Assessing excess profits from different entry regulations

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Abstract

Entry regulations affecting professional services such as pharmacies are common practice in many European countries. Most entry restrictions are coupled with price or retail margins regulations. From time to time, discussion on whether such regulated professionals obtain fair profits or excess profits are common. We propose a way to assess the impact of entry regulations on profits using the information provided by differences in entry restrictions. We use the case of different regional policies governing the opening of new pharmacies in Spain to show that policy experiments are useful to assess the impact of entry regulations.

Keywords: entry, regulation, professional services.

JEL Codes: L51; H51; L84; I18.

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1. Introduction

Stringent entry regulations for pharmacies that take the form of a cap on the number of pharmacies allowed to enter a given geographic area are common practice in many European countries. Mossialos and Mrazek (2003) report that entry is restricted in the UK, France and Norway, althougth it is not in the Netherlands. Neither it is regulated in the US or Canada. Most entry restrictions are coupled with price or retail margin regulations: regarding reimbursement of costs and payment of remunerations or fees.

There is an on-going discussion in Europe on whether such stringent regulations are for the sake of the public interest or for the benefit of the private incumbents. The European Commission has opened infringement procedures against Spain and other countries that have such stringent entry regulations. And, there is a growing empirical literature discussing the effects of such regulations. Schaumans and Verboven (2006) have recently found unambiguous support that the geographic restrictions are not in favour of the public interest, and that professional regulation beyond pure licensing should be considered with extreme caution.

Eckard Jr. (1985) showed that restricting entry into new car retailing creates artificial scarcity rents for existing dealers, which are collected through higher car prices. Valletti et al. (2002) concluded that different regulatory tools, such as uniform pricing and coverage constraints in the telecommunications market are not competitively neutral and may have far-reaching strategic effects, and in turn, have different effects in terms of achieving universal service objectives.

On the other hand, Klapper et al. (2006) found that costly regulations hamper the creation of new firms, especially in industries that should naturally have high entry. These regulations also force new entrants to be larger and cause incumbent firms in naturally high-entry industries to grow more slowly.

Following the literature on entry models that goes back to Bresnahan and Reiss (1990 and 1991), and the subsequent extensions by Mazzeo (2002), Seims (2005), and particularly Schaumans and Verboven (2006) that estimate a model of entry for the pharmacies sector in Belgium, we propose a way to infer the impact of entry regulations by comparing their effects in different regions that differ in the way that those regulations are designed and enforced. We use the case of different regional policies governing the opening of new pharmacies in Spain to show that policy experiments are useful to assess the impact of entry regulations.

Entry models have been used to assesses a closely related question: whether there is excessive entry in markets with product or location differentiation. As theory is ambiguous on whether there is scope for welfare enhancing entry regulations, the question is open to assessment in a case by case basis. The key issue is to estimate whether new entrants in the industry add to consumer surplus with their entry more than they are reducing the profits to incumbents by stealing their business. Berry and Waldfogel (1999) and Davis (2002) used for the first time a model of entry to assess the efficiency of free entry, and both found excessive entry in the radio broadcasting and the motion picture exhibition industries respectively. By contrast, Gowrisankaran and Kreiner (2007) find too little entry in the ATM industry, a lack of geographical coverage or penetration.

The aim of this paper is constrained to use the particular case of recent policy changes in entry regulations for pharmacies in Spain to show a way to assess its impact on profits and universal service obligations. Assessing the impact of the regulation on welfare is beyond the scope of this paper, although this question undoubtedly merits further research.

In particular we compare the case of the region of Navarra, in which entry of pharmacies is totally free, although their location is not, with the region of Basque Community in which severe regulations on entry of pharmacies are set. We find that entry regulations are a bad policy instrument to obtain larger geographical coverage of the retail pharmacy services. There is a negative effect of geographic entry regulations on universal service obligations. Geographic entry regulations can severely reduce the likelihood of having a pharmacy open to the public in less populated municipalities.

Additionally, we find that geographic entry regulations are like a tide that lift all boats unevenly: profits of the pharmacies in the market increase with entry regulations, but profits increases are larger for the pharmacies at the upper tail of the distribution of profits (well located pharmacies), than for the median or the mean pharmacy. Therefore, reforming entry regulations might prove very difficult because the small number of pharmacies that gain the most from regulations will be willing to invest heavily in lobbying to avoid policy reforms.

The paper is organized as follows. Section 2 describes policy changes in Spain that allow us to assess the impact of regulations across different regional jurisdictions, the data and the empirical strategy that we will follow. Section 3 outlines the entry model that we will use to infer the impact of entry regulations on profit and service geographic reach. Section 4 outlines the econometric specification, the parameters and distribution functions that will be estimated, and also show the results. Section 5 concludes.

2. Data and empirical strategy

There is a large number of studies in economics that use natural experiments or quasi-experiment designs to examine outcome measurements for observations in treatment groups and comparison groups. Cox and Isaac (1987) show that experiments are used to explicitly assess alternative regulatory mechanisms, sometimes obtaining surprising results. Meyer (1995) describes the strengths and weaknesses of using quasi-experiments in economics. Among good natural experiments, Meyer (1995) cites those induced by policy changes that may allow a researcher to obtain exogenous variation in the main explanatory variables.

Regional changes in entry regulations in Spain qualify as such experimental situation. Besley and Case (2000) explore the use of different methods for estimating policy incidence when there is a concern about policy endogeneity. Eckel and Lutz (2003) state that experiments are able to isolate one aspect of a situation at a time, and also experimental tests allow the researcher to examine the robustness of a theory's predictions to failures of its assumptions. Finally, Symeonidis (2000 and 2007) shows how policy reforms such as the introduction of cartel law in the UK in the late 1950s can be used as a natural experiment to compare cartelized and not cartelized industries before and after the introduction of cartel law.

Geographic entry regulations in Spain dates back to the 19th century. However, early on regulations took the form of minimum requirements. In 1860, the government mandated that local governments should guarantee that there existed *at least* one pharmacy available every 2000 inhabitants to attend the poor . This was a typical universal service obligation (USO) on local governments, in which public funds should be committed to guarantee that retail pharmacy services were within easy reach.

