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Local Competition and Physicians' Pricing Decisions: New Evidence from France

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Abstract

More than 40% of French specialist practitioners are able to balance bill their patients. We examine the determinants of their choice to switch or not to an optional system of self-limitation of fees in exchange for subsidies, and the role in particular of local competition. We use a logit model with data on 5568 gynecologists, ophthalmologists and pediatricians, in years 2012 and 2016. We find that their decision is guided primarily by their characteristics such as their initial price or type of practice, and the share of patients that they can balance bill. The local competitive environment does not have a significant impact on the pricing decisions of private physicians. Therefore, governments that want to limit balance billing need to apply a mandatory ceiling rather than introducing an optional system.

JEL Classification: H51, I11, I18

Keywords: Balance billing, Health care access, fee regimes, Fee-for-services, Local and Price competition

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1 Introduction

Among the three main modes of payment of general practitioners and specialists physicians (fee-for-services, salary, capitation) plus the combinations of two or three of these payment modes¹, fee-for-services is the only means used in about one-third of developed OECD countries. Six countries (Australia, Austria, Belgium, Denmark, France and New-Zealand) allow some or all of their physicians to set their prices freely with the result that in those countries, pricing of physician services impacts access to healthcare.

France presents an interesting context to explore physicians' pricing decisions. In France, a significant number of physicians, mainly specialists, are able to balance bill their patients based on no other limit than their evaluation of "tact and moderation". Part of the bill that is above the regulated fee is not covered by national health insurance (NHI) but may be reimbursable from an optional private insurance depending on the type of cover chosen. The practice of balance billing has increased rapidly during the last 30 years to reach nearly 2.5 billion Euros in 2016, and making it a major political issue that has led the French government to try to put a stop to the progression of extra fees. In a bid to achieve that, in 2013 the French government introduced a system whereby physicians could choose to sign a contract which obliged them to freeze their fees in exchange for several benefits.

Leaving physicians free to adopt or not this new contract introduces the question of what determines medical fees at the individual level. Since in many countries physicians are not able to set their prices, this issue is attracting less research attention in the economic literature. The objective of this paper is to bring new evidence about the determinants of physicians' pricing decisions, and more precisely the individual choice to agree or not to freeze their fees. We use a comprehensive data set of private practitioners' prices for three specialties (ophthalmology, gynecology and pediatrics). The econometric model explores the characteristics of physicians, and the characteristics of demand and supply. The latter competitive influences on practitioners' individual choices are at the heart of our study since the literature is not conclusive about the impact of competition on physicians' pricing decisions.

Our empirical results highlights a limited impact of demand and supply characteristics on the switching decision whereas the physician's individual characteristics such as initial price or type of practice play a strong role. Another important variable is the share of the local population benefiting from two public schemes (CMU-C and ACS) who cannot be balance billed.

The reminder of the paper is organized as follows. In section 2, we briefly present the French healthcare system while section 3 reviews the related empirical literature. Section 4 details our dataset and the main descriptive statistics which highlight the differences according to the physician's specialty. In section 5, we present the econometric model and discuss our empirical results. Finally, conclusions are presented in section 6.

¹Pay-for-performance plans which are never used as the main mode of payment are not considered here.

2 The French context

The French health care system is an excellent experimental context to study physicians' pricing decisions. Doctors are paid on a fee-for-services basis, with many specialists able to determine their own fees. However, a recent government reform is pushing physicians to reveal their pricing strategies for the coming few years.

2.1 Organization of the French primary care system

French physicians bill their patients on a fee-for-services basis. The level of the regulated fee is the same country wide, and is negotiated at the national level between physician organizations and the national health insurance (NHI) system. However, two categories of doctors are involved: "sector 1" doctors must respect the legal fee; "sector 2" physicians have the possibility to bill above the statutory fee but are obliged to respect a certain level of "tact and moderation" and to not balance bill low-income patients². The choice of sector has to be made at the beginning of the career; also, sector 2 has some training and qualification requirements³.

Patients are free to choose their physician but must designate a particular doctor, usually a general practitioner (GP) to act as gate-keeper. Every citizen is covered by the NHI, and all citizens are free to subscribe to a private health insurance which pays the difference between what is covered by the NHI and what the physician charges (89% of the population has a private health insurance). In the case of insured consumers, sector 1 physician charges are fully reimbursed⁴; however, the NHI does not cover the extra fees imposed by sector 2 doctors. According to their insurance contract, consumers are responsible for paying these extra fees themselves, and being reimbursed entirely or partially from their private insurance.

Although the share of physicians who can balance bill their patients is less than 10% of GPs, it is more than 40% of specialists. On average, in the case of specialists, the extra fee amount was equal to 55% of the statutory fee in 2014 vs. 25% in 1990. Extra fees represented 2.46 billion Euros in 2014.

2.2 The reform of the "Contract to improve access to health care"

The rapid growth of extra fees has made them a political issue in France. Government and the NHI entered negotiations with physician unions to create an intermediate sector - the "Contract to improve access to health care" ("Contrat d'accès aux soins" in French, or CAS⁵) - between sectors 1 and 2. Since 2013, sector 2 physicians⁶ are free to sign up to this contract or not; for those that sign they commit to stabilizing their fees at a level of not more than 100% of the regulated fee. In return, these physicians receive several benefits (in particular a public subvention or grant which in 2013 averaged 6950 Euros) while their patients are able to obtain higher reimbursements from both their public and private health insurance. The CAS is signed annually, is renewable, and after each annual period can be discontinued by the physician who then would return to sector 2.

