Does physician labor supply respond to competition?

Philippe Choné (CREST) Elise Coudin (INSEE) Anne Pla (DREES)

University Paris Dauphine, May 2019

Context and objective

Regulatory regimes

- Sector 1 physicians paid at reference prices
- Sector 2 physicians can charge extra-billings

S2 physicians expected to price with "tact and moderation"

- Yet charge €50 instead of €30
- Extra-billings have gone from b€.9 in 1990 to b€2.4 in 2014

Research questions

- Do high prices decrease physician activity (income effects)?
- How do activity and price depend on
  - individual characteristics (income, family)
  - competitive environment
  - demand conditions?
- Can market forces discipline prices?

Literature

Physician competition

- Gaynor and Town (2012) Newhouse, Williams, Bennett, and Schwartz (1982), Brown (1993), Dionne, Langlois, and Lemire (1987), Gunning and Sickles (2013), Wong (1996)
- Closest to Gravelle, Scott, Sivey, and Yong (JIE,2016)
  - Effect of competition on price and quality
  - Cross-section / Panel, Profit-maximizers / Utility maximizers
- Induced demand for S1 physician: Delattre and Dormont (HE, 2003)
  - Differences: Data (S2, GPs / specialists, exhaustive / sample, medical density), estimation strategy, results

Physician labor supply (no competition)

- Rizzo and Blumenthal (JHE, 1994): income effect dominated by substitution effect
- Thornton and Eakin (JHR, 1997) Andreassen, Di Tommaso, and Strom (JHE, 2013)

Preview of results

Theory: Labor supply and competition

- S2: Reaction function upward sloping iff income effects strong enough
- S1: No reaction to competition or demand

Empirical part: Data

- 3 direct access specialties: gynecologists, pediatricians, ophthalmo
- Exhaustive data set, matched with tax returns
- 4 years: 2005, 2008, 2011, 2014

Results: Stark contrast between S1 and S2 physicians

- S1: Labor supply determined by individual preferences: Strong income effects. No role of competition or demand conditions
- S2: Activity increases and fees decrease with physician density
  - Increase labor supply by .25 percent if competitors increase their 1 percent
  - Respond to demand as well

Road map

1. Modeling physician labor supply in a competitive environment
2. Data and industry background
3. Empirical strategy
4. Results
5. Concluding comments

Outline

1 Modeling physician labor supply in a competitive environment

2 Data and industry background

3 Empirical strategy

4 Results

5 Concluding comments

Labor supply

Consumption-leisure preferences

$U_i(c_i, q_i)$, where c_i denotes consumption and q_i output of physician i

Budget constraint

$$c_i = N_i + R_i(q_i; q_{-i})$$

N_i: Non-professional income ; $R_i(q_i, q_{-i})$: revenue if competitors produce q_{-i}

First-order condition

$$\frac{\partial R_i(q_i; q_{-i})}{\partial q_i} = \text{MRS}_i(c_i, q_i)$$

Fee-regulated physicians ("Sector 1")

Assumption: Physician labor supply is not constrained by demand

- Either because demand is rationed at regulated price
- Or because she can induce demand

Revenue function is linear, p^{r}: Regulated price

$$R_i(q_i; q_{-i}) = p^{\mathrm{r}}\, q_i$$

First-order condition

$$\mathrm{MRS}_i(N_i + p^{\mathrm{r}} q_i, q_i) = p^{\mathrm{r}}$$

Labor supply

- depends on own preferences and characteristics
- does not depend on competition or demand environment

Fee-regulated physicians ("Sector 1")

Example: With CES utility function

$$U(c,q) = [\,\alpha\, c^{\gamma} + (1-\alpha)\,(\bar{q}-q)^{\gamma}\,]^{1/\gamma}$$

- Cobb-Douglas $\gamma = 0$
- Leontief: $\gamma = -\infty$

Example: Cont'd

Labor supply

$$q_i = \frac{\alpha^{\sigma}\,\bar{q} - (1-\alpha)^{\sigma}(p^{\mathrm{r}})^{-\sigma} N_i}{\alpha^{\sigma} + (1-\alpha)^{\sigma}(p^{\mathrm{r}})^{1-\sigma}}, \qquad \text{with } \sigma = 1/(1-\gamma)$$

- decreases with N_i: Income effect
- increases with p^{r} for $\sigma = 1$ (Cobb-Douglas)
- decreases with p^{r} for $\sigma = 0$ (Leontief)

Not tested here

Free-billing physicians ("Sector 2")

Assumption: Prices adjust to clear the market

- Log-log form for the inverse demand function

$$\ln p_i = a_i - \sum_j \eta_{ij} \ln q_j$$

- $\eta_{ii} \geq 0$ and $\eta_{ij} \geq 0$ if physicians i and j are substitutes

Revenue function

$$R_i(q_i; q_{-i}) = q_i \, p_i(q_i; q_{-i}) = e^{a_i} \, q_i^{1-\eta_{ii}} \prod_{j \neq i} q_j^{-\eta_{ij}}$$

Physician objective $U_i \left[q_i \, p_i(q_i; q_{-i}) + N_i \, , \, q_i \right]$