It was only in 1939 when the central government set a geographic entry regulation that restricted the number of pharmacies: the previous regulation of minimum requirements turned to a regulation capping the number of pharmacies. The new law set that there should be no more than one pharmacy every 2000 inhabitants in each municipality. This type of stringent geographic regulation has remained taking slightly different forms in Spain until very recently.

In 2000, the Parliament of one of the Spanish regions (the Foral Community of Navarra, a small region at the North of Spain currently having slightly over 600,000 inhabitants) passed a law turning back to a regulation of minimum requirements: the regional government should guarantee that there is at least a pharmacy each so-called health care zone (a zone contains a municipality larger than 2000 inhabitants, or a group of different municipalities of around 2000 inhabitants).

The new law sets just a still non-binding cap by which entry will be restricted if the number of inhabitants per pharmacy in the region turns lower that 700 (now there are on average around 1000 inhabitants per pharmacy). During the last seven years, the number of pharmacies in the region has doubled.

The regulatory reform was highly controversial with the incumbent pharmacists being strongly against it and the central government was skeptical and critical. However, the regional Parliament passed it by an overwhelming majority. In 2004, the case reached the Constitutional Court that finally decided that the new regulations were well aligned with the constitutional provisions: the regional government was taking care of the provisions set by the constitution and the Spanish pharmacies law regarding the duty of assuring a fair geographic coverage of the pharmacy services by using a less interventionist approach. This was consistent with the EU policy of having only trade and professional regulations that are necessary, adequate and proportional to the public aim they pursue.

In fact, the reform in the entry regulations was probably the undesired outcome of the policy process. The proponent of the legislation was the Health Minister of the region who was a doctor whose original intent was to obtain discounts from existing pharmacies in the distribution of the medicines prescribed by the doctors of the public sector. Paradoxically, mark-ups of pharmacies are fixed by the central government in Spain, while currently health care is managed and funded by the regions. Navarra funds its public health care system with the revenues obtained from direct and indirect taxes which are fully decentralized.

As the pharmacies opposed to give discounts to the regional government, the Health Minister threatened with allowing entry by new pharmacies. Those new pharmacies would be licensed under a contract with the regional government by which they would be forced to give discounts on the centrally fixed mark-ups. During the legislative process, confrontations between the regional government and the pharmacist were very tough.

The pharmacists even locked out, and public health care centers were judicially allowed to exceptionally dispense medicines during the pharmacists lock out. In Spain, pharmacies should be private outlets owned exclusively by pharmacists. Neither private firms nor public organizations can open a pharmacy, and no outlet other than licensed pharmacies can sell medicines.

As the constitutionality of imposing a contract with discounts to the new pharmacies was questioned, the regional Parliament of Navarra opted for getting rid of the most stringent entry regulation: the cap on the number of pharmacies that are allowed to open. It only kept a regulation setting the minimum number of pharmacies per health care zone, a global maximum for the region to avoid region wide excessive entry, and a minimum distance of 150 meters between new and old pharmacies (previously the minimum distance was 250 meters).

In this paper, we are going to infer the impact of entry regulations on profit and service geographic reach by comparing opening of pharmacies in Navarra where entry has turned to be almost free, and that of the nearby Basque Autonomous Community where there still enforce one of the most stringent entry regulation in Spain.

The Basque Autonomous Community is another region of Spain that has complete fiscal autonomy. It funds all the regional and local public expenditure using direct and indirect taxes. The rest of regions in Spain fund the public health care services they manage from a block transfer from the central government who is getting almost all the revenues from direct and indirect taxes.

We will look at the entry of pharmacies at the municipal level. Data on the number of pharmacies is from the regional governments data on health care facilities for 2006, and data on demographics at municipal level is from the National Statistical Office (last population update is 2005). The unit of observation is the municipality and we account for 213 observations in the Basque Community and 262 observations in the Navarra region. We selected municipalities with less than 15,000 inhabitants and whose density of population are less than 800 inhabitants per squared kilometer.

For each municipality we consider its population, the number of pharmacies, the density of population, the fraction of population younger than 16 years old and older than 65 years old in order to catch those people with higher needs in terms of health-care assistance, and the number of public health centers among other variables. Tables 1 and 2 offers descriptive statistics for the main variables in the sample, distinguishing them by region.

Table 1a. Navarra Foral Community

Number of pharmacies	Mean population	S.D. population	Headcount per pharmacy	Number of Municipalities	Percentage of municipalities
-	184	183		122	47%
1	691	424	691	81	31%
2	1,855	673	928	26	10%
3	3,131	919	1,044	19	7%
4	4,737	1,381	1,184	6	2%
5	4,478	720	896	3	1%
6	7,621	-	1,270	1	0%
7	7,074	973	1,011	3	1%
12	10,924	-	910	1	0%
Total				262	100%

Note: 262 municipalities of less than 15,000 inhabitants and 800 inhab/km2

Table 1b. Euskadi Autonomous Community

Number of pharmacies	Mean population	S.D. population	Headcount per pharmacy	Municipalities	Percentage of municipalities
-	393	231		82	38%
1	1,781	1,109	1,781	97	46%
2	5,655	915	2,828	16	8%
3	8,742	2,152	2,914	7	3%
4	10,334	1,054	2,584	7	3%
5	14,382	704	2,876	2	1%
6	14,438	629	2,406	2	1%
Total				213	100%

Note: 213 municipalities of less than 15,000 inhabitants and 800 inhab/km2

From the statistics in Table 1 we can observe that more pharmacies are entering municipalities of Navarra at a lower mean population level than in the Basque Community as could be expected, since the entry in Navarra is free. In the same sense the number of citizens needed to support one additional pharmacy is lower in Navarra than in the Basque Community. However, the percentage of municipalities with no pharmacies at all is higher in Navarra (46.6%) than in the Basque Community (38.5%). From the table, we can see that on average the municipalities in Navarra without pharmacy are less populated on average, but we do not know whether entry regulations are good or bad for having more pharmacies in such small municipalities. The aim of this paper is to estimate precisely the impact of entry regulations on the geographic coverage by pharmacies.