²A small percentage of sector 1 physicians have a "permanent right to balance bill"; in this study, they are classed as sector 2 doctors.

³The sector 2 system was created in 1980 and was open to all physicians until 1990.

⁴Excepted a 1 euro co-payment that insurance does not cover.

⁵In 2017, the CAS changed its name, to become OPTAM, but the system stays very close to CAS.

⁶A small proportion of sector 1 doctors can also have access to CAS.

Therefore, based on the physician's decision to adopt or not the CAS we can deduce the pricing policy that the physician wants to apply in future years. With the exception of the most expensive physicians, penalized by the "100%-ceiling", for physicians who do not plan to raise their prices in the next years the CAS is the best choice. In contrast, doctors who choose to remain in sector 2 give out a strong indication of their future pricing policy which should be inflationist.

3 Review of the literature

Although this debate has lost some topicality in countries where physicians are no longer free to set their fees, the physician pricing process was an important subject of debate in health economics during the 1970s and 1980s. Economists identified the main determinants of physicians' fees. One of these is related to individual physician specificities. Others are linked to the characteristics of demand, and the influence of private or public insurance on prices. Lastly, and more controversial, the level of competition has an impact on medical fees.

3.1 Physicians' individual characteristics

Weeks et al. (2013) highlight that there are gender based income differences among physicians which always penalize female practitioners in both the USA and in Europe (Austria, France, Norway, United Kingdom). Furthermore, male physicians seem more responsive to financial incentives, and more likely than female physicians to adapt their practices to new rules [Rizzo and Zeckhauser (2006), Weeks et al. (2013), Coudin et al. (2015)]. In the French context, male physicians are more likely than female physicians to choose free billing [Bellamy and Samson (2011)]. However, Gravelle et al.'s (2016) study of Australian GPs, shows that female pediatricians set higher fees.

In the context of the French CAS, given the characteristics of the contract with a maximum average fee equal to twice the standard fee, we can hypothesize that expensive physicians will be less likely to adopt the CAS.

H1: The CAS adoption rate decreases as the physician's fee rises.

3.2 Demand-side determinants

The pricing decisions of physicians depend also on the characteristics of demand, i.e. the local population. If practitioners are free to adapt their fees for each patient, we can assume that the pricing process includes an evaluation of the patient's ability to pay in order to adapt the fee as closely as possible to each individual situation. For instance, in their balance billing model, Glazer and McGuire (1993) assume that physicians know their patients' willingness to pay. However, even in this model, price discrimination is not perfect, since physicians split patients into only two categories: those who pay only the fee, and those who are balance billed. The authors admit that "nothing near such perfect price discrimination is observed in practice" (p.244).

Rather than individual discrimination, we focus on the impact on price of the average income of local population. Empirical studies show that wealthier populations usually are correlated to higher fees [Steinwald and Sloan (1974) , Jones et al. (2004) , Johar (2012)]. For the French context, Bellamy and Samson (2011) provide empirical results and findings from the literature which show that the wealthier the area, the higher the share of physicians who balance bill.

Therefore, we can hypothesize about the impact of demand-side characteristics on the adoption of CAS:

H2: The CAS adoption rate decreases as the population's wealth increases

H3: The CAS adoption rate increases as the share of the population who cannot be balance billed by physicians rises.

3.3 Effect of insurance on the level of fees

Reducing the budget constraints of consumers means that health insurance can lead to increased fees [Feldstein (1970) , Steinwald and Sloan (1974)]. However, Newhouse (1970) finds no evidence of physicians' short-run profit maximization related to insurance cover. In the case of France's health care system, Jelovac (2013) develops a theoretical model showing that health insurance is inflationist, and Dormont and Peron (2016) demonstrate that more comprehensive insurance cover changes consumers' preferences in favor of expensive specialists, leading to a rise in medical fees.

3.4 Level of competition and physicians' prices

Some recent empirical results accord with the standard theory prediction, i.e. that fees decrease if local competition is high [see Johar (2012), Gravelle et al. (2016), Chone (2016) for preliminary results]. However, many other empirical studies find the opposite results of a high density of sellers associated *ceteris paribus*, to higher prices, e.g. in Australia [Richardson et al. (2006)], France [Bellamy and Samson (2011)] and the USA [Fuchs (1978) , Pauly and Satterthwaite (1981)]. Several theoretical frameworks have been proposed to explain this apparent paradox.

1. Target income hypothesis

Some economists suggest that physicians try to achieve a target income [Newhouse (1970), Evans (1974) , Wedig et al. (1989) , Rizzo and Blumenthal (1996)]. In those models, physicians aim at a predefined level of income. When the number of doctors increases, the demand addressed to each physician decreases; thus, to reach their target income, physicians have to set higher fees. The underlying hypothesis is that physicians are able to increase their fees without losing patients: they have monopoly power. Empirically, Rizzo and Blumenthal (1996), based on a survey of young American physicians, show that doctors with a high target income will set higher fees.

