Entry and Regulation: Evidence from Health Care Professions [a]

2022-10-11 @ Empirical Game Theory Analysis

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[a] Schaumans and Verboven 2008, RAND Journal of Economics

Introduction

- Market of pharmacies and physicians in Belgium
- Impact of geographical entry restriction
  - Limiting max. number of pharmacies per municipalities
  - ***Does it provide higher consumer welfare when the restriction is lifted?***
    1. Availability
    2. Markup

Interaction

1. Geographical:
    - A market with highly locality, since no advertising is allowed
    - Defined at township level (smaller than municipalities)
    - Exclude urban towns to avoid overlapping
2. Within profession:
    - **strategic substitutes**
    - No price competition: fixed price (markup) negotiated through social insurance regime
    - No advertising competition
    - Within profession competition is limited
3. Between profession:
    - **strategic complementary**

Entry Game

type 1 = pharmacies, type 2 = physicians

Payoff function:

$$\pi_i^*(N_1, N_2) = \underbrace{\pi_i(N_1, N_2)}_{\text{Determined by covariates}} - \underbrace{\varepsilon_i}_{\text{Random part}}$$

Firm enters the market if $\pi_i^* > 0$.

Nash Equilibrium of N_1, N_2 Under Free Entry

(n_1, n_2) is a Nash equilibrium if and only if:

$$\pi_1(n_1 + 1, n_2) < \varepsilon_1 \leq \pi_1(n_1, n_2)$$
$$\pi_2(n_1, n_2 + 1) < \varepsilon_2 \leq \pi_2(n_1, n_2)$$

However, this may show multiplicity.

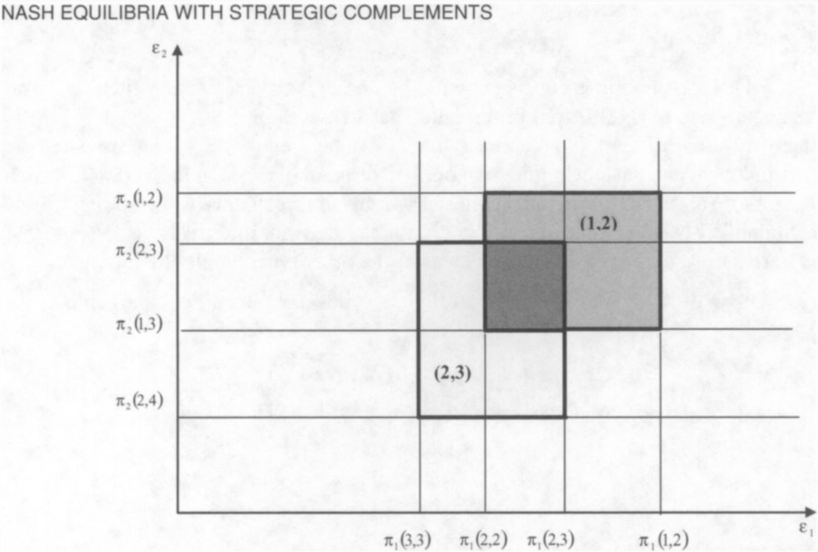

Figure 1: Multiple Nash Equilibrium

Multiple Equilibrium

- By assuming **sequential entry**, subgame perfect Nash equilibrium predicts higher number of firms would be realized.
- Prob. dist. for outcome (n_1, n_2) is now well-defined:

$$\begin{aligned}\Pr\left(N_1 = n_1, N_2 = n_2\right) = &\int_{\pi_1(n_1+1,n_2)}^{\pi_1(n_1,n_2)} \int_{\pi_2(n_1,n_2+1)}^{\pi_2(n_1,n_2)} f\left(u_1, u_2\right) \mathrm{d}u_1 \, \mathrm{d}u_2 \\ &- \int_{\pi_1(n_1+1,n_2)}^{\pi_1(n_1+1,n_2+1)} \int_{\pi_2(n_1,n_2+1)}^{\pi_2(n_1+1,n_2+1)} f\left(u_1, u_2\right) \mathrm{d}u_1 \, \mathrm{d}u_2.\end{aligned}$$

Nash Equilibrium of N_1, N_2 Under Restriction

By restriction $N_1 = \bar{n}_1$,

$(\bar{n}_1, n_2)$ is a Nash equilibrium if and only if:

$$\begin{aligned} \varepsilon_1 &\leq \pi_1(\bar{n}_1, n_2) \\ \pi_2(\bar{n}_1, n_2 + 1) < \varepsilon_2 &\leq \pi_2(\bar{n}_1, n_2) \end{aligned}$$

Econometric Specefication

$$
\begin{aligned}
\pi_i^*(N_1, N_2) = &\lambda_1 \ln(S) && \text{Market size} \\
&+ X\beta_i && \text{Market characteristics} \\
&- \alpha_i^j && \text{Own-type FE} \\
&+ \gamma_i^k / N_i && \text{Other-type complementary FE} \\
&- \varepsilon_i
\end{aligned}
$$