Table 2 shows that the mean number of pharmacies is higher in Navarra than in the Basque Community as well as the maximum number of pharmacies operating in a municipality. Thus, from descriptive statistics it seems clear that a

Table 2a. Summary statistics. Navarra Foral Community

		Obs	Mean	Std. Dev.	Min	Max
Number of pharmacies	pharmacies	262	1.02	1.49	0.00	12.00
Number of public health centers	health centers	262	1.12	1.04	0.00	9.00
Density	density	262	37.21	67.32	0.72	590.64
Fraction of population, 16 and younger	%young	262	0.11	0.05	0.00	0.26
Fraction of population, 65 and older	%old	262	0.26	0.10	0.06	0.74
Fraction of population with foreign nationality	%foreign	262	0.04	0.05	0.00	0.45

Note: Municipalities of less than 15000 inhabitants and less than 800 inh/Km2.

Table 2b. Summary statistics. Basque Autonomous Community

		Obs	Mean	Std. Dev.	Min	Max
Number of pharmacies	pharmacies	213	0.94	1.13	0.00	6.00
Number of public health centers	health centers	213	0.92	0.61	0.00	4.00
Density	density	213	124.11	163.46	4.21	777.78
Fraction of population, 16 and younger	%young	213	0.13	0.03	0.05	0.24
Fraction of population, 65 and older	%old	213	0.20	0.05	0.09	0.36
Fraction of population with foreign nationality	%foreign	213	0.03	0.02	0.00	0.11

Note: Municipalities of less than 15000 inhabitants and less than 800 inh/Km2.

more competitive environment exists in Navarra regarding the pharmacies market, which obviously it is a result from a liberalized entry policy.

As we will explain in detail in the following section, we will use the dataset above to estimate a simple entry model with the form of a standard ordered probit model in which the endogenous variable denotes the number of pharmacies operating in each municipality. This is a discrete variable model that will be estimated using a latent variable that will follow a normal distribution. In particular our latent variable is a ratio of variable profits to fixed costs. Negative values of this ratio mean no entry, while positive values of the ratio mean entry.

We will estimate also the threshold of the ratio that drive entry by more than one pharmacy. We estimate two different specifications for this entry model. In the first one, the population of each municipality is used as a measure of the market size, while in the second specification, we add some extra market characteristics in order to better explain differences in variable profits to fixed costs ratio across municipalities, which in turn is the key variable in order to decide the entry.

The model is estimated separately for Navarra, and the model is used to predict a but-for scenario of free-entry in the Basque Community.

3. The entry model

We use an entry model as that outlined by the literature of entry as a strategic game: see Bresnahan and Reiss (1990 and 1991) and Berry (1992). Entry models have already used to analyze the entry of pharmacies by Schaumans and Verboven (2006). This latter paper is the first one to consider that geographic entry restrictions may exist.

In this class of models, inferences are drawn about unobserved payoffs from the equilibrium relationship between the observed market structure and market characteristics such as market size. Those models are static models. Reviews of the fundamentals of this type of static models can be found in Reiss and Wolak (2005) and Berry and Reiss (2007). Dynamic entry models have been developed more recently and are reviewed by Pakes, Ostrovsky and Berry (2005).

In general, the literature on entry decisions agrees on the fact that entry drivers are mainly related with cost factors, such as market and competitors characteristics. This drivers are highlighted in Reiss and Spiller (1989), Morrison and Winston (1990), Bresnahan and Reiss (1990 and 1991), Berry (1992), Joskow et al. (1994), and Dresner et al. (2002).

In the present paper there is just one type of firms, pharmacies, with a large pool of potential entrants for each local market. Entry decisions at each local market are summarized by the total number of firms entering the market.

The total number of firms entering each local market is a random variable N. Equilibrium realizations of this random variable are denoted by n. Firms are subject to an entry restriction in any local market when $N \leq \overline{n}$. this is the case when in any local market there cannot be more than $\overline{n}$ firms. If $N < \overline{n}$, the entry restriction is not binding in equilibrium; by contrast, when $N = \overline{n}$ the entry restriction is binding.

Firms are identical, then they have the same payoff functions. If a firm does not enter, it has zero payoffs. If a firm enters, its payoffs depend on the total number of entering firms:

$$\pi^*(N) = \pi(N) - \varepsilon, \tag{3.1}$$

where $\pi(N)$ is the deterministic component of payoffs, and ε is a random component, unobserved to the econometrician. The nature of the competitive interaction sets the precise relationship between the deterministic component of payoffs and the number of firms. In this type of entry models, the main assumption is that entry decisions by firms are strategic substitutes: when one firm decides to enter, the payoffs from entry by another firm decreases. That is, this is assuming that the discounted expected profit flow from entering the market is decreasing in the number of firms.

$$\pi(N+1) < \pi(N) \tag{3.2}$$

Variable profits of entry are decreasing with respect to the number of simultaneous entrants. This assumption is plausible and consistent with this type of entry literature, and it is key to characterize the Nash equilibrium outcomes.

Following Schaumans and Verboven (2006), when entry restrictions are not binding, $N < \overline{n}$, each firm freely decides whether or not to enter, given the entry decisions of the other firms. There is a large number of pure-strategy Nash equilibria in this entry game. Bresnahan and Reiss (1990) resolve this problem aggregating the non-unique Nash equilibrium outcomes into a Nash equilibrium in a simultaneous game, or into a subgame perfect equilibrium outcome in a sequential game.

Any observed market configuration n is a Nash equilibrium outcome if and only if the random component of profits, ε, satisfies the following condition:

$$\pi(N+1) < \varepsilon \leq \pi(N). \tag{3.3}$$

When this condition is satisfied, n firms find profitable to enter, and no additional firm has an incentive to enter, therefore n turns out to be a Nash equilibrium outcome. The assumption that the deterministic component of payoffs is decreasing in the number of firms guarantees that there are realizations of ε for which this condition holds, so that market configuration n is observed with positive probability.