However, target income is rejected by several economists [Steinwald and Sloan (1974), Pauly and Satterthwaite (1981), Reinhardt (1985) , Stano (1985) , McGuire and Pauly (1991) , McGuire (2000)]. First, the idea of a target is questioned: why would the physician set a target income? How would it be set? Why do

we observe differences among physicians, and over time? [McGuire and Pauly (1991)]. These authors conclude that: "Health economists can debate the size of income effects, without having to explain the absurd behavior which underlies the literal target income hypothesis" (p.406). Steinwald and Sloan (1974) conducted an empirical study of the determinants of physicians' fees; their results are not consistent with the target income hypothesis, and they suggest a profit-maximizing-type model.

2. Primary care as "reputation good"

As already mentioned, the target income hypothesis most often is associated to monopolistic competition. Several studies adopt a monopolistic competition framework and explain the positive correlation between competition and price but without using target income. Pauly and Satterthwaite (1981) and Pauly (1988) assume that primary medical care is a "reputation" good. This assumption has two implications. First, sellers are differentiated according to location, type, specialty and technical competence. Then, consumers choose their seller based on recommendations from relatives or friends. The authors assume that the above applies to the case of physicians. In this framework, an increase in physician density lowers consumer information about each doctor, complicating consumer research. Therefore, consumers become less price sensitive which means that the doctor demand curve is less elastic. So, higher physician density will lead to higher fees. This research model and its implications, have been criticized by Phelps (1986) and Wong (1996) for lack of plausibility.

3. Physician-induced demand

The most controversial debate is that surrounding the question of physician-induced demand (PID). Rice (1983) defines PID as "demand inducement [occurring] when a physician recommends or provides services that differ from what the patient would choose if he or she had available the same information and knowledge as the physician" (p.803). In more economic terms, it means that physician can shift the consumer demand curve in his/her own interest in order to increase quantity and/or price. The existence, or at least extent of PID is the subject of a long-lasting theoretical and empirical debate among economists, in particular because of its fundamental consequences for public policy recommendations, and its links to political preferences [Reinhardt (1985)].

Authors in favor of PID provide empirical evidences for different periods and countries, and relative to quantities and prices [Evans (1974), Fuchs (1978), Rice (1983), Wedig et al. (1989), Rizzo and Blumenthal (1996), Delattre and Dormont (2003), Coudin et al. (2015)]. Stano (1985) strongly refutes previous pro-PID studies, criticizing the weakness of the theoretical models developed, the methodological errors in the econometric demonstrations, and in particular, the use of aggregated market data. Using data from individual physicians, Stano claims that the higher per capita intensity of care in high medical density areas is due to contact with more physicians and not to inducements offered by every individual physicians. Feldman and Sloan (1988) propose alternative explanations for the correlation between physician concentration and high fees. First, they assume that doctors in large markets are more specialized than those in small markets, and therefore are more expensive. Second, higher density reduces travel and waiting times which encourages consumers to use medical services. *Ceteris paribus*, this tends to increase fees. Lastly, Feldman and Sloan claim that it is not

higher density that causes higher fees but rather the high level of fees in an area attracts more doctors. The paper by Feldman and Sloan was criticized by Wedig et al. (1989) who provided new empirical evidence in favor of PID, and by Rice and Labelle (1989) who reproach Feldman and Sloan for a misleading picture of the literature on PID.

Some other studies have tried to be less controversial by agreeing about the existence of a PID but questioning its extent and its impacts on the health care market [McCarthy (1984) , McGuire and Pauly (1991)]. Labelle et al. (1994) call economists not to focus only on the economic consequences of PID but to extend the analysis to include the health outcomes of PID.

Thus, the literature is not conclusive about the effects of competition on medical fees. Both empirical and theoretical works provide contradictory findings although most studies conducted since the mid-1970s tend to find a positive correlation between local competition and fee levels. In the context of the present paper, we try to evaluate the impact of local competition not on the level of fees but on their expected evolution. Therefore:

H4: the CAS adoption rate decreases as the local competition increases.

4 Data and Descriptive Statistics

4.1 Data presentation

We use a set of French NHI data (Caisse Nationale d'Assurance Maladie des Travailleurs Salariés - CNAMTS) which contains price information for every private physician in three specialties (ophthalmology, gynecology and pediatrics) in 2012 and 2016. The data set was created by UFC-Que Choisir, the leading French consumer organization which collected information provided on the public health insurer's website to help patients choose their physician. For every physician, we have information on their geographical location (at the municipality level)⁷, gender, type of activity (private only, or private and hospital), "sector" in 2012 and 2016 (including CAS), and fee level in 2012.

From our database, we built two sets of data. The first contains the population observed: physicians practicing in 2012 and 2016 and authorized to balance bill ("sector 2"). Thus, we exclude physicians in sector 1, and new physicians who started their private activity after 2012. The second data set is composed of all private physicians which allows us to assess the level of local competition faced by our observed population. The comprehensive data set comprises 5014 gynecologists, 4612 ophthalmologists and 2613 pediatricians. Therefore, by definition, our observed population is smaller: 2533 gynecologists, 2284 ophthalmologists and 753 pediatricians.

To identify the determinants of the choice to adopt or not CAS, we use several types of data. First, we use data relative to the characteristics of the geographical area in which the physician practices. We chose the geographical unit, "living area" ("bassin de vie" in French) as defined by the French national statistics institute

⁷For physicians with multiple offices, we consider the main one.

