The determinants of physicians' choices for location :
a discrete choice analysis for French General Practitioners

Eric Delattre

ENSAI and CREST-LSM

Anne-Laure Samson

LEDa-Legos, Université Paris Dauphine

Purpose of the paper

▶ Examine factors affecting GPs' location choices for establishing their initial practice

▶ Microeconometric analysis :
  ▶ Estimation of discrete choice models to evaluate the impact of monetary and non monetary variables (weather conditions, etc) on the choice of one region.

  ▶ Simulations of the impact of financial incentives on GPs' locations choices

Outline

- The French regulation of medical demography

- Data and descriptive statistics on the geographic location of French GPs

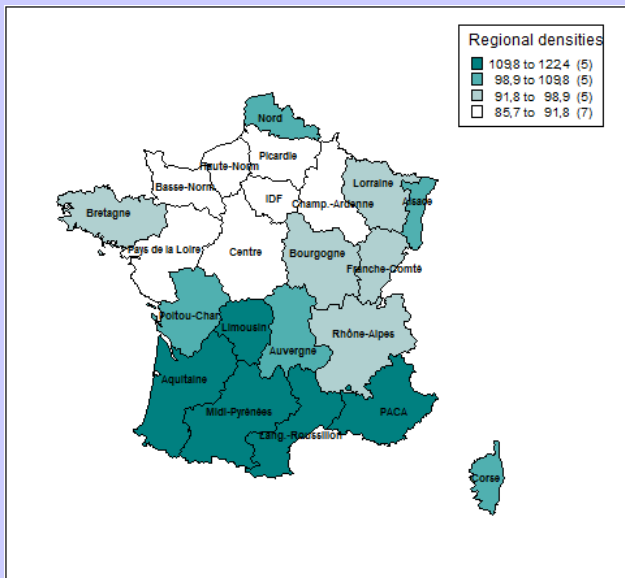- Microeconometric analysis of GPs' choice of practice location and policy implications

- I -
The French regulation of medical demography

A high GPs :population ratio in France

But large inequalities in the distribution of GPs

Consequences

▶ In regions where medical density is low : Inequalities in access to care
  ⇒ It induces rationing for patients (equity problems)

▶ In regions where medical density is high : Supply-induced demand (SID) for sector 1 GPs
  ⇒ This creates inappropriate expenses (efficiency problems)

▶ French context : ageing of the physician population, feminization of the profession, decline in the attractiveness of the GP profession and of the self-employed status.

  ⇒ To regulate the geographic location of GPs is of major concern for public policies

The French regulation of ambulatory care

- Payment system
  - Fee-for-services
  - Fixed prices for 87% of GPs (sector 1 GPs) - overbilling is forbidden

- Number of practicing physicians :
  - Numerus Clausus : a restricted number of places in medical schools since 1971

- **But no regulation of the geographic location of GPs (until recently) : after graduation, GPs are free to choose where they practise**

Public policies to improve the geographic repartition of doctors are recent

- ▶ Since 2000 : The numerus clausus is splitted into the different regions according to their future needs for physicians
  ⇒ Policy designed at the regional level
  ⇒ But a very long-term policy

- ▶ Since 2004 : grants and financial incentives are provided to prompt new GPs to settle in areas with low level of medical density
  ⇒ Policy designed at the local level (municipality)
  ⇒ Reform too recent to be evaluated
  ⇒ It concerns very few GPs

Questions raised

▶ What factors (monetary and non monetary) affect French GPs' choices of location ?

⇒ What kind of policy could improve the geographic repartition of GPs over the French territory ?

⇒ Choice of location = choice of the region of practice

▶ Small literature on this subject :
  ▶ Large literature on the measurement of the inequal repartition of physicians (Gini indexes)
  ▶ But smaller literature on explaining the choices of location (Bolduc et al., 1996 ; Goddard et al., 2010) ;

- II -

# Data and descriptive statistics on the geographic location of French GPs

Data

- ► An exhaustive data set about GPs :
    - ► All French self-employed GPs who started their practice between 1997 and 2002
    - ► Reliable information : drawn from the administrative files collected by the public health insurance (CNAMTS)
    - ► 9 000 GPs (sector 1 GPs) - 32 000 individual-year observations
    - ► Panel dimension of the data is not taken into account : we keep information on the first year a GP appears in the data set

- ► Variables :
    - ► At the individual level : age, gender, level and composition of the activity, year and region of the MD
    - ► Information on the location : region (22) ; département (96) ; urban or rural area
    - ► At the regional level : expected income and activity, hedonic variables (weather conditions), GPs :pop ratio, specialists :pop ratio,...

