instead of making TIOLI contracts, insurers and providers bargain over prices. I test these predictions by estimating the causal effect of FFS relative to capitation using a dynamic difference-in-differences approach. Findings show that FFS causes substantial increases in hospital care and declines in ambulatory care consistent with the model. Treatment effects are heterogeneous across services depending on whether the service is more or less discretionary.

Conditional on a balanced sample of insurer-provider-services, descriptive evidence shows that the use of FFS is declining over time yet healthcare costs continue to rise. To explain this decline I study the causal effect of market structure on FFS choice. In markets where insurers have a higher bargaining power relative to providers, equilibrium contracts should be ones that place higher financial risk on providers such as capitation. Leveraging exogenous shocks to insurance market structure coming from insurer terminations, I find that highly concentrated markets have no change in the fraction of services covered under FFS, while competitive insurance markets see substantial increases in FFS.

My findings provide two important suggestions: (1) given that retrospective contracts between insurers and providers do not necessarily increase healthcare spending, even though they shift the composition of care that patients receive towards a hospital setting, regulation of these contracts may not be necessary; (2) in a setting without premiums like Colombia, having private insurers is important for gatekeeping healthcare since insurers determine which contracts are signed and therefore the incentives that providers face.

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Appendix 1 Additional descriptives

This appendix presents summary statistics of the sample used in the dynamic *did* approach, time series of outcomes for treated and control groups as a test of parallel pre-trends, and time series of comorbidity incidence and use of FFS by region.

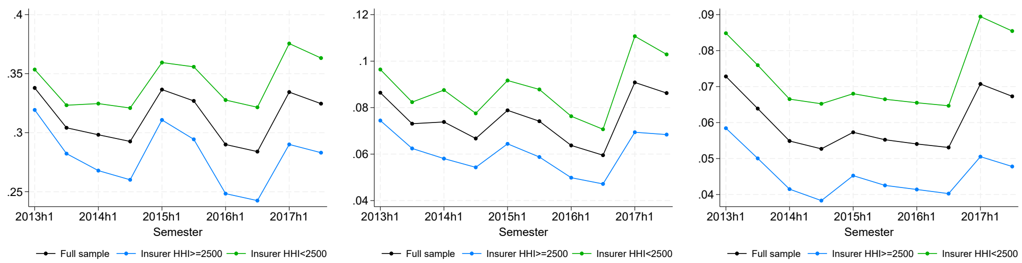
Appendix Table 1: Pooled summary statistics for causal analysis sample

	(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.

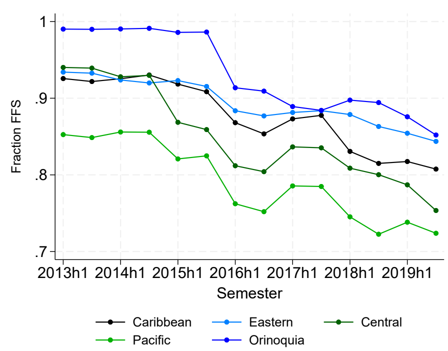
Appendix Figure 1: Time series of comorbidity incidence

(A) Cardiovascular (B) Pulmonary (C) Renal



Note: Figure presents time series of the fraction of claims associated with ICD 10 codes related to cardiovascular diseases in panel A, pulmonary diseases in panel B, and renal diseases in panel C. 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.

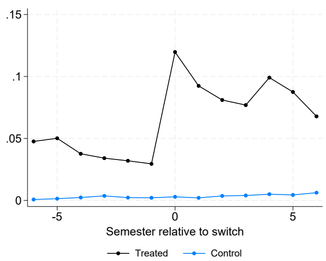
Appendix Figure 2: Use of FFS by region



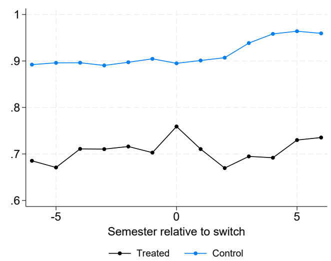
Note: Figure presents time series of the fraction of insurer-provider-services under FFS in each region of the country.