(INSEE). INSEE defines "life area" as the smallest territory where inhabitants can access the most common services and facilities. These 1666 spatial units cover the whole of France with no gaps or overlaps. We rejected the municipality level because of their number in France (almost 36.000), and because consumers often travel to another location to access health services. We decided also that the departments were too big (there are 96 in France) to represent a realistic consumer living territory. For every spatial unit we have information on the median income per capita, the percentage of the local population for whom physicians are not allowed to balance bill⁸, and the share of the population aged more than 60 years.

We also have information on fees. Since every medical procedure has a different price, we focus here on the most standard medical activity, the consultation in the physician's office. The information website we used to collect data provides details on the physician's most frequent fee. If a physician does not have a fixed fee but changes it according to the consumer, the NHI website provides a fee range; in this case we use the average fee. To assess the level of competition, for every "life area", and for the three specialties studied, we calculate physician density, share of physicians practicing in sector 1 and the average fee for those physicians allowed to charge extra fees.

4.2 Descriptive Statistics

We used an unbalanced data⁹ on 5568 French physicians. Our population is composed mainly of gynecologists (2533, 45.5%) and ophthalmologists (2284, 41%). However, we have information also on 753 pediatricians which represent 13.5% of our physician sample.

Before presenting the descriptive statistics, we conduct a Chi-2 test to determine whether the choice to adopt or not CAS is dependent on the physician's specialty. If so, it would be more relevant to conduct our analysis by specialty rather than considering the whole sample. Table 1 presents the contingencies with expected values and the result of the Chi-2 test. It shows that the variable choice is equal to 0 if the physician decides to remain in "Sector 2", and is equal to 1 if the physician decides to adopt CAS. In relation to specialties, 1 refers to gynecologists, 2 is ophthalmologists and 3 is pediatricians.

Table 1: Chi-2 independence test

Choice	Specialties		
	1	2	3
0	1989 (2068.5)	2068 (1863)	490 (614.9)
1	544 (464.5)	214 (418.4)	263 (138.1)

Pearson Chi-2(2): 277.39 P-Value: 0.000

⁸Those data (share of population who benefit from two public aids, CMU-C and ACS) are available only at the departmental level.

⁹Indeed, informations are missing for some physicians as their initial price level. We precise it later.

Thus, the Chi-2 test highlights that the choice to adopt or not CAS is specialty dependent. Indeed, if we compare empirical and theoretical (in parenthesis) values, gynecologists and pediatricians over-adopt CAS, while the reverse is true for ophthalmologists. More specifically, the number of ophthalmologists that adopted CAS is half of the theoretical expectation while in the case of pediatricians the number is twice the theoretical expectation. Based on these results, we decided to conduct our analysis by specialties.

Descriptive Statistics by specialty

1. Local environment

We have information on four different variables characterizing the local economic environment in which the physician operates: population density, share of over 60s, standard of living measured by median income per capita, and share of population benefiting from two public aid schemes -CMU-C and ACS.

In terms of population density, pediatricians seem to operate in more densely populated areas compared to the two other two specialist physicians. Although our pediatrician sample is relatively small compared to the other two samples¹⁰, we think that the 40% estimated gap between the average density levels for pediatricians and ophthalmologists is significant. The gap is smaller in the case of gynecologists (20%). For the other three variables, it seems that the local environment in which the different physicians operate is similar; the share of over 60s ranges between 21.82% for pediatricians and 23.22% for ophthalmologists; and standard of living, ranges between 21137 for ophthalmologists and 21820 for pediatricians. Finally, the share of the population benefiting from two public benefits, CMU-C and ACS, is between 9.016% for ophthalmologists and 9.116% for pediatricians. Also, the estimated standard deviation for each specialty is relatively similar for these three variables.

Table 2: Local environment

Variable	Specialties	Obs	Mean	Std. Dev.	Min	Max
Density pop	gynecologists	2533	1350.131	1087.183	23.839	2746.46
	ophthalmologists	2282	1162.15	1081.911	7.584	2746.46
	pediatricians	753	1623.145	1091.429	28.526	2746.46
pop over 60 (%)	gynecologists	2533	22.35	4.162	8.456	49.478
	ophthalmologists	2282	23.227	4.705	8.456	49.478
	pediatricians	753	21.819	4.181	8.456	41.509
Standard of living	gynecologists	2533	21444.02	1868.467	16562.62	37229.05
	ophthalmologists	2282	21137.37	1897.684	14747.5	28378.75
	pediatricians	753	21819.6	1830.577	16420.45	37229.05
CMU (%)	gynecologists	2533	9.059	2.285	3.685	15.052
	ophthalmologists	2282	9.016	2.323	3.685	15.052
	pediatricians	753	9.116	2.128	3.685	15.052

¹⁰This is due simply to the fact that the absolute number of pediatricians is significantly lower than the numbers of the two other specialties. In other words, for the three specialties, we have the same representation of French physicians.

2. Local competition and price environment

We have information on five different variables characterizing the local competition and price environment in which physicians operate: number of physicians, density of physicians, share of physicians operating in Sector 1, average price of physicians operating in Sector 2, and the initial price of physicians.

Concerning the number of physicians, we note that the average number of pediatricians and ophthalmologists by location is much lower than the number of gynecologists (35% and 45% respectively). The density of physicians by specialty also differs widely. Indeed, the average density of pediatricians is almost half that for gynecologists. Nevertheless and surprisingly, the share of gynecologists in the Sector 1 system is nearly half the share of pediatricians suggesting that the density difference should not necessarily imply a negative impact on average price.