What drives location choices for French GPs (1) ?

Region	med. density	income	sun hours	health exp.
Centre	88.6	67,000€	1,718	229€
Picardie	89.7	78,000€	1,631	233€
Basse Norm.	90.3	66,000€	1,651	206€
Midi-Pyr	117	61,000€	2,012	267€
PACA	126	56,000€	2,881	309€
Langu-Rouss	128	59,000€	2,510	284€

- Practicing in regions where medical density is low is already financially attractive
- A trade-off between income / quality of life ?
- Disparities in the location of GPs explained by differences in health care demand ? Higher needs in the south or physician induced demand ?

What drives location choices for French GPs (2) ?
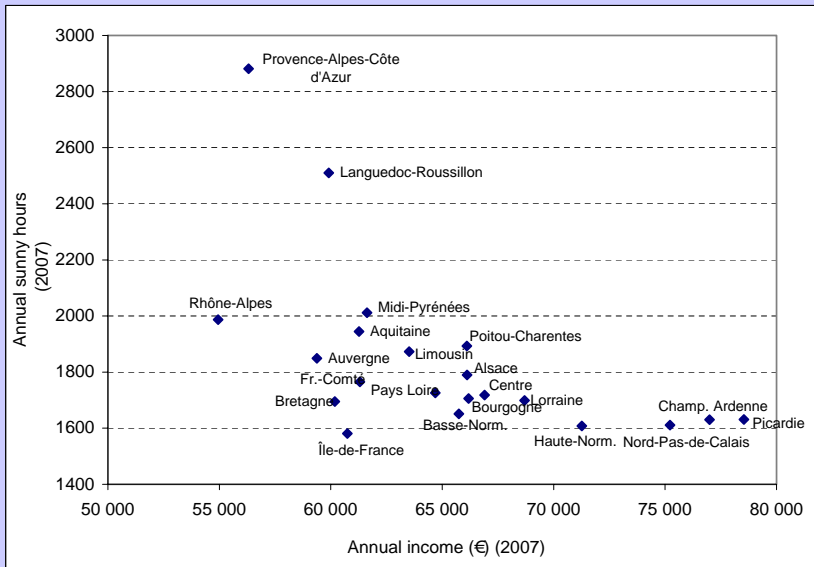
What drives location choices for French GPs (3) ?

- ▶ Low mobility after graduation : 74% of new GPs begin their practice in the region of their MD.

- ▶ Logit model : to explain the probability for GPs to leave their region of graduation :
  - ▶ Characteristics of the GPs (gender, age)
    - ▶ young GPs are more likely to leave their region of MD (proxy of marital status ?) ; no effect of gender
  - ▶ Characteristics of their region of graduation.
    - ▶ GPs are less likely to leave regions of the south of France
    - ▶ i.e. GPs are less likely to leave regions with a low level of income, with access to seaside and a high level of hours of sun.

Strong inequalities between regions of graduation
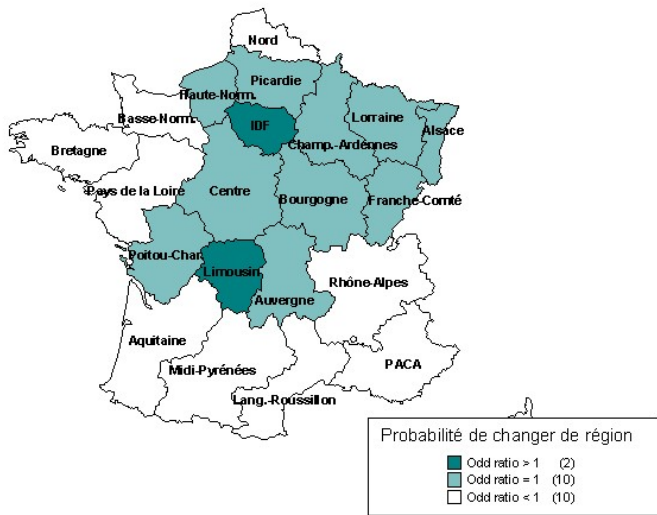
Summary

▶ The mobility of students is low, in all regions : Important to develop policies influencing *students* location choices in order to correct regional disparities
  ⇒ More variations in the numerus clausus ? scholarships ?

▶ What makes some regions be more attractive to GPs than others ? Influence of the expected level of income, of the expected quality of life or the level of demand for health care ?