- depends on demand and competition through price

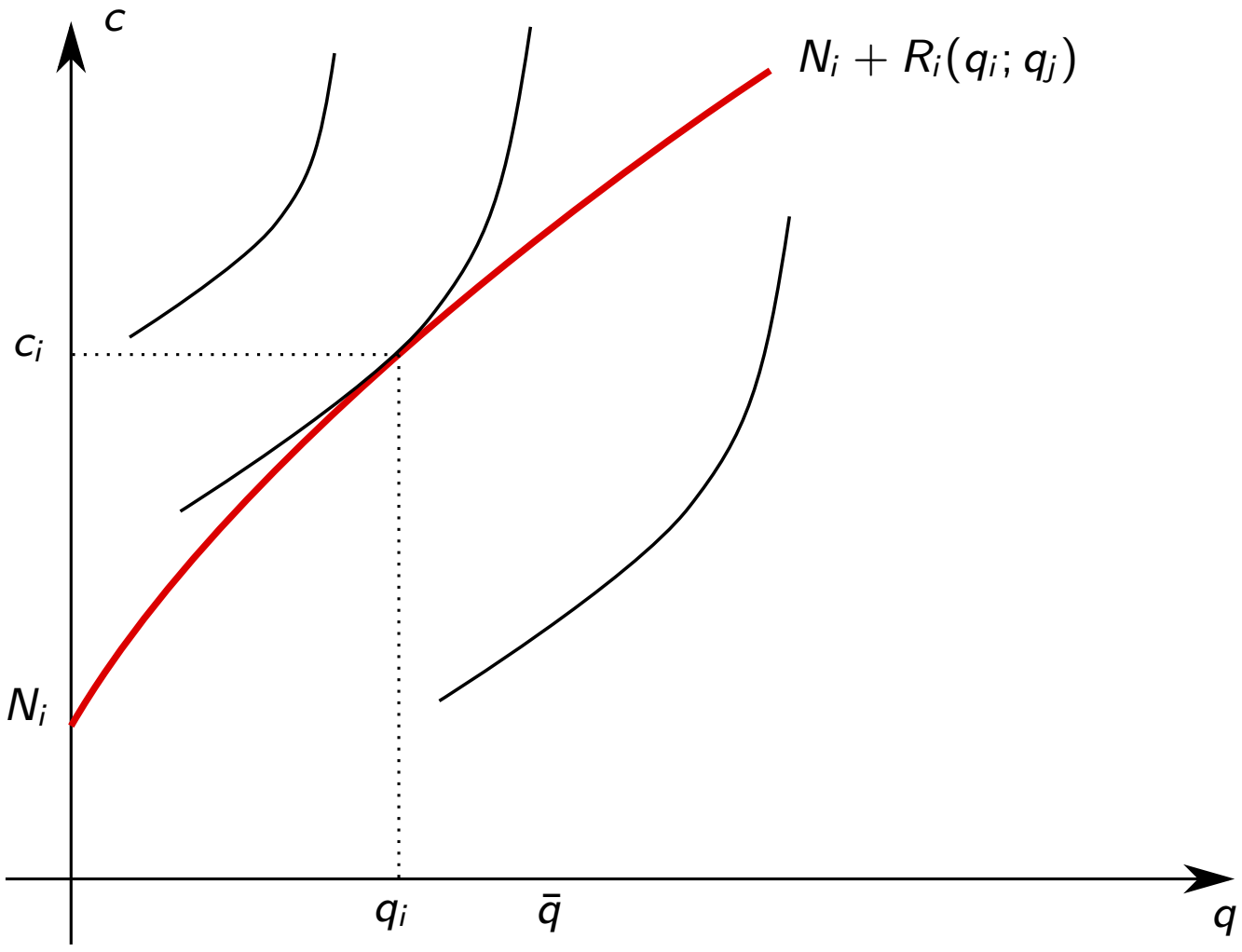


Figure 1: Consumption-leisure preferences and labor supply

Free-billing physicians ("Sector 2")

Responses to demand and competition

- Output reaction function: $\rho_{ij} = \frac{\partial q_i}{\partial q_j}$
- Response to demand variation $\partial q_i / \partial a_i$
- Same channel: Effect on price
- Rise in competitors' labor supply $\Longleftrightarrow$ Negative demand shock

Output response upward sloping if and only if income effect dominates substitution effect

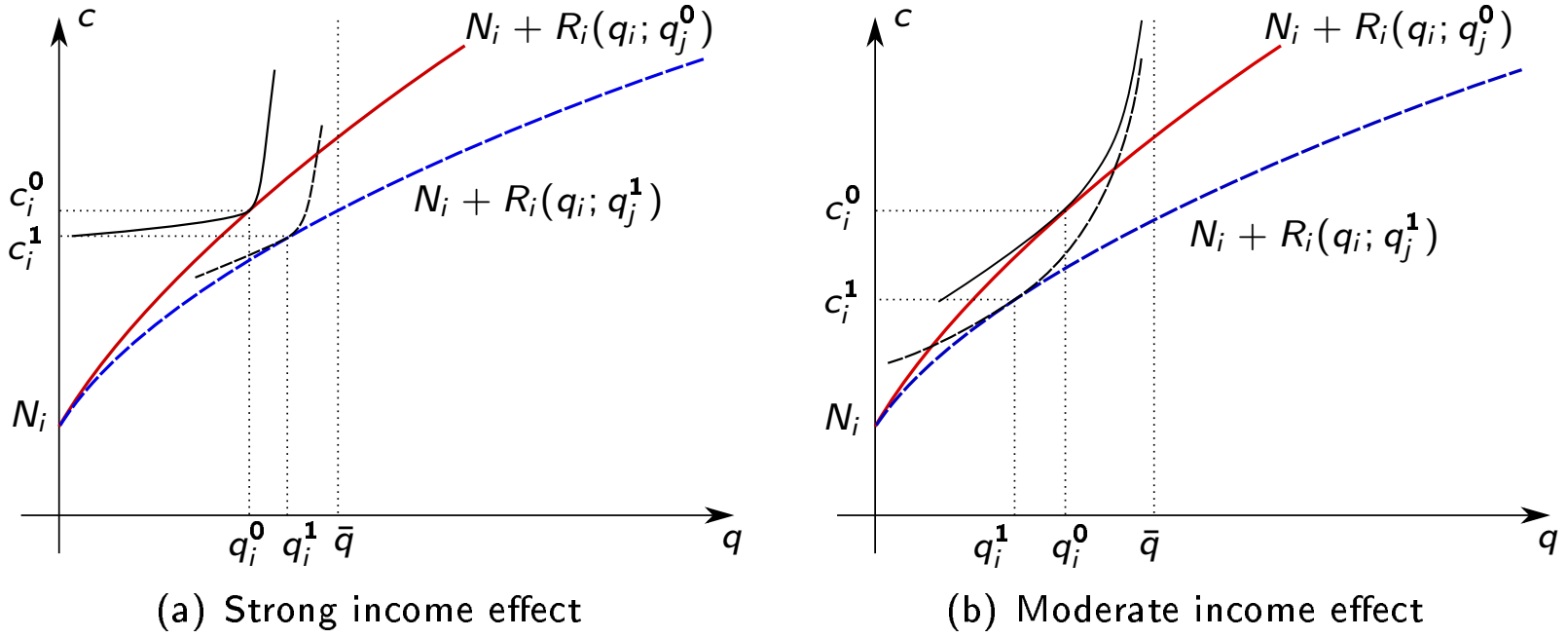
$$\eta_{ij} \left[1 - \eta_{ii} - q_i \frac{\partial \, \mathrm{MRS}_i}{\partial c_i} \right] < 0$$