Appendix Figure 3: Descriptive evidence of parallel pre-trends

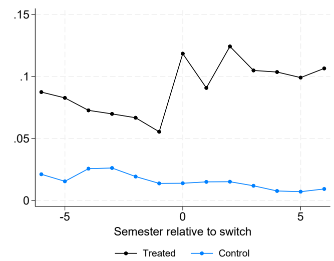
(A) Hospital care



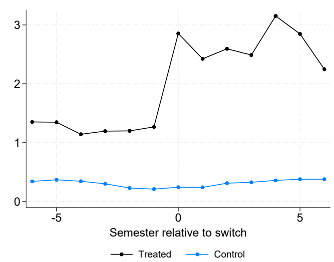
(B) Ambulatory care



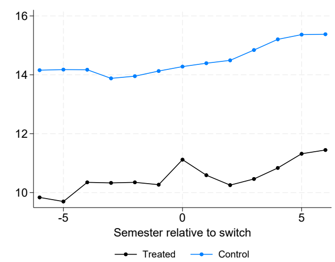
(C) Urgent care



(D) Log total hospital cost

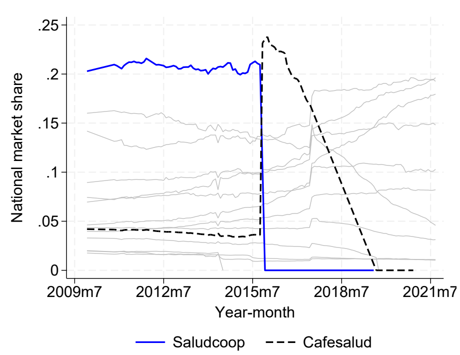


(E) Log total ambulatory cost



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 Figure 4: 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 2 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 main 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-1	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.

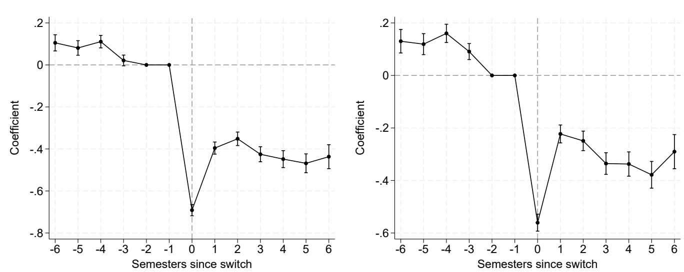
Appendix Table 3: Dynamic *did* coefficients conditional on service

	Hospital care			Ambulatory care		
	Consult	Labs	Imaging	Consult	Labs	Imaging
t-6	0.0084	-0.0106	0.0040	0.0010	0.0135	0.0153
	(0.0036)	(0.0025)	(0.0033)	(0.0059)	(0.0046)	(0.0058)
t-5	0.0140	-0.0040	0.0151	-0.0129	0.0020	0.0007
	(0.0036)	(0.0024)	(0.0037)	(0.0060)	(0.0043)	(0.0057)
t-4	0.0003	-0.0040	0.0130	0.0131	-0.0047	0.0003
	(0.0030)	(0.0017)	(0.0034)	(0.0055)	(0.0035)	(0.0050)
t-3	0.0019	-0.0022	0.0104	0.0092	-0.0032	0.0036
	(0.0024)	(0.0014)	(0.0028)	(0.0049)	(0.0031)	(0.0043)
t-2	-0.0001	-0.0018	-0.0044	-0.0107	0.0011	0.0015
	(0.0020)	(0.0013)	(0.0018)	(0.0039)	(0.0023)	(0.0031)
t-1	0.0566	0.0645	0.1370	-0.0868	-0.1170	-0.2120
	(0.0039)	(0.0028)	(0.0053)	(0.0053)	(0.0041)	(0.0066)
t+1	0.0514	0.0577	0.1150	-0.0666	-0.0959	-0.1520
	(0.0039)	(0.0027)	(0.0052)	(0.0054)	(0.0038)	(0.0065)
t+2	0.0450	0.0662	0.0639	-0.0789	-0.1510	-0.1240
	(0.0040)	(0.0029)	(0.0040)	(0.0063)	(0.0048)	(0.0063)
t+3	0.0498	0.0711	0.0543	-0.0742	-0.1370	-0.1050
	(0.0043)	(0.0030)	(0.0037)	(0.0062)	(0.0047)	(0.0062)
t+4	0.0553	0.0955	0.0639	-0.0769	-0.1630	-0.1240
	(0.0047)	(0.0035)	(0.0045)	(0.0066)	(0.0053)	(0.0071)
t+5	0.0527	0.0868	0.0638	-0.0726	-0.1560	-0.1220
	(0.0047)	(0.0039)	(0.0050)	(0.0070)	(0.0057)	(0.0075)
t+6	0.0411	0.0661	0.0801	-0.0554	-0.1220	-0.1220
	(0.0045)	(0.0046)	(0.0064)	(0.0069)	(0.0066)	(0.0087)
N	56440	113971	64631	56440	113971	64631

Note: Table presents coefficients and standard errors of the dynamic *did* design for the fraction of claims delivered in a hospital setting and in an ambulatory care setting, conditional on the service.