This intuition seems to be confirmed by the data. Indeed when looking at the average price of Sector 2 physicians and the individual prices in the sample, gynecologists set the highest average price (around 55 euros) while pediatricians fix the lowest average price (45 euros). Ophthalmologists are between the two at 50 euros on average.

Table 3: Local competition and price environment

Variable	Specialties	Obs	Mean	Std. Dev.	Min	Max
Nb physicians	gynecologists	2533	490.099	564.356	1	1252
	ophthalmologists	2282	336.692	443.304	1	1017
	pédiatrics	753	362.899	336.477	1	722
Density physicians	gynecologists	2533	12.085	3.465	1.637	50.285
	ophthalmologists	2282	10.271	2.968	1.005	33.523
	pédiatrics	753	6.894	1.989	1.300	21.925
Physicians S1 (%)	gynecologists	2533	25.526	14.445	0	85.714
	ophthalmologists	2282	29.75	15.408	0	83.333
	pédiatrics	753	43.68	15.42	0	90
Average price S2	gynecologists	2531	55.421	10.049	23	80
	ophthalmologists	2276	49.754	9.222	23	70
	pédiatrics	753	45.149	7.303	26	52.5
Individual Price	gynecologists	2464	55.374	17.075	23	180
	ophthalmologists	2174	49.644	16.927	23	200
	pédiatrics	745	45.121	15.010	23	150

3. Characteristics of physicians

Concerning their gender, there are clear differences across specialties. While 52.06% of pediatricians are women, the share for ophthalmologists is only 33.96%. Among gynecologists, women represent 46.31% of the sample.

Concerning status, more ophthalmologists compared the other specialties have private practices while ophthalmologists and pediatricians tend to operate both types of practice. Nevertheless, it seems that most physicians whatever their specialty choose private practice status only.

Table 4: Gender of physicians

Specialties	Obs	Men	Women	% Women
gynecologists	2563	1360	1173	46.31%
ophthalmologists	2282	1507	775	33.96%
pediatricians	753	361	392	52.06%

Table 5: Status of physicians

Specialties	Obs	Private practice only	Private and Hospital practice	Private and employed practice	N/A
gynecologists	2563	57.8%	28.74%	11.76%	1.7%
ophthalmologists	2282	65.07%	23.27%	10.17%	1.49%
pediatricians	753	53.39%	29.48%	15.67%	1.46%

5 Empirical Specification and Estimation results

5.1 The empirical specification

Since the decision to adopt or not the CAS is a binary choice, we have two main empirical models: a probit or a logit. The main difference between these two models is the probability distribution used to describe the behavior of the error term. We assume a normal distribution in the probit model, and a logistic distribution in the logit model. Since the results of the two models are relatively similar we decided to focus on the logit model.

Our interest variable y_i can be write in the following way:

$$y_i = \begin{cases} 1 & \text{if the physician } i \text{ have decided to swith to CAS} \\ 0 & \text{if the physician } i \text{ have decided to stay in Sector 2} \end{cases}$$

Thus, we can consider this observed choice y_i as the realization of a random variable Y_i which can take the values 0 and 1 with π_i and $1 - \pi_i$, respectively. Thus, Y_i follows a Bernoulli distribution of parameter π_i which we write $Y_i \sim B(\pi_i)$. The probability distribution of Y_i is given by:

$$Pr(Y_i = y_i) = \pi_i^{y_i} (1 - \pi_i)^{1-y_i}$$

The expected value of Y_i is simply $E(Y_i) = Pr(Y_i = 1) = \pi_i$. We assume that the choice of physician is linked to some exogenous variables (presented in the previous section):

$$y_i = X_i' B + u_i$$

where X_i is a vector of exogenous variables and u_i is the error term. In the logit model, we assume that u_i follows an i.i.d logistic distribution and the condition probability takes the logistic form:

$$\pi_i = Pr(Y_i = 1 | X_i) = \frac{\exp(X_i' B)}{1 + \exp(X_i' B)}$$

Using the log of the odds (which is the ratio of the probability to its complement) we define the logit function as:

$$\text{logit}(\pi_i) = \log\left(\frac{\pi_i}{1 - \pi_i}\right) = X_i' B$$

To avoid potential multicollinearity problems, we analyze the Pearson correlation coefficient between quantitative variables. Tables 7 and 8 in appendix A shows that the population density is strongly correlated with the number of physicians ($\hat{\rho} > 0.95$ for each specialty) and with the average price of sector 2 doctors ($\hat{\rho} > 0.85$ for each specialty). As the other variables are not strongly correlated, we decided to not include the population density as an exogenous variable in our model. Finally, our empirical specification introduce all variables presented in the previous section as X_i (except the population density). In what follows we present the econometric results obtained by applying the maximum likelihood estimator. Using logit model, we report the odds ratio for each exogenous variables.

5.2 Estimation results

The table 6 below present our core econometric results by specialty. The reported standard errors are robust to heteroskedasticity and robsutness checks are presented in appendix B.