Assuming that ε has a density function $f(\cdot)$, the probability of that market configuration n will be observed as the unique Nash equilibrium outcome when entry restrictions are not binding is the following:

$$\Pr(N = n) = \int_{\pi(n+1)}^{\pi(n)} f(u)du \equiv P(n). \tag{3.4}$$

4. Estimation and results

We observe $i = 1, 2...I$ local markets in which a number of firms have decided simultaneously or sequentially to enter. There is a unique perfect equilibrium outcome in a simultaneous game or a unique subgame perfect equilibrium outcome in a sequential game for every possible realization of ε.The likelihood function related to the probabilities of observing a particular market configuration ranging from no entry ($n = 0$) to entry by more than 5 firms ($n = 5+$), is just the following:

$$l = P(n = 0) + P(n = 1) + P(n = 2) + P(n = 3) + P(n = 4) + P(n = 5+). \quad (4.1)$$

We specify the density $f(\cdot)$ as a normal density that lead us to estimate the entry model as an standard ordered probit model as the ones estimated by Bresnahan and Reiss (1990 and 1991) and many others. Following Genovese (2001) and Schaumans and Verboven (2006) we define firms profits as $\Pi_i^*(N) = V_i(N)\exp(-\nu_i) - F_i(N) \geq 0$ where $V_i(N)$ is variable profits, $F_i(N)$ is fixed costs, and ν_i is a multiplicative error term capturing unobserved market-specific variable profits. For estimation convenience we start assuming that the standard deviation ν is equal to one. Firms enter if and only if $\Pi_i^*(N) \geq 0$, or equivalently if and only if

$$\pi_i^*(N) = \ln\left[V_i(N)/F_i(N)\right] - \nu_i \geq 0. \quad (4.2)$$

That is, firms payoffs $\pi_i^*(N)$ are the log of the variable profit to fixed costs ratio. The following linear specification allow us to explain the latent variable, firms payoffs, as a function of market variables that affect the log of the variable profit to fixed costs ratio:

$$\pi_i^*(N) = \lambda \ln(S_i) + \beta_k X_i^k - \alpha^j - \nu_i. \quad (4.3)$$

The variable S is market size, measured by the population of each market, X^k are k different other observed market characteristics, λ and β_k are the parameters that show the impact of observed market characteristics on the log of the profit to fixed costs ratio, and the parameters α^j are fixed effects when there are j firms in the market. This fixed effects are the "cut-values" in this simple ordered probit where the cut-value for the one entrant market structure is set at zero ($\alpha^1 = 0$). The fixed effects α^j ($\alpha^2, \alpha^3, \alpha^4, \alpha^{5+}$) measure the competition effect of j firms on the average entrant payoffs (simultaneous game) or last entrant payoffs (sequential game).

To estimate the model we restrict the standard deviation of ν, to be equal to one. As it is common in discrete choice models, the scale of the payoffs is not identified. We are estimating a standard ordered probit model in which $\nu \backsim$

$N(0,1)$.We will add some additional structure on the payoffs to identify the scale of the payoffs.

Once we have estimates of the drivers of entry in a region with free entry such as Foral Community of Navarra, we will use this estimates to simulate the counterfactual or but-for scenario in other regions such as the Basque Autonomous Community.

The model give us predictions of entry in the liberalization scenario. Additionally, we follow Schaumans and Verboven (2006) to estimate what should be the reduction in regulated markups in the liberalization scenario for leaving the region with a number of pharmacies similar to the current regulated scenario. The difference in markups will be our best estimate of the overcharges that patients and insurers are paying for the current pharmaceutical coverage.

As in Schaumans and Verboven (2006), to account for the reduced regulated markups, we adjust the estimated intercept β_0 downwards by an amount $\lambda \ln(\Delta)$, where $0\leq \Delta \leq 1$ refers to a given reduction in the net markups. As we have just information of gross markups, 27,9%, but we have no information of variable retail cost, we cannot compute the effect of an absolute reduction in regulated gross markups.

We alternatively can predict the effect of a relative reduction in the net markups. If net markups are denoted by μ, we estimate the effect of a drop by a given factor Δ, where $0\leq \Delta \leq 1$, i.e. a reduction from μ to $\Delta\mu$. Following to Schaumans and Verboven (2006) we assume that variable profits are the following:

$$V(N) = \mu \cdot R(N) \cdot S, \tag{4.4}$$

where $R(N)$ is revenues per population head. That is, we make the following two assumptions that seem reasonable for pharmacies: net markups μ are constant across markets, and that the variable profits per population head are independent from the number of consumers S. Now we specify $\ln(R(N)/F(N)) = \overline{\beta}_k X_i^k - \overline{\alpha}^j - \epsilon_i$. We allow in this new specification the error term ε to have a more general normal distribution with unknown standard deviation: $\epsilon \backsim N(0,\sigma)$.So $\epsilon = \sigma\nu$. And substituting this into the the payoffs, we obtain:

$$\overline{\pi}_i^*(N) = \ln(S_i) + \ln\mu + \overline{\beta}_k X_i^k - \overline{\alpha}^j - \epsilon_i, \tag{4.5}$$

and dividing by σ,

$$\pi_i^*(N) = \frac{\overline{\pi}_i^*(N)}{\sigma} = \frac{1}{\sigma}\ln(S_i) + \frac{\ln\mu}{\sigma} + \frac{\overline{\beta}_k}{\sigma} X_i^k - \frac{\overline{\alpha}^j}{\sigma} - \nu_i. \tag{4.6}$$

Comparing this expression of firms payoffs, with the previous one, the additional structure links the coefficients of the two specifications so that $\lambda = 1/\sigma$ and that $\beta_0 = (\overline{\beta}_0 + \ln \mu)/\sigma$.The estimates of λ identifies the standard deviation of $\epsilon_i : \sigma$, . And, the intercept β_0 was containing the net markup μ. For a different pharmacy markup such as $\Delta\mu$, the intercept in the first specification would be $\beta_0' = (\overline{\beta}_0 + \ln \Delta\mu)/\sigma$.And then, adjusting the markup is equal to adjusting the intercept by $\beta_0' - \beta_0 = \ln \Delta/\sigma = \lambda \ln \mu$.