In the CES case:

$$\eta_{ij} \left[N_i + \gamma R_i(q_i; q_{-i}) \right] < 0.$$

False for Cobb-Douglas ($\gamma = 0$). True for Leontief ($\gamma = -\infty$)

Response to change in demand or competition



(a) Strong income effect

(b) Moderate income effect

Figure 2: Physician response to negative shock, i.e. competitor increased output

- Panel (a): Upward sloping output response
- Panel (b): Downward sloping output response (akin to standard Cournot)

Outline

1 Modeling physician labor supply in a competitive environment

2 Data and industry background

3 Empirical strategy

4 Results

5 Concluding comments

Data

Source

- Administrative database containing activity and fees of all self-employed physicians (SNIIR-AM, CNAM)
- matched with income tax returns (INSEE-DREES-CNAM-DGFiP)

Annual Data: 2005, 2008, 2011 and 2014

- SNIIRAM: number of medical procedures performed as well as annual fees, extra-billings, sex, age, year of practice beginning, specialty, postal code
- Tax returns: household earnings, non-practice income, per type of income, type of household, number and age of children

Sample selection

- All self-employed gynecologists, pediatricians, and ophthalmologists operating in metropolitan France
- Excluded: Full-time wage-earners, physicians > 65, those with no contract with Public Health insurance

Extra-billings account for 40% of earnings of S2 physicians

Table 1: Physicians fees and activity in 2014

	Gynecologists		Pediatricians		Ophthalmologists	
Nb of physicians	2968	(-)	1577	(-)	3084	(-)
% sector 2	54	(-)	31	(-)	54	(-)
For sector 2 only: mean (std)						
Annual Fees in k€	274	(154)	189	(94)	435	(298)
at reference prices	159	(100)	99	(106)	274	(209)
extra-billings (EB)	115	(85)	73	(57)	161	(125)
% of EB in Fees	43	(15)	37	(15)	38	(14)
Composite output	5683	(3569)	3789	(1825)	9784	(7466)
For sector 1 only: mean (std)						
Annual Fees in k€	165	(105)	139	(71)	257	(160)
at reference prices	160	(99)	126	(66)	251	(152)
extra-billings (EB)	6	(17)	2	(7)	6	(21)
% of EB in Fees	3	(6)	1	(4)	2	(4)
Composite output	5699	(3538)	4501	(2344)	8980	(5443)

Source: CNAM. Self-employed physicians below 65 in 2014, who began their practice before 2011.

Price and output

Composite output

$$q_{it} = \frac{\text{Annual fees at reference prices}}{\bar{p}_{0t}} = \frac{\sum_j \bar{p}_{jt} n_{ijt}}{\bar{p}_{0t}}$$

$\bar{p}_{0t}$ = Reference price of standard visit, $\bar{p}_{jt}$ = Reference price of procedure j