Table 6: Logit estimations

Variable	gynecologists			ophthalmologists			pediatricians		
	Odds Ratio	Std. Err.	P>z	Odds Ratio	Std. Err.	P>z	Odds Ratio	Std. Err.	P>z
pop over 60	1.067	0.015	0.000	1.017	0.016	0.283	1.031	0.025	0.202
Standard of living	1.000	0.000	0.751	1.000	0.000	0.092	1.000	0.000	0.001
CMU-C/ACS	1.050	0.023	0.025	1.077	0.028	0.004	1.114	0.047	0.011
Sex	0.718	0.079	0.003	1.214	0.200	0.239	0.872	0.155	0.441
Status	0.878	0.072	0.116	1.283	0.155	0.039	0.805	0.103	0.088
Initial price	0.934	0.006	0.000	0.965	0.012	0.005	0.908	0.014	0.000
Nb physicians	1.000	0.000	0.049	1.008	0.023	0.720	1.042	0.044	0.322
Density physicians	0.984	0.014	0.257	1.000	0.000	0.894	1.000	0.001	0.558
physicians S1	0.539	0.213	0.117	0.982	0.390	0.964	1.668	0.922	0.355
Average price S2	1.017	0.013	0.198	0.984	0.020	0.409	0.953	0.028	0.106

Common variables influencing the odds to switch to CAS

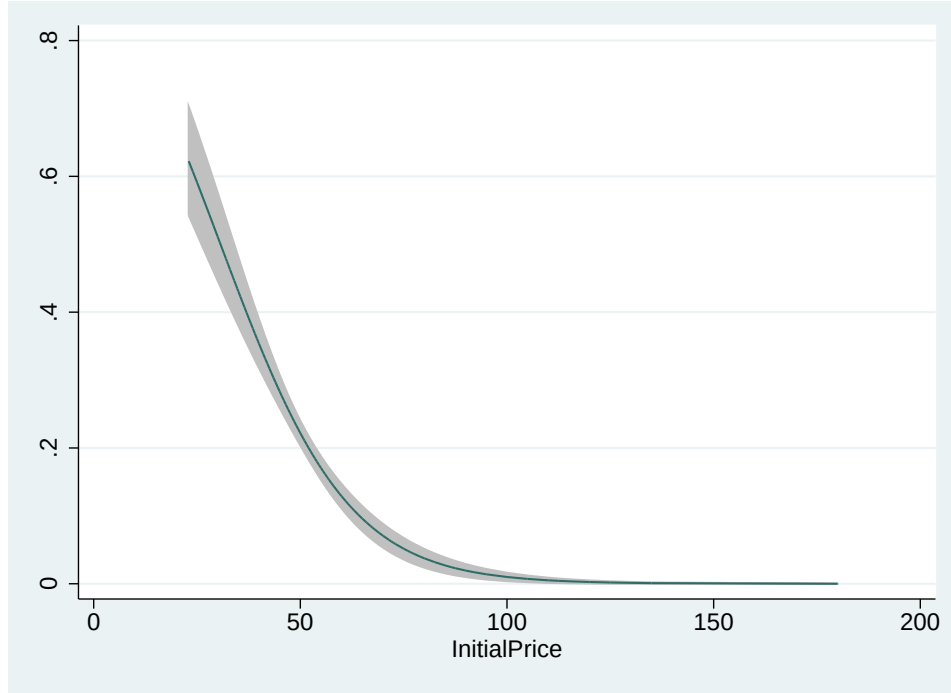
By looking at Table 6, we see that there are only two variables that have a major influence on the odds of choosing CAS whatever the physician's specialty: the initial price, and the share of the local population that benefits from CMU-C and ACS. Note that pediatricians seem to be more sensitive than the other two specialties.

The odds associated to these two variables are in line with our expectations. Indeed, as anticipated, the higher the initial price set by the physician the lower the odds that the physician will switches to CAS. Also

as anticipated, the higher the share of the local population benefiting from CMU-C and ACS in the area where the physician operates, the higher the odds that the physician will switch to CAS.

A natural question that arises is the shape of the relationship between these two variables, and the odds of choosing CAS. To address these issues, we calculate the conditional marginal effects for these two variables. The graph in Figure 1 depicts the conditional marginal effects of the initial price for gynecologists (Similar figures are obtained for the two other specialties).

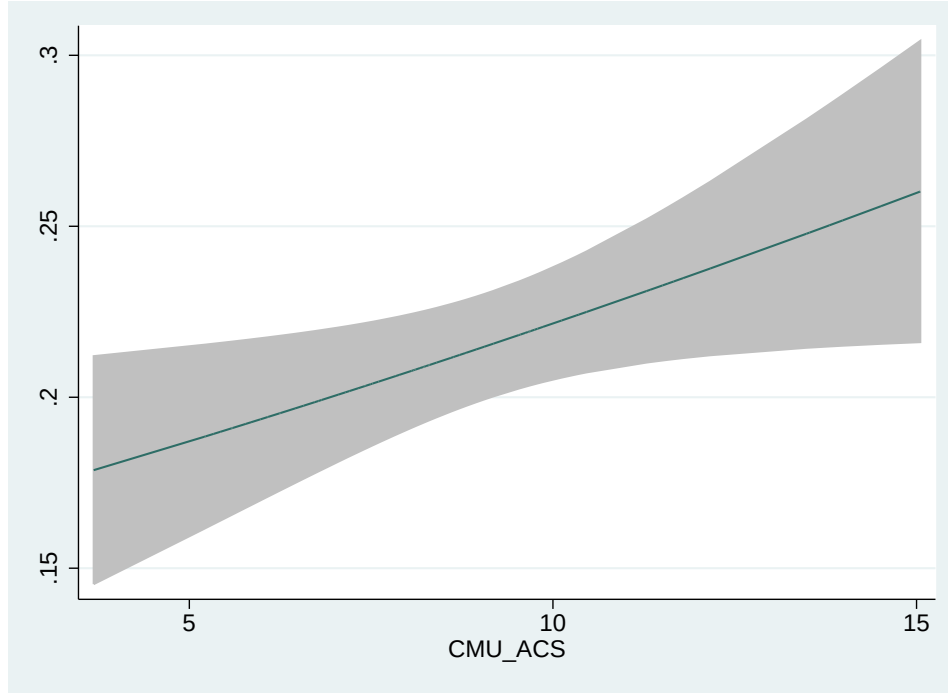
Figure 1: Marginal effects of the initial price