- III -

Microeconometric analysis of GPs' choice of practice location

Econometric framework

▶ The Utility of GP i for practicing in region j is :
$$U_{ij} = X'_{jt}\beta + Z'_i\gamma + \alpha_j + \epsilon_{ij}, i = 1, ..., N \text{ et } j = 1, ..., J$$

▶ GP i chooses to locate in region j if $U_{ij} \geq U_{ik}, \forall k = 1, ..., J$

▶ We estimate a conditional logit model (where the ϵ_{ij} are supposed to be iid) :

$$\begin{cases} y_{ij} = 1 \text{ if } U_{ij} \geq U_{ik} \ \ \forall k = 1, ...J \\ y_{ij} = 0 \text{ otherwise} \end{cases}$$

▶ We measure $p_{ij} = P(y_i = j) = \frac{exp(X'_{jt}\beta + Z'_i\gamma + \alpha_j)}{\sum exp(X'_{jt}\beta + Z'_i\gamma + \alpha_j)}$

Potential explanatory variables

- Regional fixed effects α_j

- GP specific variables (gender, age) in Z_i'

- Variables characterizing the region of practice (X_{jt})

    - a "sedentarity dummy" that equals 1 if the GP begins his practice in the region in which he obtained his MD

    - The average level of income expected in each region j
      $\Rightarrow$ Its effect is theoretically undetermined, depending on GPs preference for leisure

    - Potential demand faced by the GP (GPs :pop. ratio and specialists :pop ratio)
      $\Rightarrow$ effect of the GPs :pop ratio also undetermined

    - Characteristics of the population (income, % of pop aged 75 and more)

    - Amenities (number of hours of sun, seaside access, house rents, number of rotary clubs,...)

The choice of the region of practice

Characteristics of the region	Model 1-a	Model 1-b	Model 2-a	Model 2-b
Regional dummies	YES	-	YES	-
Sedentarity dummy	-	-	17.5***	15.6***
GPs' income	0.073**	0.070**	0.128**	0.121**
GPs' income sq.	-0.006**	-0.006**	-0.001**	-0.0008**
Retiring GP dens	-0.116	-0.033	-0.311***	-0.338***
Retiring GP dens sq.	0.026**	0.010	0.039*	0.033
Unemployement rate	0.083**	-0.048**	-0.045	-0.044
Price of flats	0.0004**	-0.00013	0.0003	-0.0001
Inhabitants income	-0.00004	-0.00015	-0.0006	-0.0002**
Number of hours of sun	-	-0.531	-	2.483***
Number of hours of sun sq.	-	0.073	-	-0.339***
Nmber of Rotary Clubs	-	0.024***	-	0.022***
GPs:pop ratio	-	-0.153**	-	-0.330***
GPs:pop ratio sq.	-	0.0008**	-	0.0013***
Spec:pop ratio	-	0.060***	-	0.131***
Spec:pop ratio sq.	-	-0.0003***	-	-0.0006***
Equipment rate	-	0.0045**	-	-0.00003
% aged 75 and more	-	-0.228***	-	0.180*
Seaside access	-	0.268***	-	0.705***
% pop in rural areas	-	0.0055	-	0.0039
Hotels occupation rate	-	-0.023	-	0.004
GP Characteristics	Not reported			

The choice of the region of practice
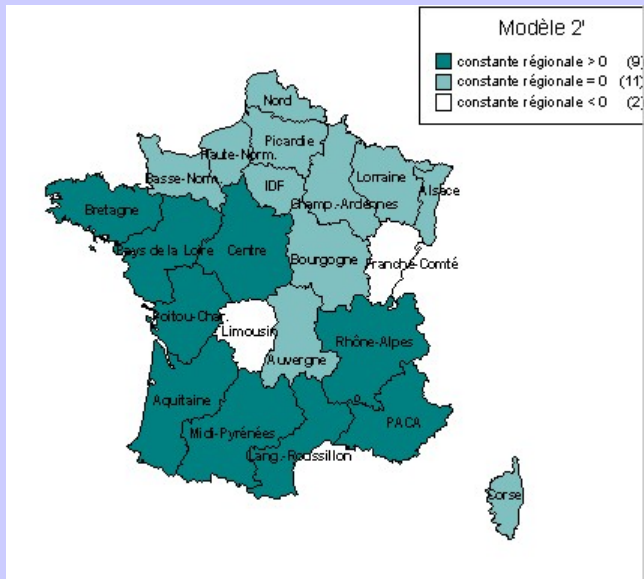
The choice of the region of practice