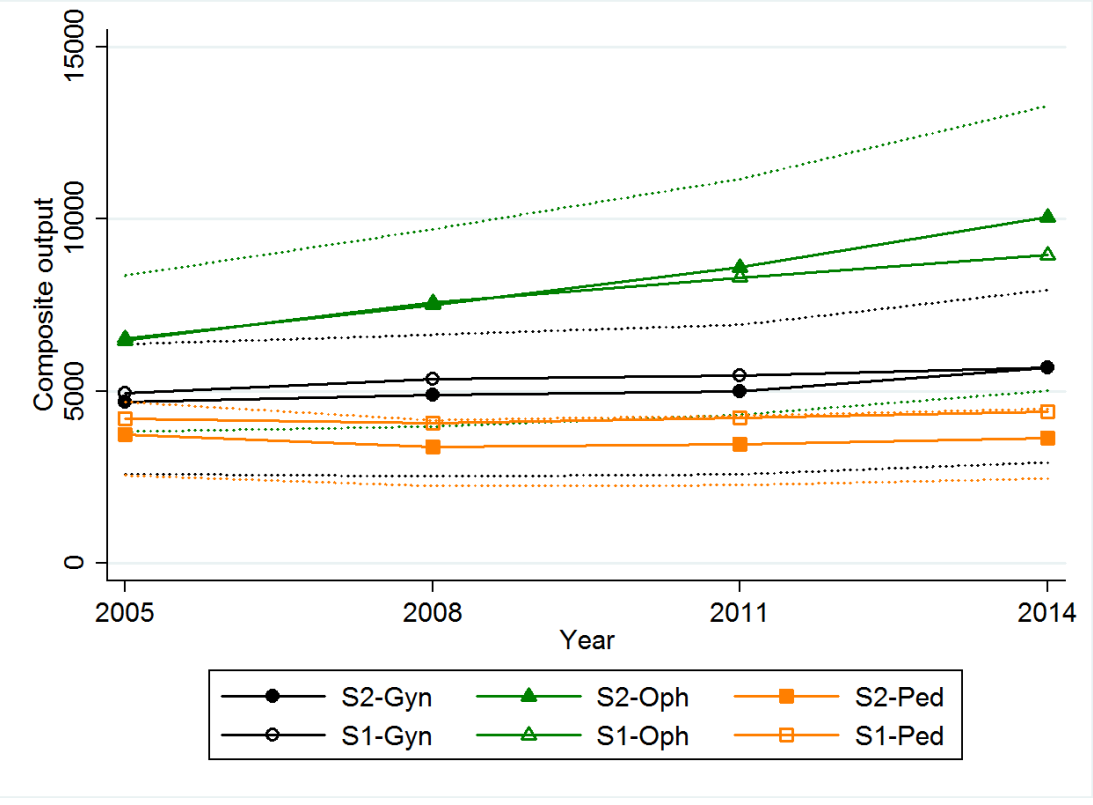
Composite price

$$p_{it} = \frac{\text{Annual fees}}{q_{it}} = \frac{\sum_j p_{ijt} n_{ijt}}{q_{it}} = \bar{p}_{0t} \frac{\sum_j p_{ijt} n_{ijt}}{\sum_j \bar{p}_{jt} n_{ijt}} = \bar{p}_{0t} \left(1 + \frac{\sum_j \delta_{ijt} \bar{p}_{jt} n_{ijt}}{\sum_j \bar{p}_{jt} n_{ijt}} \right)$$

with δ_{ijt} = extra-billing rate on procedure j

Output

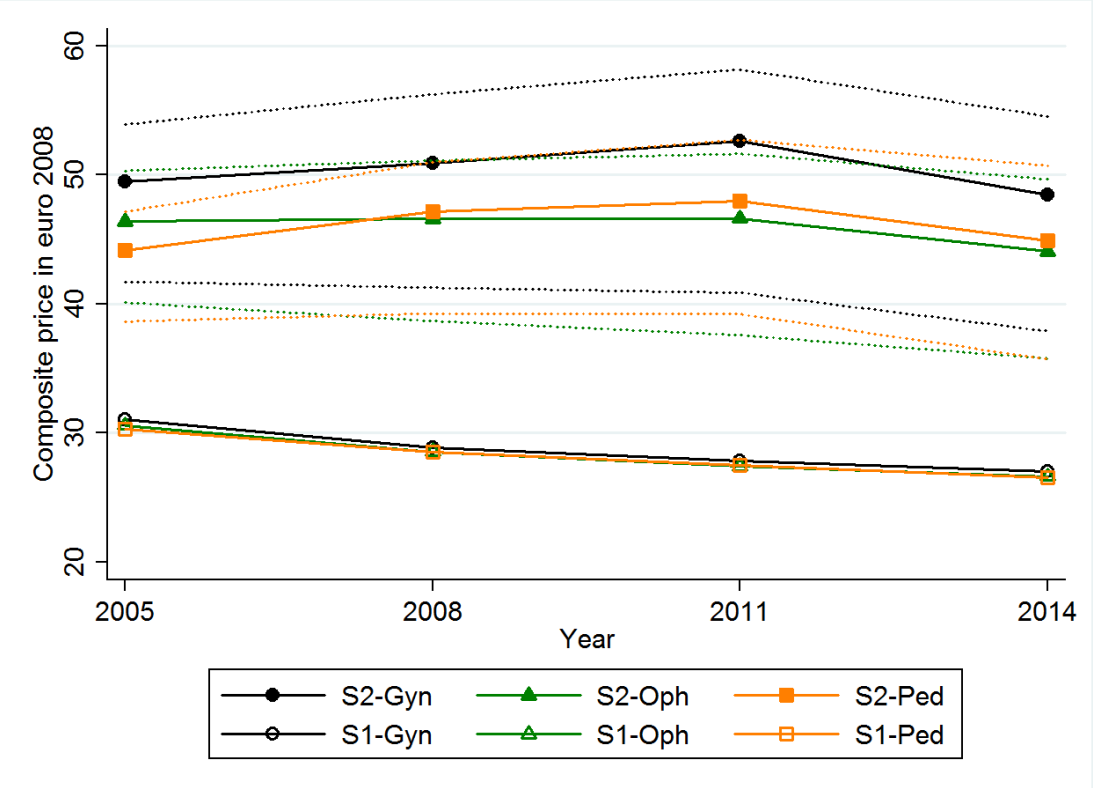
Figure 3: Composite output



- Dotted lines: interquartile intervals
- No big difference between S1 and S2 physicians

Price

Figure 4: Composite price in 2008 euros



- Individual heterogeneity both in level and in variations
- Temporal break in 2011 possibly linked to arrangement introduced in Nov 2012 ("*Contrat d'accès aux soins*")? (20% had enrolled in January 2014)