	Bivariate ordered probit models					
	No account for entry restrictions		Account for entry restrictions		General model with strategic complements	
Pharmacies' payoff equation						
Constant	−19.05	(1.18)	−14.09	(3.40)	−13.54	(1.82)
ln(population)	2.49	(0.06)	1.95	(0.12)	1.43	(0.13)
% young	−0.31	(2.48)	0.73	(9.18)	0.22	(4.26)
% old	10.18	(2.43)	19.00	(5.20)	19.32	(3.54)
% foreign	−1.03	(0.94)	−0.94	(0.96)	−1.00	(1.08)
% unemployed	9.20	(2.22)	22.71	(4.85)	23.06	(4.40)
Flanders	−0.03	(0.14)	0.13	(0.34)	0.11	(0.25)
Income	−0.43	(0.14)	−0.35	(0.18)	−0.32	(0.19)
α_1^2	2.26	(0.11)	1.50	(0.18)	1.09	(0.23)
α_1^3	3.64	(0.13)	2.56	(0.20)	1.94	(0.30)
α_1^4	4.83	(0.15)	3.14	(0.22)	2.37	(0.35)
γ_1^1	–		–		0.78	(0.29)
Physicians' payoff equation						
Constant	−19.41	(0.94)	−19.28	(1.12)	−17.42	(0.98)
ln(population)	2.54	(0.07)	2.53	(0.08)	2.27	(0.07)
% young	3.45	(2.08)	2.22	(2.25)	2.02	(2.15)
% old	6.85	(1.84)	6.81	(1.90)	5.98	(1.89)
% foreign	−3.61	(0.73)	−3.58	(0.69)	−3.43	(0.72)
% unemployed	2.30	(1.83)	2.29	(1.98)	0.67	(1.89)
Flanders	−0.65	(0.12)	−0.56	(0.13)	−0.58	(0.13)
Income	0.32	(0.11)	0.32	(0.12)	0.37	(0.11)
α_2^2	1.30	(0.10)	1.32	(0.10)	1.23	(0.10)
α_2^3	2.34	(0.12)	2.36	(0.12)	2.27	(0.13)
α_2^4	2.99	(0.13)	3.09	(0.13)	2.91	(0.14)
γ_2^1	–		–		0.16	(0.19)
γ_2^2	–		–		2.01	(0.29)
γ_2^3	–		–		3.89	(1.01)
γ_2^4	–		–		5.99	(0.83)
ρ	0.32	(0.03)	0.05	(0.07)	−0.15	(0.09)
Log likelihood	−2255.6		−1761.5		−1740.6	

Figure 2: Estimation Result

Counterfactual: Lifting Restriction

	Net markup change			
	$\Delta = 1$	$\Delta = 0.75$	$\Delta = 0.5$	Nonuniform
(A) No change in entry restrictions ($\Phi = 1$)				
Number of pharmacies	1515	1437	1273	1230
Number of physicians	4371	4337	4269	4264
Number of markets without pharmacy	242	254	286	279
Number of markets without physician	152	153	154	154
(B) Maximum number of pharmacies doubles ($\Phi = 2$)				
Number of pharmacies	2330	2067	1663	1595
Number of physicians	4563	4488	4362	4343
Number of markets without pharmacy	186	207	255	244
Number of markets without physician	144	146	150	150
(C) Full free entry in the pharmacy market (Φ is large)				
Number of pharmacies	4140	3191	2176	2088
Number of physicians	4683	4566	4399	4391
Number of markets without pharmacy	145	180	242	227
Number of markets without physician	127	136	145	143

Figure 3: Entry Predictions under Alternative Regulatory Policies

Degree of entry restriction Φ	Net markup drop by factor Δ	Absolute gross markup drop		Number of markets without pharmacy
		$\mu = \nu$	$\mu = \nu - 10\%$	
1	1.000	0%	0%	242
1.25	0.664	−7.7%	−3.9%	250
1.5	0.532	−10.8%	−5.4%	259
1.75	0.470	−12.2%	−6.1%	269
2	0.432	−13.0%	−6.5%	277
2.25	0.411	−13.6%	−6.8%	282
2.5	0.395	−13.9%	−7.0%	287
Large	0.346	−15.0%	−7.5%	309

Figure 4: Keeping Total Number of Pharmacies Constant

Conclusions

- Impacts of entry restriction:
  - Direct: Reduce pharmacies
  - Indirect: Reduce physicians
- Liberalizing entry restrictions and lowering regulated markup simultaneously would transfer welfare to consumers.

Appendix

To model “markup drop”, authors rewrite pharmacies’ payoff function into:

$$\Pi_i^*(N_1, N_2) = S\mu R(N_1, N_2)\exp(-\varepsilon_1) - F_1(N_1, N_2)$$

where μ is markup rate.

It’s equivalent to consider alternative payoff function:

$$\pi_1^*\left(N_1, N_2\right) = \ln(S) + \ln(\mu) + \underbrace{\ln\left(R\left(N_1, N_2\right) / F_1\left(N_1, N_2\right)\right)}_{\text{Determined by covariates}} - \varepsilon_1 \geq 0$$