We are assuming that variable retail costs are zero, and therefore that net markups are equal to gross markups. We do not have information on the variable retail costs other than wholesale costs. Assuming that most retail costs are fixed seem plausible as Schaumans and Verboven (2006) suggest because retail costs are mostly labor costs, and time spent on servicing patients is essentially fixed during opening hours. In any case, it would be not difficult to consider that net markups are larger than gross markups, and to estimate the corresponding reduction in gross markups of a drop in net markups.

We estimate two different specifications of the entry model. In the first one, we use just population (or the log of population) of each municipality as a measure of market size (S_i). Population turns out to be a very good entry driver. With this first and parsimonious specification we explain at most 55% of the variance of entry across municipalities. In a second specification, we add some extra market characteristics which may explain differences in the variable profit to fixed costs ratio across municipalities: the number of public health centers in each municipality, density, the percentage of young people in the municipality, the percentage of old citizens, and the percentage of foreigners.

Those are market characteristics also used by Schaumans and Verboven (2006). They also used the unemployment rate and mean income. We do not have data on these two market characteristics for our sample of small municipalities. Adding these market characteristics, we are only able to increase the percentage of the variance of entry across municipalities by two percentage points, reaching at most 57%.

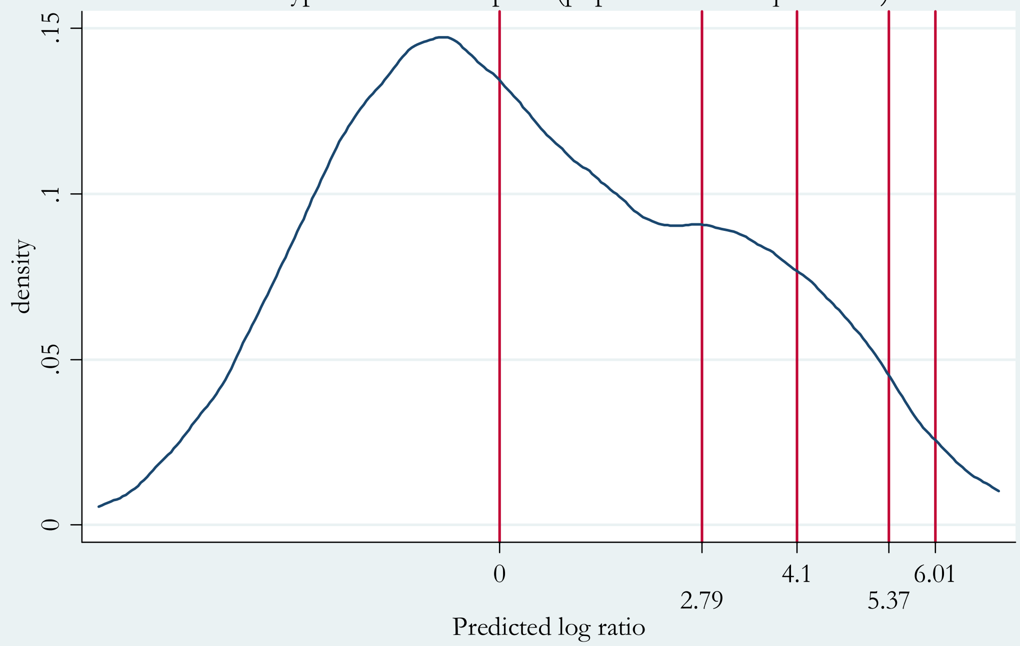
Table 3 shows the results of estimating the entry model for the Foral Community of Navarra in which the entry restrictions are not biding, and markups of pharmacies are regulated at 27.9%. In the left hand panel, it shows that the model with population (in logs) is a robust driver of entry. Additionally, the entry thresholds are also estimated with precision. The latent variable in the model is the log ratio of variable-profits to fixed costs. In the model, we have the lower bound of one entrant ($n = 1$) fixed at zero.

Table 3. Estimation results. Foral Community of Navarra

		Coef.	Robust Std. Err.	z-statistics	Coef.	Robust Std. Err.	z-statistics
constant	β_0	-11.29	(1.59)	7.10	-11.39	(1.36)	8.39
ln (population)	λ	1.95	(0.27)	7.28	2.07	(0.25)	8.33
health centers	β_1				0.09	(0.10)	0.85
density	β_2				0.003	(0.001)	2.26
%young	β_3				-7.08	(1.76)	4.01
%old	β_4				-0.03	(1.53)	0.02
%foreign	β_5				1.58	(1.82)	0.86
	α^2	2.79	(1.59)	1.76	2.90	(1.36)	2.14
	α^3	4.10	(1.92)	2.14	4.32	(1.72)	2.51
	α^4	5.37	(2.06)	2.61	5.64	(1.84)	3.06
	α^{5+}	6.01	(2.32)	2.59	6.31	(2.07)	3.05
Log likelihood			-155.86			-150.81	
Pseudo-R2			0.55			0.57	
		Wald Chi2(1)	52.97		Wald Chi2(6)	6771.62	
Obs.			262			262	

Note: Standard errors robust to heterocedasticity and correlation among municipalities of the same county.

Figure 1 Ratio variable-profits to fixed costs
of an hypothetical monopolist(population as unique driver)



The log ratio of variable profits to fixed costs should be larger to zero to have positive entries, because in this case the ratio of variable profits to fixed costs is larger than one, that is variable profits are larger than fixed costs and entry is possible. Negative log ratios corresponds to zero entry $(n = 0)$. Each α^j shows the lower bound of the log ratio for two entrants $(n = 2)$, three entrants $(n = 3)$, four entrants, $(n = 4)$, and five or more entrants $(n = 5+)$. Using the first panel estimates, we have predicted the ratio of variable-profits to fixed-costs by an hypothetical monopolist. This is computing using the linear prediction of the ratio of variable profits to fixed costs without taking into account the competition fixed effects $(\alpha^j) : \lambda \ln(S_i) + \beta_k X_i^k$. Figure 1 shows the density of this ratio and the bounds of the log ratio that sort out different market structures.