Competition indicators for S2 physicians

Table 2: S2 physicians: Competition environment in 2014

	mean	p50	p25	p75	sd
Free-billing competitors	45.45	20.07	7.06	55.50	57.98
Regulated-fee competitors	13.92	11.19	5.05	20.65	10.75
Δ Free-billing competitors	-1.04	0.00	-1.74	0.83	3.64
Δ Regulated-fee competitors	-1.21	-0.83	-2.08	0.00	1.66
% wo competitor changes	0.01	0.00	0.00	0.00	0.09
% with same nb of competitors	0.02	0.00	0.00	0.00	0.15
% with less competitors	0.71	1.00	0.00	1.00	0.45
% with more competitors	0.27	0.00	0.00	1.00	0.44
Free-billing medical density	8.80	8.16	5.11	12.28	4.37
Δ Free-billing log medical density	-0.00	-0.01	-0.04	0.03	0.10
Regulated-fee medical density	3.78	3.10	2.22	4.92	2.32
Δ Regulated-fee log medical density	-0.06	-0.05	-0.11	-0.01	0.12
Observations	3774				

Competition indicators for S2 physicians

- 45 S2 competitors and 14 S1 competitors on average
  - Exponentially distance-weighted: 1 at 0 minutes, .5 at 10 minutes, 0 at 45 minutes
- Median number of S2 competitors (20 competitors) well below the mean
- Large interquartile
- Average number of competitors fell between 2011 and 2014
- but 25% of physicians experienced a rise in their S2 competitors.
- Virtually all S2 physicians experience a change in their competitive environment

Competition indicators for S1 physicians

Table 3: S1 physicians : Competition environment in 2014

	mean	p50	p25	p75	sd
Free-billing competitors	15.01	5.00	1.20	14.98	27.98
Regulated-fee competitors	9.38	6.89	3.00	12.79	8.82
Δ nb of free-billing competitors	-0.07	0.00	-0.34	0.47	1.89
Δ nb of Regulated-fee competitors	-0.78	-0.37	-1.22	0.00	1.34
% wo competitor changes	0.02	0.00	0.00	0.00	0.13
% with same nb of competitors	0.05	0.00	0.00	0.00	0.22
% with less competitors	0.63	1.00	0.00	1.00	0.48
% with more competitors	0.32	0.00	0.00	1.00	0.46
Free-billing medical density	4.44	3.59	1.36	6.44	3.85
Δ free-billing log medical density	0.03	0.00	-0.04	0.07	0.19
Regulated-fee medical density	5.52	4.92	3.30	7.29	2.83
Δ Regulated-fee log medical density	-0.07	-0.05	-0.12	-0.00	0.13
Observations	3855				

Competition indicators for S1 physicians

- Much less S2 competitors (15 instead of 45 on average)
- To a smaller degree, also have less S1 competitors (9 instead of 14)
- a large dispersion in the number of S2 competitors, with an interquartile range (1;15)
- S1 physicians face a reduction in the number of S1 competitors (minus one competitors). Half of them face a rise in S2 competitors and the other half a fall.
- Virtually all S1 physicians experience a change in their competitive environment
  - 63% (32%) face a reduction (a rise) in the number of competitors

Medical densities

- computed at the zipcode level
- two-step floating catchment area method used to measure spatial accessibility (*Accessibilité Potentielle Localisée*)

$$d_z = \sum_j w(t_{zj}) \frac{m_j}{\sum_i \text{pop}_i \; w(t_{ij})}$$

  - z: Zipcode
  - m_j = Number of physicians in neighboring zipcode j
  - i = Neighboring zipcodes of j
  - $w(t) = \exp(-\alpha t)$ as above

All physicians experience a decline of the S1-density, with an average of -6%

Medical densities

For S2 physicians

- Face more competition from S2 than from S1 (8.8/100,000 instead of 3.8/100,000)
- high dispersion around the mean
- Fairly stable between 2011 and 2014
- Some physicians face more competition from S2 in 2014 than in 2011, some face less

For S1 physicians

- Average S2-medical density 4.4/100,000
- Average S1-medical density 5.5/100,000
- Some physicians face more competition from S2 in 2014 than in 2011, some face less

Outline

1 Modeling physician labor supply in a competitive environment

2 Data and industry background

3 Empirical strategy

4 Results

5 Concluding comments

Empirical strategy

Price and output depend on

- Perceived quality: $\alpha_i^q + Q(Exp_{it})$
- Preferences: $\alpha_i^\Phi + \Phi(X_{it})$, non-professional income, kids, etc.
- Same for competitors: $v_{G_t(i)}$, where $G_t(i)$ set of competitors
- Competitive environment: densities S1, S2, GP
- Characteristics of the local demand: pop, wealth, age structure

Step 1: Take time-first differences

Get rid of fixed part

1. perceived quality of physician and competitors
2. fixed part of demand

Only stayers contribute

Endogeneity of densities S1 and S2

Location choice potentially creates upward bias for the effect of density on price

- Unobserved *variations* of demand and competitors quality/preferences
- Potentially correlated with *changes* in medical densities
- Physicians likely to move in areas where unobserved demand increases

Instrument for $\text{density}_t - \text{density}_{t-1}$: density of old physicians at $t-1$

- Negatively correlated with variation of density (first-stage)
- Independent from changes in demand between $t-1$ and t
- Less clear for correlation with competitors average quality

Two endogenous variables (densities S1 and S2) and two instruments

- Use Sanderson and Windmeijer (2016)
- Enough power to identify the two effects separately

Estimating equations

Equilibrium equations: Price S2 and Quantities (S1 and S2)

- densities, demand variables, individual and competitors characteristics (experience and preferences)

Inverse demand: Price

- quantities S1 and S2, demand variables, experience
- no physician or competitor preferences