Thus, the shape of the marginal effects is clearly convex with the initial price of physicians. Indeed, the probability that gynecologists in Sector 2 choose to switch into CAS is more than 50% for those whose price is set at under 40 euros, around 20% for with a price set at 50 euros, and nearly 0% for those with a price above 100 euros. Given the design of the CAS, with a maximum average fee at 56 euros, this result is not surprising. While the less expensive physicians have only to freeze their fees, physicians whose average fee is above the ceiling will have to reduce their fees if they want to switch to CAS. In summary, the CAS system provides strong incentive for gynecologists in Sector 2 whose initial price is relatively close to the Sector 1 price (28 euros).

The graph in Figure 2 shows the conditional marginal effects of the share of local population benefiting from two public benefits, CMU-C and ACS, for gynecologists (Similar figures are obtained for the two other specialties).

Figure 2: Marginal effects of the share of local population benefiting of CMU-C / ACS



Thus, the shape of the marginal effects seems to be linear with the share of the local population benefiting from CMU-C and ACS although the confidence interval clearly are higher for the extreme values. The probability range that gynecologists in Sector 2 will decide to switch to CAS is between 15% and 20% for those operating in an area where the share of CMU-C and ACS is lower than 5% whereas this range increases by between 22% and 30% for those operating in an area where the share of CMU-C and ACS is 15%. This result is in line with our hypothesis. Physicians are not allowed to balance bill recipients of CMU-C or ACS. Therefore, we can assume that the incentive to switch is higher for physicians that are not allowed to balance bill a high proportion of their patients. In contrast, it is more costly to freeze the extra fee for those physicians with the possibility to balance bill almost all of their patients.

Competitive environment does not seem to influence significantly the odds to switch to CAS

Table 6 highlights that number of physicians, physician density, share of physicians in Sector 1 and physician average price in Sector 2 do not seem significantly to influence the odds that a physician will switch from Sector 2 to CAS. This holds for pediatricians and ophthalmologists but for gynecologists the choice seems to be influenced slightly by the number of gynecologists in the local environment. Nevertheless, this is a surprising finding because it shows that the choice to be in CAS is not influenced (at the individual level) by the local competitive environment.

The differences existing between specialties

Table 6 highlights important differences among specialties. Indeed, although the share of the population aged over 60 significantly increases the odds of switching to CAS for gynecologists, this does not hold for the

other two specialties. The physician's gender also seems to be important for explaining the observed choice of gynecologists whereas this variable has no impact on the two other specialties. Specifically, it seems that the odds of male gynecologists switching to CAS are 1.4 times ($1/0.718$) higher than the odds for female gynecologists.

The result for the influence of the local standard of living is unexpected. It is only among pediatricians that this choice seems to be significantly influenced by the standard of living in the area in which they operate. Also, it is surprising that the higher the standard of living the higher the odds that pediatricians will switch to CAS. The lack of influence of the local standard of living for two out of the three specialties suggests that physicians take no account of the economic situation in their pricing decision. We can assume that this is a consequence of the segmentation of supply between physicians allowed to balance bill (Sector 2) and the others (Sector 1). As a consequence, patients choosing a Sector 2 physician have a higher willingness to pay. Moreover, we cannot ignore the role of private insurance which can compensate for balance billing (depending on the level of coverage chosen).

The last element concerns physician status. Although status does not influence the choice of gynecologists, this is not the case for ophthalmologists and pediatricians. It seems that for ophthalmologists with only private practices the odds of switching to CAS are lower. For pediatricians the opposite is true although the influence of status is less significant. We can assume that this difference among specialties is a consequence of the specificities of their medical practice. Ophthalmologists with mixed private and hospital practices, are often specialized in eye surgery. Therefore, most of their income comes from this activity, and CAS becomes more attractive for the private part of their activity. In contrast, the hospital practice of pediatricians is most of time outpatient consultations which are less lucrative than surgery. Therefore, pediatricians have a higher incentive to maximize their private practice fees.

6 Conclusion

In this paper, we examined the determinants of the decision of French private physicians to switch or not to the contract to improve access to health care (CAS), proposed by the NHI. In other words, what drives a physician to freeze his or her fees in exchange for NHI benefits?