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 Table 4: Dynamic *did* coefficients conditional on service

	Log total hospital costs			Log total ambulatory costs		
	Consult	Labs	Imaging	Consult	Labs	Imaging
t-6	-0.1150	-0.6980	-0.6100	-0.2930	0.1240	-0.2800
	(0.0767)	(0.0669)	(0.0996)	(0.0932)	(0.0644)	(0.0753)
t-5	0.0794	-0.5570	-0.4420	-0.4480	0.0032	-0.3810
	(0.0756)	(0.0590)	(0.0916)	(0.0920)	(0.0587)	(0.0771)
t-4	-0.0836	-0.4910	-0.3120	0.0341	0.1710	-0.2400
	(0.0671)	(0.0462)	(0.0830)	(0.0821)	(0.0469)	(0.0662)
t-3	0.0621	-0.2620	-0.0725	-0.0276	0.0929	-0.0568
	(0.0563)	(0.0402)	(0.0784)	(0.0726)	(0.0403)	(0.0532)
t-2	-0.1010	-0.2700	-0.2350	-0.2050	0.0053	-0.0763
	(0.0454)	(0.0349)	(0.0654)	(0.0556)	(0.0308)	(0.0399)
t-1	0.8870	1.1120	2.3170	-1.3440	-1.6960	-2.7770
	(0.0669)	(0.0549)	(0.1010)	(0.0751)	(0.0500)	(0.0847)
t+1	0.9620	1.1900	2.0190	-0.8200	-1.0550	-2.0230
	(0.0754)	(0.0590)	(0.1080)	(0.0787)	(0.0487)	(0.0807)
t+2	0.9490	1.8400	1.5260	-0.8190	-1.5920	-1.5730
	(0.0824)	(0.0708)	(0.1100)	(0.0902)	(0.0609)	(0.0792)
t+3	0.9790	2.0000	1.1840	-0.8360	-1.5420	-1.5190
	(0.0848)	(0.0761)	(0.1120)	(0.0917)	(0.0608)	(0.0775)
t+4	1.0620	2.7720	1.7030	-0.8020	-1.5510	-1.6590
	(0.0968)	(0.0916)	(0.1390)	(0.0985)	(0.0663)	(0.0914)
t+5	1.1450	2.4790	1.6220	-0.6640	-1.4950	-1.7900
	(0.1010)	(0.0982)	(0.1500)	(0.1060)	(0.0695)	(0.0953)
t+6	0.8260	1.6140	1.9650	-0.5420	-1.4120	-1.8330
	(0.1070)	(0.1090)	(0.1730)	(0.1160)	(0.0916)	(0.1170)
N	56440	113971	64631	56440	113971	64631

Note: Table presents coefficients and standard errors of the dynamic *did* design for the log of total costs in a hospital setting and the log of total costs in an ambulatory care setting conditional on the service.

Appendix Table 5: 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-1	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.

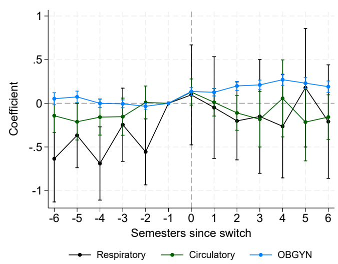
Appendix Table 6: Dynamic *did* coefficients conditional on monopoly markets

	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-1	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

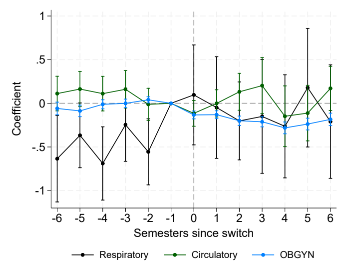
Note: Table presents coefficients and standard errors of the dynamic *did* design for the log of total hospital and ambulatory costs, conditional on monopoly markets and markets with more than one insurer.