Output reaction function: Quantities (S1 and S2)

- Quantities of competitors, demand variables, individual characteristics (experience and preferences)
- No competitors preferences

Note: mostly non-significant

Outline

1 Modeling physician labor supply in a competitive environment

2 Data and industry background

3 Empirical strategy

4 Results

5 Concluding comments

Output equation for fee-regulated specialists (3 specialties)

	OLS Output	IV Output
D.Log local medical density S2	-0.021*	-0.034
	(0.012)	(0.080)
D.Log local medical density S1	-0.089***	-0.054
	(0.024)	(0.125)
D.Local GP log density	0.009	0.010
	(0.033)	(0.035)
D.Non professional Log income /100	-0.714***	-0.713***
	(0.177)	(0.177)
D.Non physician Log income /100	-0.311**	-0.314**
	(0.130)	(0.131)
D.Child/ex-spouse support (y/n)	0.003	0.003
	(0.008)	(0.008)
D.$\leq$3 yo child (y/n) x Women	-0.108***	-0.108***
	(0.020)	(0.020)
D.$\leq$3 yo child (y/n) x Men	-0.022	-0.022
	(0.035)	(0.035)
D.Log Nb persons in Household	0.003	0.003
	(0.014)	(0.014)
D.Log local population	-0.053	-0.035
	(0.162)	(0.190)
D.Local log median income	-0.148	-0.138
	(0.238)	(0.236)
L.Experience in years/10	-0.013	-0.012
	(0.025)	(0.025)
L.Experience^2/100	-0.014**	-0.014**
	(0.007)	(0.007)
Constant	0.194***	0.194***
	(0.032)	(0.032)
Observations	12995	12995
R^2	0.035	0.034
$R^2 adj$	0.033	0.033
endogeneity test (pval)		0.868
Nb inst.		2.000
1st st. F excluded for S1-med dens		359.480
1st st. F excluded for S2-med dens		277.300
Sanderson-Windmeijer F-test for S1-med dens		452.570
Sanderson-Windmeijer F-test for S2-med dens		408.774
Stock-Wright S (joint 0) (pval)		0.892
Anderson-Rubin (joint 0) (pval)		0.892

Standard errors in parentheses

Standard errors clustered by physician.

Output equation for fee-regulated specialists (3 specialties)

S1 physician labor supply depend only on own preferences

- Densities S1 et S2: No effect on quantity
- Powerful instruments identify the two medical densities (real zeros!)
- Wealth: No effect on labor supply
- One young kid for women reduces labor supply by 10%
- Income effects on labor supply on labor supply: strong and significant
- Competitors' characteristics have no effect

With number of consultations instead of composite output

Same results, except for population wealth

Price and output for free-billing specialists (3 specialties)

	OLSP	OLSO	IVP	IVO
D.Log local medical density S2	-0.035***	-0.083***	-0.710***	0.615**
	(0.008)	(0.025)	(0.083)	(0.206)
D.Log local medical density S1	-0.008	-0.022	-0.356***	0.517**
	(0.007)	(0.020)	(0.072)	(0.183)
D.Local GP log density	-0.021*	-0.039	0.031*	-0.099**
	(0.013)	(0.039)	(0.018)	(0.044)
D.Non professional Log income /100	0.042	-0.258	0.085*	-0.313
	(0.039)	(0.190)	(0.048)	(0.191)
D.Non physician Log income /100	-0.020	-0.257	-0.012	-0.275*
	(0.030)	(0.160)	(0.037)	(0.164)
D.Child/ex-spouse support (y/n)	0.000	0.015*	0.001	0.014
	(0.002)	(0.008)	(0.003)	(0.009)
D.$\leq$3 yo child (y/n) x Women	0.000	-0.067**	-0.004	-0.063**
	(0.006)	(0.028)	(0.008)	(0.028)
D.$\leq$3 yo child (y/n) x Men	-0.009*	0.001	-0.012*	0.002
	(0.005)	(0.013)	(0.006)	(0.013)
D.Log Nb persons in Household	-0.001	0.029**	-0.000	0.028**
	(0.003)	(0.013)	(0.004)	(0.014)
D.Log local population	0.163**	-0.322	-0.355**	0.344
	(0.069)	(0.219)	(0.120)	(0.322)
D.Local log median income	0.751***	-0.916**	0.961***	-1.128***
	(0.091)	(0.300)	(0.127)	(0.332)
L.Experience in years/10	0.008*	-0.147***	-0.003	-0.136***
	(0.004)	(0.020)	(0.006)	(0.021)
L.Experience^2/100	-0.001	0.016**	0.001	0.014**
	(0.001)	(0.006)	(0.002)	(0.006)
Constant	-0.063***	0.277***	-0.075***	0.296***
	(0.010)	(0.033)	(0.014)	(0.036)
Observations	11640	11640	11640	11640
R^2	0.117	0.082	-0.380	0.028
R^2adj	0.116	0.081	-0.383	0.027
rho	-0.266			
Breusch_Pagan_pvalue	0.000			
endogeneity test (pval)			0.000	0.002
Nb inst.			2.000	2.000
1st st. F excluded for S1-med dens			175.382	175.382
1st st. F excluded for S2-med dens			189.606	189.606
Sanderson-Windmeijer F-test for S1-med dens			165.721	165.721
Sanderson-Windmeijer F-test for S2-med dens			170.382	170.382
Stock-Wright S (joint 0) (pval)			0.000	0.006
Anderson-Rubin (joint 0) (pval)			0.000	0.006

Price and output for free-billing specialists (3 specialties)