We found that the characteristics of demand (local standard of living, age) have a small impact on the decision. We also tested the impact of the level of local competition on the switching decision and found that it was limited, whatever the variable tested (number or density of local competitors, their price levels, or the share of competitors allowed to balance bill patients). On the other hand, the physician's individual characteristics such as initial price or type of practice play a strong role in the decision. The share of the local population benefiting from two public schemes (CMU-C and ACS) who cannot be balance billed is another explanation. We regret lack of information on physicians' ages since this might be another explanatory factor: practitioners nearing retirement age, satisfied by a certain level of activity might be less interested in switching.

It seems that French private practitioners take account only of their individual situations and their direct financial interest from switching in terms of the difference between a fee freeze and receipt of a public subsidy if they switch. It seems also that physicians do not take much account of their local environment. Therefore, we can assume that they do not consider CAS as providing competitive advantage to differentiate with local competitors. Switching is not a response to the local economic landscape, given that choosing CAS allows the physician's patients to benefit from higher reimbursements from both public and private insurance.

Our results, and particularly the absence of an impact of the local environment on the pricing decision, indicate that the choice of an optional system to reduce balance billing is not an effective policy. Since physicians appear to make their pricing decision based only on their direct financial interest and taking no account of the strength of the local competition, the optional system is chosen only by physicians who are financially advantaged by its design. Consequently, given that government cannot rely on competition to lower fees, to be effective a policy to reduce balance billing should be based on a mandatory system of limitation of extra-fees.

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Appendix

Appendix A

Table 7: Correlation between variables (1)

	InitialPrice	Popdensity	popover60	Sd_of_living	CMU_ACS	Nbgyncos	Densitgyncos	gyncosS1
InitialPrice	1.0000							
Popdensity	0.4636	1.0000						
popover60	-0.3144	-0.7015	1.0000					
Sd_of_living	0.3711	0.6978	-0.5848	1.0000				
CMU_ACS	-0.1070	-0.1470	0.0788	-0.5283	1.0000			
Nbgyncos	0.4746	0.9627	-0.6230	0.7295	-0.2298	1.0000		
Densitgyncos	0.0385	0.0335	-0.0694	0.1634	-0.1114	0.0040	1.0000	
gyncosS1	-0.2902	-0.4770	0.3435	-0.4293	0.1413	-0.4508	-0.1674	1.0000
Avg Price G S2	0.4830	0.8558	-0.5454	0.6905	-0.1724	0.8781	-0.0003	-0.5939
Nbophtal	0.4742	0.9624	-0.6199	0.7279	-0.2288	0.9998	-0.0000	-0.4484
Densitophthal	-0.0818	-0.1649	0.2682	-0.0857	-0.0692	-0.1722	0.4850	0.0672
ophthalS1	-0.1811	-0.2811	0.1444	-0.3119	0.2028	-0.2973	-0.0373	0.3152
Avg Price O S2	0.4949	0.8975	-0.6400	0.7334	-0.2320	0.9232	0.0387	-0.5411
Nbpedia	0.4742	0.9628	-0.6242	0.7283	-0.2266	0.9998	0.0015	-0.4479
Densitpedia	0.1061	0.2220	-0.2323	0.2366	0.0148	0.1595	0.5940	-0.1939
pediaS1	-0.2815	-0.5112	0.2933	-0.4583	0.1304	-0.5138	-0.1733	0.5069
Avg Price P S2	0.4354	0.8922	-0.6127	0.7113	-0.2357	0.9044	-0.1332	-0.5293

Table 8: Correlation between variables (2)

	Avg Price G S2	Nbophtal	Densitophthal	ophthalS1	Avg Price O S2	Nbpedia	Densitpedia	pediaS1	Avg Price P S2
Avg Price G S2	1.0000								
Nbophtal	0.8777	1.0000							
Densitophthal	-0.1596	-0.1677	1.0000						
ophthalS1	-0.4045	-0.2964	0.0522	1.0000					
Avg Price O S2	0.8826	0.9217	-0.2279	-0.3623	1.0000				
Nbpedia	0.8771	0.9997	-0.1724	-0.2939	0.9230	1.0000			
Densitpedia	0.1694	0.1572	0.3346	-0.0092	0.1862	0.1655	1.0000		
pediaS1	-0.5972	-0.5134	0.0342	0.2714	-0.5445	-0.5091	-0.1247	1.0000	
Avg Price P S2	0.8790	0.9037	-0.2848	-0.4015	0.8881	0.9038	0.0645	-0.4924	1.0000

Appendix B

Table 9: Robustness Checks

Variable	gynecologists			ophthalmologists			pediatricians		
	Odds Ratio	Std. Err.	P>z	Odds Ratio	Std. Err.	P>z	Odds Ratio	Std. Err.	P>z
pop over 60	1.068064	.0146393	0.000	1.018228	.0160434	0.252	1.02147	.0235332	0.356
Standard of living	1.000011	.0000207	0.606	.9999103	.0000297	0.003	1.000134	.0000355	0.000
CMU-C / ACS	1.053457	.0205014	0.007	1.068529	.0270345	0.009	1.113429	.0420703	0.004
Sex	.7284801	.0797629	0.004	1.211487	.1988943	0.243	.861065	.1518959	0.396
Status	.894803	.0734326	0.176	1.269618	.1517648	0.046	.8033174	.1015014	0.083
InitialPrice	.9398785	.0051144	0.000	.962087	.0103049	0.000	.999435	.0003888	0.146
Nbgyncos	.9998616	.0001651	0.402	.9997306	.000325	0.407	.9002333	.01299	0.000

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