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

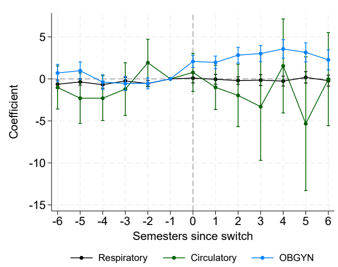
(a) Hospital care



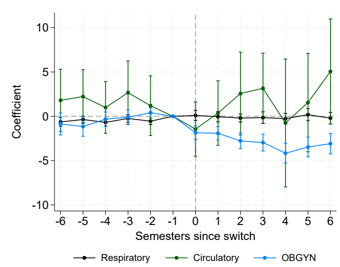
(b) Ambulatory care



(c) Log total hospital cost



(d) Log total ambulatory cost



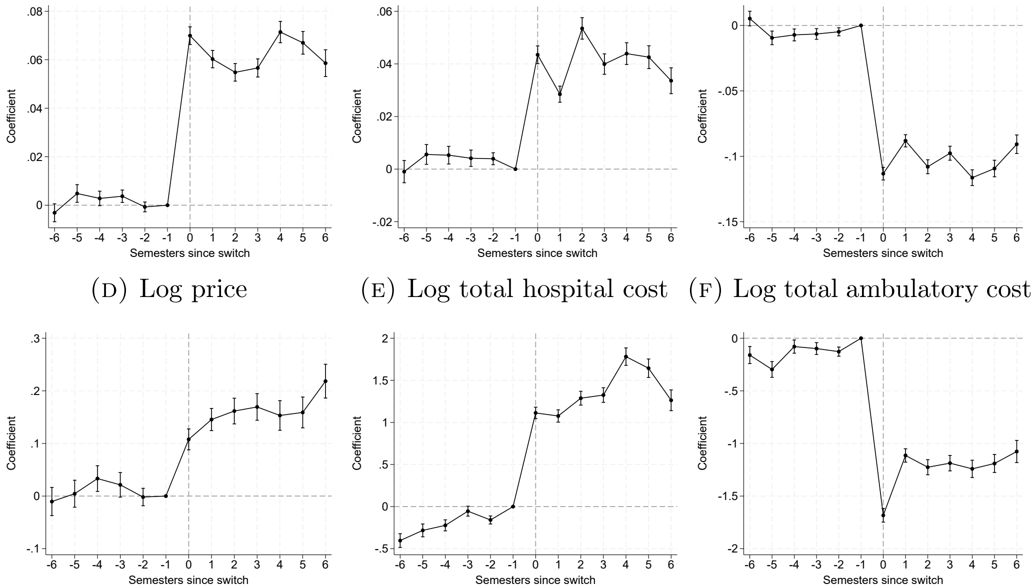
Note: Figure presents coefficients and 95 percent confidence intervals of the dynamic *did* using as outcomes the fraction of claims provided in a hospital setting in panel A, fraction of claims provided in an ambulatory care setting in panel B, log of total healthcare cost in a hospital setting in panel 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 3   Robustness checks

Appendix Figure 7: Robustness on the sample of insurers

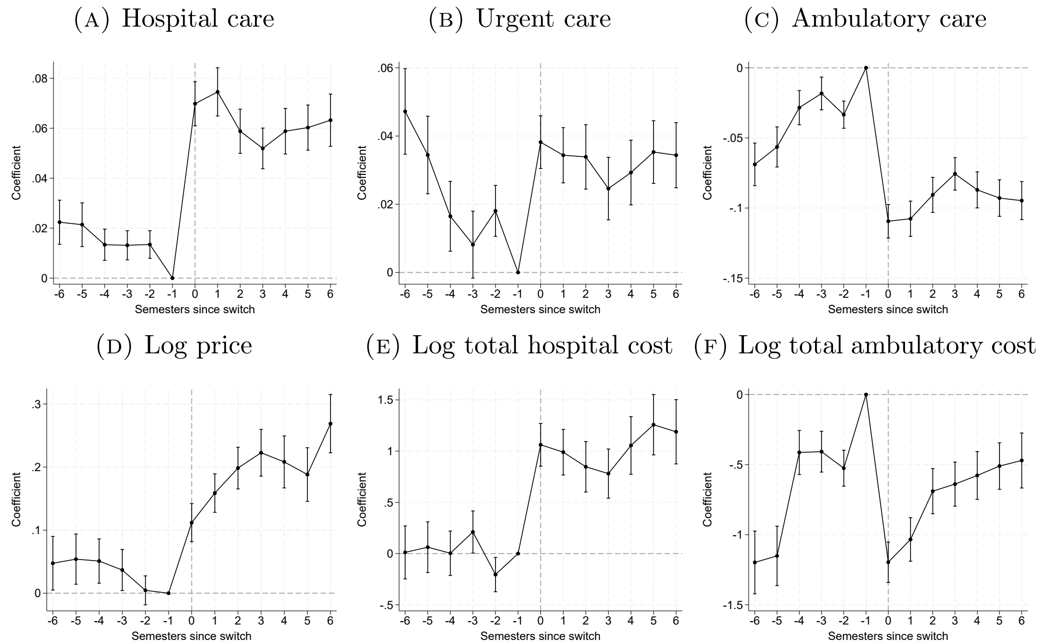
(A) Hospital care (B) Urgent care (C) Ambulatory care