S2 physicians work less if density falls

- Densities have a strong effect on price (< 0) and quantity (> 0)
- Powerful instruments identify the two medical densities
- Wealth: Strong effect on price (> 0) and quantity (< 0)
- Experience: Concave effect on labor supply
- Young kids for women
- Income effects on labor supply on labor supply: elasticity -.3 but imprecise
- Competitors' characteristics have no effect

Table 4: Adding 446 physicians (5% of total)

	All fee-regulated (S1) (%)	All free-billing (S2) (%)
Medical density (S1)	10.5	
Medical density (S2)		9.6
Price (S2)	-3.7 (0.75)	-6.8 (0.80)
Individual quantity (S1)	-0.6 (1.31)	-0.3 (0.77)
Quantity S1	9.9 (1.31)	-0.3 (0.77)
Individual quantity (S2)	5.4 (1.91)	5.9 (1.97)
Quantity S2	5.4 (1.91)	15.5 (1.97)
Total quantity	7.4	8.7

Adding physicians in Section 2 decreases price in S2 by more, thus reducing price dispersion, and increases activity by more

Bias in the estimate of density

Estimated impact on S2-density on Prices

- Pooled equation in cross-section:
  - $.079^{***}$: densities, demand variables, physician characteristics, year effects
  - $.002$: with physician zipcode effects
  - $-.042^{**}$: with physician effects
- Time-difference and instrument density: $-.710^{***}$
- Confirming upward bias

Estimated impact on S1-density on prices

- $-.356^{***}$
- Pooled estimates are much higher (but non-monotonic)

Price and Output in differences (IV) depending on regulatory environment

	IVP APLS1>Median	IVO APLS1>Median	IVP APLS1<Median	IVO APLS1<Median
D.Log local medical density S2	-0.297***	0.226	-1.684***	1.460**
	(0.048)	(0.151)	(0.402)	(0.638)
D.Log local medical density S1	-0.108**	0.137	-0.475**	0.281
	(0.048)	(0.149)	(0.151)	(0.248)
D.Local GP log density	0.019	-0.047	0.087**	-0.151*
	(0.020)	(0.051)	(0.044)	(0.080)
D.Non professional Log income /100	0.069	-0.300	0.094	-0.305
	(0.054)	(0.187)	(0.086)	(0.332)
D.Non physician Log income /100	-0.041	-0.060	0.020	-0.478
	(0.036)	(0.131)	(0.076)	(0.307)
D.Child/ex-spouse support (y/n)	0.003	0.013	0.003	0.013
	(0.003)	(0.012)	(0.005)	(0.013)
D.$\leq$3 yo child (y/n) x Women	-0.004	-0.040	-0.013	-0.098
	(0.007)	(0.026)	(0.019)	(0.063)
D.$\leq$3 yo child (y/n) x Men	-0.014**	0.001	-0.006	0.008
	(0.006)	(0.017)	(0.013)	(0.021)
D.Log Nb persons in Household	0.006	0.015	-0.003	0.040**
	(0.004)	(0.019)	(0.008)	(0.019)
D.Log local population	-0.016	0.086	-1.151**	0.684
	(0.096)	(0.293)	(0.352)	(0.681)
D.Local log median income	0.555***	-0.596	2.532***	-2.472**
	(0.119)	(0.367)	(0.460)	(0.882)
L.Experience in years/10	0.008	-0.151***	-0.014	-0.142***
	(0.006)	(0.022)	(0.012)	(0.040)
L.Experience^2/100	-0.002	0.021**	0.004	0.011
	(0.002)	(0.007)	(0.003)	(0.011)
Constant	-0.056***	0.296***	-0.215***	0.504***
	(0.013)	(0.040)	(0.042)	(0.085)
Observations	5868	5868	5767	5767
R^2	-0.026	0.084	-1.160	-0.011
R^2adj	-0.030	0.081	-1.167	-0.014
endogeneity test (pval)	0.000	0.171	0.000	0.007
Nb inst.	2.000	2.000	2.000	2.000
1st st. F excluded for S1-med dens	127.402	127.402	24.256	24.256
1st st. F excluded for S2-med dens	160.389	160.389	12.934	12.934
Sanderson-Windmeijer F-test for S1-med dens	240.121	240.121	85.844	85.844
Sanderson-Windmeijer F-test for S2-med dens	241.550	241.550	55.188	55.188
Stock-Wright S (joint 0) (pval)	0.000	0.319	0.000	0.019
Anderson-Rubin (joint 0) (pval)	0.000	0.318	0.000	0.018

Standard errors in parentheses

Standard errors clustered by physician.

Inverse demand for free-billing (S2) physicians (3 specialties)

D.Log Price	OLSP	IVP	IVP
D.Log Output	-0.073***	-0.108	-0.151**
	(0.009)	(0.073)	(0.058)
D.Free-billing Compet. Log Output	-0.007***	-0.254***	-0.163***
	(0.002)	(0.058)	(0.029)
D.Regulated Compet. Log Output	-0.004	-0.228*	-0.044
	(0.003)	(0.119)	(0.033)
D.Local GP log density	-0.026**	-0.015	-0.020
	(0.012)	(0.022)	(0.016)
D.Log local population	0.167**	0.370**	0.261**
	(0.065)	(0.132)	(0.090)
D.Local log median income	0.658***	0.149	0.339**
	(0.086)	(0.303)	(0.158)
L.Experience in years/10	-0.003	-0.014	-0.019*
	(0.004)	(0.014)	(0.011)
L.Experience^2/100	0.000	0.002	0.002
	(0.001)	(0.002)	(0.002)
Constant	-0.051***	0.101*	0.040
	(0.010)	(0.055)	(0.030)
Observations	11953	11640	11527
R^2	0.180	-1.321	-0.410
$R^2 adj$	0.179	-1.324	-0.411
endogeneity test (pval)		0.000	0.000
Nb inst.		7.000	17.000
1st st. F excluded for output		3.315	2.275
1st st. F excluded for S1 compet. output		11.838	7.739
1st st. F excluded for S2 compet. output		9.598	8.394
Stock-Wright S (joint 0) (pval)		0.000	0.000
Anderson-Rubin (joint 0) (pval)		0.000	0.000

Standard errors in parentheses

Standard errors clustered by physician. Controls for years, specialities and age composition of local population.