▶ Large differences of attractiveness among French regions
▶ A strong influence of the training region
▶ Influence of the expected income on the choice of the region of practice

$$U_{ij} = \beta_1 * Income_j + \beta_2 * Income_j^2 + X_j'\beta + Z_i'\gamma_i + \epsilon_{ij}$$

$$\frac{\partial p_{ij}}{\partial Income_j} = p_{ij}(1 - p_{ij})(\beta_1 + 2\beta_2 * Income_j)$$

Table: Marginal effect of income

	Average density	$p_{.j}$	ME (average) w/o sedent. dum	ME (average) with sed. dum
PACA	130	11%	0.00146	0.00415
Bretagne	101	6.6%	0.00053	0.00206
Ile de France	94	4.4%	0.00038	0.00144
Champagne-Ardennes	91	2.6%	-0.00023	0.00019
Nord	103	1.9%	-0.00018	0.00014

▶ GPs could value income differently depending on the region -> 3 kinds of income variables depending on the level of the GPs :pop ratio
▶ Impact of income is higher where the GPs :pop ratio is high

Could incentives influence the geographic distribution of GPs ?

- Impact on individual probabilities of an increase of 5000€ on location choice
- The simulation is only performed for physicians who change location after their MD :
  - Huge costs of moving : large sedentary variable coefficient.
  - Probability of moving does not depend on income

Table: Change in the geographic location

	Number of Settled GPs	Simulated number of GPs (5000€)	Variation
Centre	131	142.5	+8.8%
Ile de France	97	99	+2.1%
Basse Normandie	63	68	+7.9%
Champ. Ardennes	56	57	+1.7%
Lorraine	44	43.5	-1.1%
Bourgogne	64	63	-1.07%
Langu. Rouss	215	213	-1.04%
PACA	240	237	-1.02%

Physicians value more the quality of life

▶ Strong effect of the number of hours of sun
▶ For each region, measurement of the MRS between income and sun
  ▶ Use of this MRS to measure the premium necessary to make GPs who practice in a region with a high GPs :pop ratio to move to a region with a lower GPs :pop ratio.

	Income difference (€)	%	Sun difference (hours)	%	MRS choosen region	Equivalent income
PACA→Centre	12 317	26.85	-1 163	-40.37	12.43	14 455
PACA→IdF*	4 971	10.84	-1 300	-45.12	12.43	16 158
PACA→Basse-Normandie	13 320	26.84	-1 230	-42.69	12.43	15 288
LR** →Centre	5 981	11.45	-792	-31.55	24.69	19 557
LR→IdF	-1 365	-2.61	-929	-37.01	24.69	22 940
LR→Basse-Normandie	689	13.20	-859	-34.22	24.69	21 211

* : Ile de France
** : Languedoc-Roussilon

▶ Equivalent income = amount of income that compensate the loss of sun
▶ Physicians who highly value quality of life keep locating in the south of France because the decrease in the number of hours of sun is not compensated by the increase in income.

An alternative econometric framework ?

- ▶ The conditional logit model and the IIA assumption ?
  - ▶ No correlation between perturbations of different regions
  - ▶ Hausman test rejects the validity of this hypothesis

- ▶ The multinomial probit model ?
  - ▶ Allows for correlation between perturbations of different regions
  - ▶ Computing issues ....

- ▶ A mixed logit model ?
  - ▶ Takes into account correlation between regions
  - ▶ Correlation proportional to the inverse of distances (Bolduc, Fortin and Fournier, 1996)

An alternative econometric framework ?

- A simultaneous model for moving and choice of location ?
  - Need more specific variables for moving : Marital status, relatives and friends location, location at the time of Bachelor graduation,...(not available).

- Endogeneity problems
  - GPs :pop ratio and specialists :pop ratio
  - The sedentarity dummy indicating if the GP begins his practice in the region of his PhD
    $\Rightarrow$ Estimation of a bivariate probit shows that this variable is likely to be endogeneous.

  $\Rightarrow$ How to deal with endogeneity problems in a conditional logit model ?

Conclusion

▶ We explain location choices of French GPs at the regional level
  ⇒ Joint impact of hedonic and economic variables

▶ Potential impact of financial incentives on the geographic
  repartition of physicians
  ⇒ The sedentary behaviour limits the impact of such policies
  ⇒ Other complementary tools have to be designed :
    ▶ policies directed at student may be effective
    ▶ need to constrain GPs NOT to settle in regions where medical
      density is high (already done for pharmacys in France)

▶ Extensions :
    ▶ Test the impact of policies that have been implemented in
      other countries (eg. in New Zealand until 1999 : fees are 10%
      to 25% higher for physicians practicing in rural areas)
    ▶ Are we using the right geographic level to explain GPs location
      choices ? Most policies seem to be designed at the local level
      (rural municipalities,...)