We can also translate these estimated bounds in the implied population thresholds for the different market structures. The implied population thresholds are computed as follows: $\gamma^j = \exp\left[\left(-\beta_0 + \alpha^j\right)/\lambda\right]$. Table 4 shows how on average markets support an increasing number of entrants. According to the estimates of the first panel in table 3 where population is the unique driver, on average markets of at least 322 inhabitants support one pharmacy. On average, markets with at least 1344 inhabitants support two pharmacies, with at least 2627 inhabitants support three pharmacies, with at least 5038 inhabitants support four pharmacies, and with at least 6989 inhabitants support five pharmacies or more. It is interesting to note that as markets get larger, the number of inhabitants to support an average pharmacy increases: the per pharmacy threshold increases from 322 to 1398.

This might be due to larger fixed costs of entry in larger markets (for example because of larger rental costs) and/or smaller variable profits in larger markets. Bresnahan and Reiss (1991) proposed to use the ratio of any per entrant threshold on the previous one as a way to infer whether behavior was oligopolistic or competitive. Competition should drive the ratio towards one. In our case, it seems that five or more pharmacies are needed to have a competitive behavior. Pharmacies have market power until there are at least 5 entrants in the market.

It should be noted however, that in Navarra entry is free but location is not. New pharmacies should be located 150 meters away from existing ones. This might make competition by new pharmacies weaker than otherwise. This can translate into lower variable profits for new entrants, and therefore that new entrants need more population support than existing ones. In this case, entrants might be behaving competitively, while incumbents still can exert location driven market power.

From the estimates, we can also obtain the distribution of the ratio of variable profits to fixed cost of the average entrant (simultaneous game) or last entrant (sequential game) in each municipality: $\ln\left[V_i(N)/F_i(N)\right] = \lambda \ln(S_i) + \beta_k X_i^k - \alpha^j$. As figure 2 shows, it ranges from 0 to 4 for the municipalities in which there is at least one entrant.

As it is the case in all these discrete choice entry models, profits are not identified. They could be so if we had information on variable profits or fixed costs. We could simulate variable profits by assuming what are fixed costs of running a pharmacy $(\widehat{F})$ because arranging the expression for the log of the ratio of variable-profits to fixed-costs we obtain that: $V_i(N, \widehat{F}) = \exp(\lambda \ln(S_i) + \beta_k X_i^k - \alpha^j) \cdot \widehat{F}$. Even we could look for plausible fixed costs that make our average simulated variable profits close to the average gross income per pharmacy that we can obtain from aggregated sales data. In 2006, gross income per pharmacy in Navarra was approximately 96,868 euros. We match this average gross income by setting fixed

Table 4. Estimated thresholds for different market structures (population as unique driver)

Lower bounds		Market size threshold (γ^j)	Per pharmacy threshold (γ^j/j)	Ratio threshold per pharmacy (γ^j) on previous threshold per pharmacy (γ^{j-1})
1 pharmacy	γ^1	322	322	-
2 pharmacies	γ^2	1344	672	2.09
3 pharmacies	γ^3	2627	876	1.30
4 pharmacies	γ^4	5038	1259	1.44
5+ pharmacies	γ^{5+}	6989	1398	1.11

costs equal to 1,586.02 euros per month (19,032.24 euros per year).

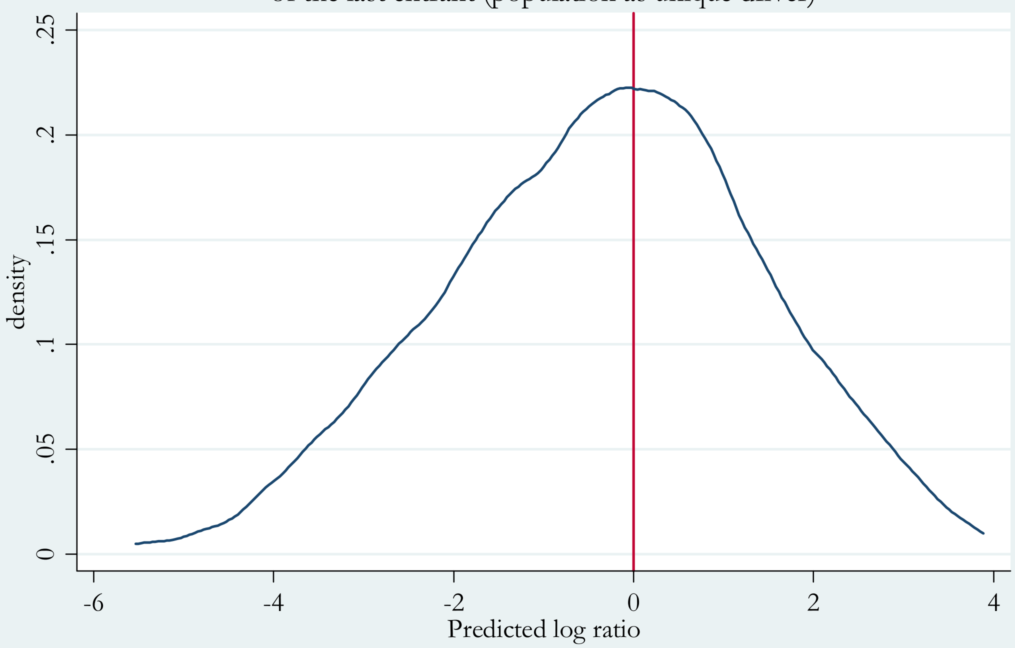
Figure 3 shows the simulated variable profits of the average entrant (simultaneous entry) or the last entrant (sequential entry) for the municipalities of Navarra with at least one pharmacy open. The distribution of variable profits is very skewed, with the median equal to 47,103 euros a year. The median is around half the mean. Additionally, it has a long tail with the 90th percentile reaching 228,841 euros.