Variations of Log outputs instrumented with lagged log densities of physicians older than 60 per sector, non practice income variables and characteristics of her household

All specialties. Only stayers are included in the sample

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$

Inverse demand for free-billing (S2) physicians (3 specialties)

Larger quantity of competitors decreases price

- Weak instruments
- Column (2): Anderson-Rubin test
- Not clear that own quantity decreases price (poorly instrumented), theoretically unimportant
- Population wealth increases price, not always significant

Reaction function for fee-regulated specialists (3 specialties)

	OLS Output	IV Output
D.Free-billing Compet. Log Output	0.001	-0.009
	(0.002)	(0.021)
D.Regulated Compet. Log Output	0.012	-0.030
	(0.011)	(0.068)
D.Local GP log density	0.006	0.009
	(0.033)	(0.035)
D.Non professional Log income /100	-0.714***	-0.714***
	(0.177)	(0.178)
D.Non physician Log income /100	-0.320**	-0.319**
	(0.130)	(0.131)
D.Child/ex-spouse support (y/n)	0.003	0.003
	(0.008)	(0.008)
D.$\leq$3 yo child (y/n) x Women	-0.106***	-0.106***
	(0.020)	(0.020)
D.$\leq$3 yo child (y/n) x Men	-0.022	-0.023
	(0.035)	(0.035)
D.Log Nb persons in Household	0.004	0.003
	(0.014)	(0.014)
D.Log local population	-0.007	0.029
	(0.159)	(0.161)
D.Local log median income	-0.118	-0.161
	(0.236)	(0.233)
L.Experience in years/10	-0.012	-0.012
	(0.025)	(0.025)
L.Experience^2/100	-0.014**	-0.014**
	(0.007)	(0.007)
Constant	0.188***	0.202***
	(0.031)	(0.040)
Observations	12995	12995
R^2	0.034	0.029
$R^2 adj$	0.032	0.028
endogeneity test (pval)		0.822
Nb inst.		2.000
1st st. F excluded for S1 compet. output		41.886
1st st. F excluded for S2 compet. output		149.105
Sanderson-Windmeijer F-test S1 compet. output		100.092
Sanderson-Windmeijer F-test for S2 compet. output		122.695
Stock-Wright S (joint 0) (pval)		0.892
Anderson-Rubin (joint 0) (pval)		0.892

Standard errors in parentheses

Standard errors clustered by physician.

Reaction function for fee-regulated specialists (3 specialties)

- No effect of higher competitors output
- No effect of population wealth
- Very similar to equilibrium equation

Reaction function for free-billing specialists (3 specialties)

	OLS Output	IV Output
D.Free-billing Compet. Log Output	0.006	0.272**
	(0.005)	(0.105)
D.Regulated Compet. Log Output	0.024**	0.477**
	(0.008)	(0.216)
D.Local GP log density	-0.045	-0.058
	(0.039)	(0.046)
D.Non professional Log income /100	-0.264	-0.293
	(0.189)	(0.198)
D.Non physician Log income /100	-0.257	-0.275
	(0.160)	(0.167)
D.Child/ex-spouse support (y/n)	0.015*	0.015
	(0.008)	(0.009)
D.$\leq$3 yo child (y/n) x Women	-0.067**	-0.072**
	(0.028)	(0.028)
D.$\leq$3 yo child (y/n) x Men	0.001	0.003
	(0.013)	(0.014)
D.Log Nb persons in Household	0.029**	0.034**
	(0.013)	(0.014)
D.Log local population	-0.283	-0.550**
	(0.217)	(0.264)
D.Local log median income	-0.921**	-0.294
	(0.301)	(0.554)
L.Experience in years/10	-0.146***	-0.140***
	(0.020)	(0.021)
L.Experience^2/100	0.016**	0.014**
	(0.006)	(0.006)
Constant	0.343***	0.140
	(0.035)	(0.103)
Observations	11640	11640
R^2	0.082	-0.110
$R^2 adj$	0.080	-0.112
endogeneity test (pval)		0.008
Nb inst.		2.000
1st st. F excluded for S1 compet. output		39.876
1st st. F excluded for S2 compet. output		25.908
Sanderson-Windmeijer F-test S1 compet. output		34.939
Sanderson-Windmeijer F-test for S2 compet. output		35.237
Stock-Wright S (joint 0) (pval)		0.006
Anderson-Rubin (joint 0) (pval)		0.006

Standard errors in parentheses

Standard errors clustered by physician.

Reaction function for free-billing specialists (3 specialties)

Upward sloping output response

- No effect of higher competitors output
- Negative but non-significant effect of population wealth
  - significant at 10% if output of S1 and S2 competitors pooled
- Very similar to equilibrium equation

Outline

1 Modeling physician labor supply in a competitive environment

2 Data and industry background

3 Empirical strategy

4 Results

5 Concluding comments

Concluding comments

Does physician labor supply respond to competition?

- S1: No
- S2: Yes, through the channel:

  More competition $\Longrightarrow$ Fall in price $\Longrightarrow$ Negative income shock

- Upward sloping reaction function in quantity