(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 8: Robustness on a balanced panel

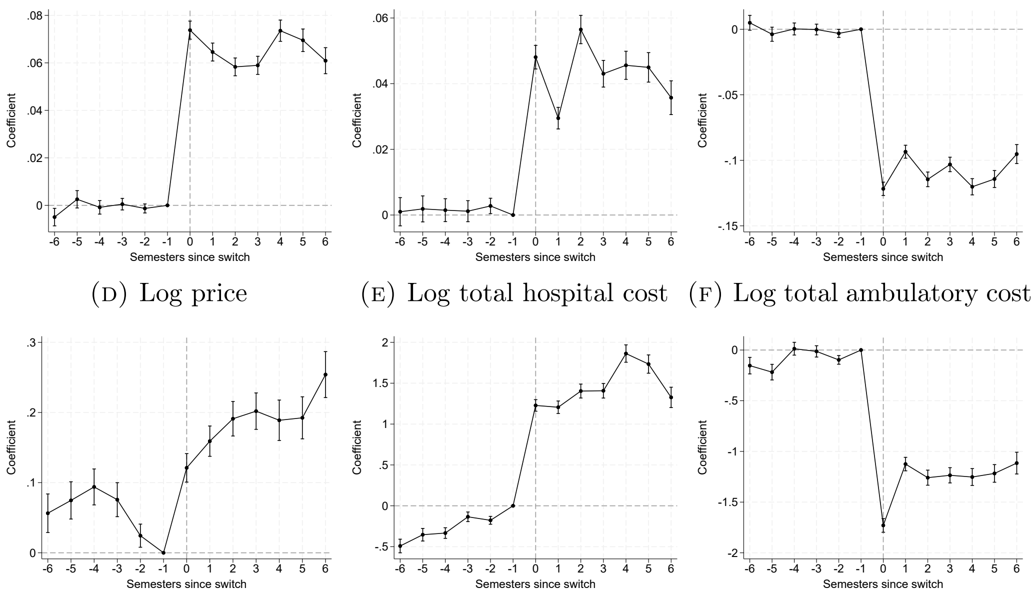


Note: Figure presents coefficients and 95 percent confidence intervals of my main dynamic *did* results using the sample of insurer-provider-services that I observe during all 14 semesters. Treated units are insurer-provider pairs that switch to cover the service from capitation to FFS. Control units 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 9: Robustness on the sample size for each service

(A) Hospital care (B) Urgent care (C) Ambulatory care

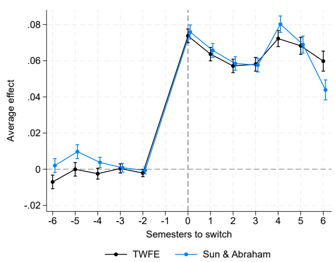
(D) Log price (E) Log total hospital cost (F) Log total ambulatory cost



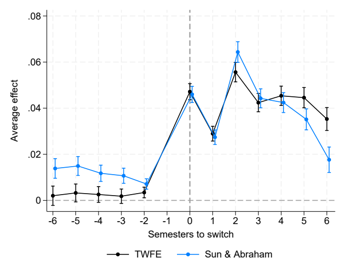
Note: Figure presents coefficients and 95 percent confidence intervals of my main dynamic *did* results dropping services that less than 200 insurer-provider pairs deliver. Treated units are insurer-provider pairs that switch to cover the service from capitation to FFS. Control units are insurer-provider 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 10: Robustness checks with alternative estimators

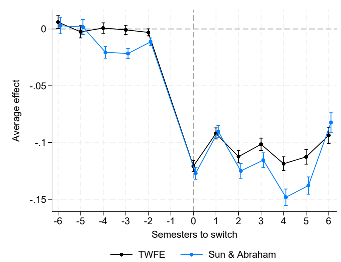
(a) Hospital care



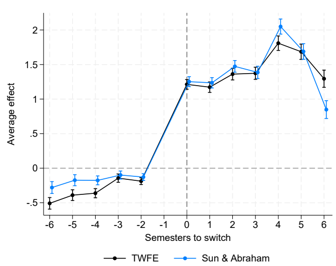
(b) Urgent care



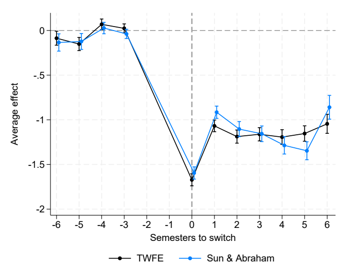
(c) Ambulatory care



(d) Log total hosp cost



(e) Log total amb. 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 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.