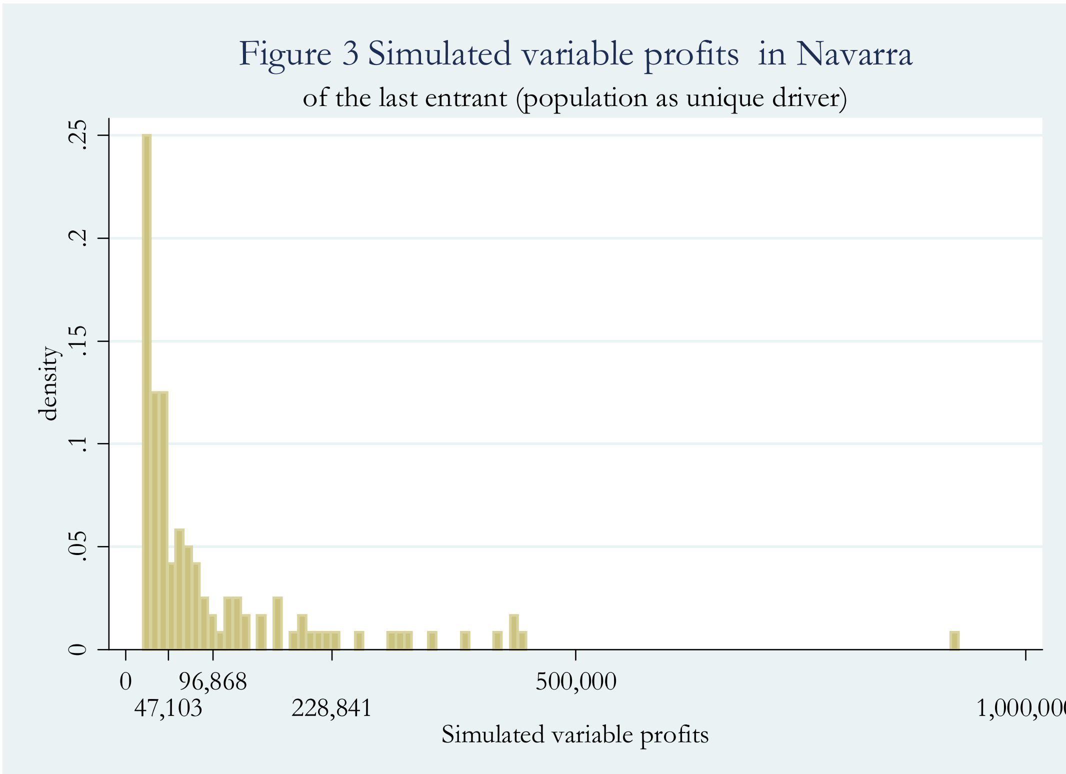
Using this same estimates for Navarra we can predict the ratio of variable profits to fixed costs and the number of entrants that could be supported by the municipal markets in the nearby Basque Autonomous Community in a but if scenario of free entry keeping the current markups regulation at 27,9%.

We could also estimate variable profits if we set the fixed costs as before. We matched the average gross income by setting the fixed costs in the Basque Community equal to 803.67 euros per month (9,644.04 euros per year). This is almost half the fixed costs in Navarra. This is plausible because fixed costs are mainly labor costs (apart from smaller rental costs and other minor inputs). And there is anecdotal evidence showing that opening hours are substantially smaller in the Basque Community. Figure 4 shows that the distribution of variable profits in the Basque Community is thicker: median variable profits double those of Navarra (99,494 euros a year).

Figure 2 Ratio variable-profits to fixed costs

of the last entrant (population as unique driver)

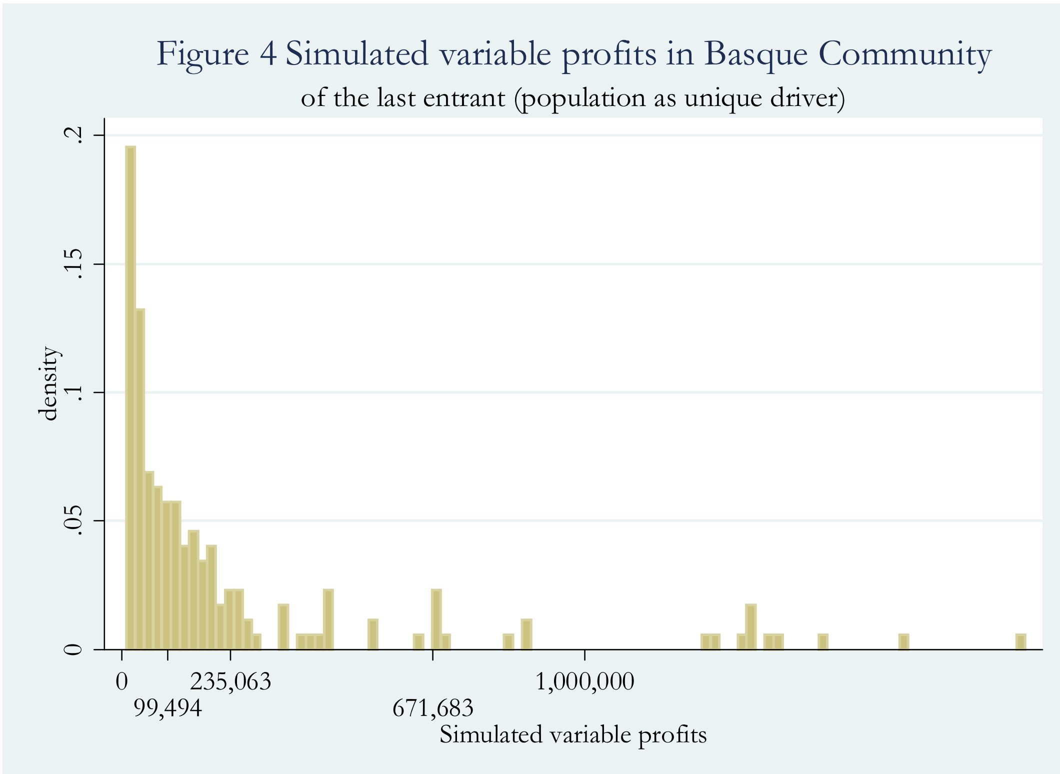




Average variable profits more than double those of Navarra (235,035 euros per year). And, the 90th percentile reaches a figure more than three fold that of Navarra (671,683 euros). Entry regulations benefit all incumbents, but particularly those in the upper tail of the distribution.

We can compare the two density functions to see the differences in the pattern of variable profits across municipalities. The distribution in the free entry setting (Navarra) is much more skewed and has the mode on the left of the mode of the distribution of variable profits in the regulated entry setting (the Basque Community).

Equality of distribution functions is rejected at 1% significance level by a conventional two-sample Kolmogorov Smirnov test (although this test should be taken with care because we have two small samples in which there are 440 unique values out of 475 combined observations). Therefore, all incumbent pharmacies benefits from regulation, but the ones in the upper tail of the variable profit



distribution are the ones that gain the most as we have already seen.

Regarding the number of entrants, table 5 shows the transition matrix from the market structure of each of the municipalities in the scenario of entry regulation towards the market structure in the but for scenario of free entry and keeping the current markups regulation at 27,9%. It shows that 45 of the 82 municipalities without pharmacy in the regulated entry scenario would have one pharmacy in the free entry scenario.

It also shows that 34 out of 97 municipalities with one pharmacy in the scenario with regulation would have two pharmacies with free entry, and 20 out of those 97 would have even three pharmacies. However, free entry would not support the unique pharmacy that is open in 2 out of those 97 municipalities that have one pharmacy in the regulated scenario. All the other municipalities that in the regulated scenario have two or more pharmacies would have one, two or even more pharmacies in the free entry scenario. There is entry in at least 86 out of

Table 5. Transition matrix of the number of municipalities by market structure from entry regulation scenario to a free entry scenario (population as unique driver)

		Regulation scenario							
		0	1	2	3	4	5	6	Total
	0	**37**	2	0	0	0	0	0	39
	1	45	**41**	0	0	0	0	0	86
Free-entry	2	0	34	**0**	0	0	0	0	34
scenario	3	0	20	5	**0**	0	0	0	25
	4	0	0	8	2	**0**	0	0	10
	5+	0	0	3	5	7	**2**	**2**	19
	Total	82	97	16	7	7	2	2	213

213 municipalities.

We can finally, obtain predictions of the transition matrix adjusting the constant term as outlined before for allowing not just a transition from regulated entry to free entry, but also a reduction in the regulated markups. Table 6 shows the transition matrix of market structures by municipalities when the markup is reduced by a quarter (from 27,9% to 20,9%). With this policy reform, there is entry in many of the municipalities (although just in half as many as before), and there is only three municipalities that see how its unique pharmacy has to close. There is entry in 42 out of 213 municipalities.

Table 7 shows the transition matrix of market structures by municipalities when the markup is reduced by a half (from 27,9% to 14%). With this policy reform, there is just one additional pharmacy that enters in 10 municipalities. And, there is 13 municipalities that see how one of its pharmacies has to close (in 9 of them it closes its unique pharmacy).

Table 6. Transition matrix of the number of municipalities by market structure from entry regulation scenario to a free entry scenario and a reduction of the regulated markup by a quarter (population as unique driver)

		Regulation scenario							
		0	1	2	3	4	5	6	Total
	0	**56**	3	0	0	0	0	0	59
Free-entry	1	26	**61**	0	0	0	0	0	87
scenario	2	0	22	**0**	0	0	0	0	22
	3	0	11	13	**2**	0	0	0	26
	4	0	0	3	2	**1**	0	0	6
	5+	0	0	0	3	6	**2**	**2**	13
	Total	82	97	16	7	7	2	2	213

Table 7. Transition matrix of the number of municipalities by market structure from entry regulation scenario to a free entry scenario and a reduction of the regulated markup by half (population as unique driver)

		Regulation scenario							
		0	1	2	3	4	5	6	Total
	0	**71**	9	0	0	0	0	0	80
Free-entry	1	11	**68**	0	0	0	0	0	79
scenario	2	0	20	**6**	0	0	0	0	26
	3	0	0	10	**6**	3	0	0	19
	4	0	0	0	1	**4**	1	0	6
	5+	0	0	0	0	0	**1**	**2**	3
	Total	82	97	16	7	7	2	2	213

5. Conclusion

Entry regulations have a strong impact both on the profits of incumbent pharmacies, and on the number of pharmacies that enter across municipalities. The policy experiment of freeing entry in a part of Spain such as Navarra seven years ago offers us a laboratory from which we have been able to infer profits and entry game across municipalities. Comparing the free entry scenario with the results in other parts of Spain in which entry is severely restricted such as in the nearby Basque Community allows us to predict a but-for scenario in case of liberalization of entry, and in case of adjusting regulated mark-ups.

With entry regulations, variable profits are boosted for all incumbents. Median variable profits double, average variable profits more than double, and variable profits of the 90th percentile reaches a figure more than three fold. The rising tide lift all boats, but the rising tide of regulation is not lifting all boats alike: some incumbents located in very good markets are the ones that gets the most from entry regulation.

Additionally, the policy experiment clearly shows that citizens are not getting a good deal from entry regulations. In the case of the Basque Community, if mark-ups remain at the current 27.9%, almost all citizens would benefit from having more pharmacies opened in their municipalities. There are only 2 municipalities which would lose their pharmacy in a free entry environment. By contrast, 45 out of 82 municipalities without pharmacy would have one.

Entry regulations are not serving a public interest of promoting better access to retail pharmacy services. Entry regulations leave almost 4 out of 10 municipalities without pharmacies. By contrast, with free entry it is only less than 2 out of 10 municipalities which would remain without pharmacy.

So restricting entry is just serving the private interest of incumbent pharmacies: at the current markup levels, they earn profits above the free-entry competitive equilibrium. Reducing markups by a quarter or even halving them would adjust current profits to a level close to the free-entry competitive equilibrium.

Finally, the policy experiment shows that the key instrument for improving service coverage across municipalities is neither entry regulations nor fixed percentage mark-ups. Increasing access to retail pharmacy services across municipalities needs a program that raises profits non linearly giving larger mark-ups to those pharmacies attending less populated municipalities, while capping the mark-ups of the pharmacies in highly populated municipalities. This is what a program such as the Essential Small Pharmacies Scheme does in the United Kingdom, but that is turning very difficult to design in countries with stringent regulations in retail pharmaceutical services.

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