THE DEMAND OF HEALTH CARE SERVICES IN ITALY: A PRELIMINARY STUDY

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Outline of the presentation

- The scientific problem and an introduction to alternative modelling approaches
- The market for physician care in Italy
- Alternative data sources
- Data and the model
- Results and comments

The scientific problem and alternative modelling approaches (1)

- Health care services have peculiar characteristics which make difficult to build a model explaining how the consumer formulates his demand.
- Health can be considered as a durable good that depreciates. By means of net investments, the stock of health capital can be accumulated by combining medical services and other inputs, such as time, to produce new health which counters the effects of aging (Grossman, 1972).

The typical demand is thus determined by the latent variable 'health status', the individual wage rate, a price vector for medical services, a time trend, a vector of environmental effects and the level of education.

The scientific problem and alternative modelling approaches (2)

This approach has not been successful in applied works: results counter to theoretical predictions.

One possible explanation: the process that drives the demand for medical services is more complicated: it involves two agents, the patient and the physician, with asymmetric information about the illness and the possible treatments (agency model).

The demand of health services depends on two different decision processes and thus can be broken down into two stages (Ulrich and Pohlmeier, 1995).

- First stage, it is the patient who decides whether to visit the physician (*contact decision*)
- Second stage: doctors together with the patient determine the duration of the treatment (*frequency decision*).

The scientific problem and alternative modelling approaches (3)

- This two-stage modelling approach has been widely applied in empirical studies.
- It provides a unifying empirical framework for the two above-mentioned theories of health care demand: a Grossman-like interpretation for explaining the contact decision, while an agency perspective could be invoked for the interpretation of the frequency decision.

The Italian market for physician care

- The Italian National Health Service (NHS) was founded in 1978. It is a universal system that provides comprehensive health insurance coverage and uniform health care to the entire population.
- It is mainly financed through general taxation. Co-payments (*tickets*) are imposed for specialist consultations, drugs, ambulatory treatments, certain diagnostic and laboratory tests, and medical appliances.
- Primary care is provided free of charge by general practitioners (GPs) paid according to a *capitation* fee. They should act as *gatekeepers* for access to secondary services.
- NHS specialized ambulatory services, including visits and diagnostics and curative activities, are provided either by public authorities or by accredited public and private facilities.
- Patients may seek care outside the NHS thus resorting to the private market for specialist care.

Data sources: Aggregate level

- A time series of household consumption (based upon the ESA95 *household final consumption expenditure* definition vs. *household actual final consumption*)
- Dataset of health indicators “Health for all”

Data sources: microeconomic level

- A series of repeated cross-section of household expenditures "Indagine sui bilanci familiari" (BF) is available for the period 1985-2004 (based upon the same ESA95 definition)

- A national survey on "Health conditions and medical services utilization" (CS) is conducted by the Italian National Statistical Institute (ISTAT) every 5 years.
  The survey provides a full account of individual health condition, health care utilization, biometric parameters, socio-economic and other relevant variables.
  No information on household income.

Data used in this study

We use the CS survey matched with the BF survey for the household total expenditure.

The integrated dataset allows to estimate the demand for the following items:

- ✓visits to a general practitioner and to several specialists
- ✓diagnostic tests
- ✓hospital services
- ✓rehabilitation care
- ✓pharmaceutical products.

In this study, we focus on medical visits.

The model (1)

We estimate a double hurdle model:

- There is a theoretical connection with a two-step decision-making process as explained above

- It is useful to tackle an important feature of the demand for medical care, which is the high incidence of zero usage

Table 1 – Tabulations of generic and specialist visits

	GP visits			SP visits		
count	Freq.	Percent	Cum.	Freq.	Percent	Cum.
0	47.812.781	83,63	83,63	48.772.510	85,31	85,31
1	6.651.514	11,63	95,26	5.703.656	9,98	95,28
2	1.832.525	3,21	98,47	1.679.837	2,94	98,22
3	476.141	0,83	99,30	504.177	0,88	99,10
4	266.628	0,47	99,77	320.597	0,56	99,67
5	57.767	0,10	99,87	74.844	0,13	99,80
6	30.249	0,05	99,92	44.653	0,08	99,87
7	11.081	0,02	99,94	17.564	0,03	99,90
8	22.553	0,04	99,98	31.879	0,06	99,96
9	10.978	0,02	100,00	14.112	0,03	100,00
Total	57.172.217	100,00		57.172.217	100,00	
Mean	0,2385533			0,2290657		
Variance	0,4318229			0,4831905		

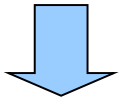
Previous research experience with two-step models for zero expenditures (Bardazzi-Barnabani, 1998).

- Similarities: the occurrence of many zeros, data is very skewed in non-zero range and is intrinsically heteroskedastic (variance increases with mean)
- Differences: we do not work with a continuous variable (expenditure) but with an integer valued dependent variable concentrated on a few low values; the meaning of zeros is somewhat different.

The model (2)

- Count data regression is appropriate when the dependent variable has the characteristics mentioned above.
- Basic count model: Poisson Regression model ⟶ not adequate here because it assumes variance=mean.

It is necessary a model allowing for further heterogeneity (more observations shifted to the tails of the distribution)



Negative binomial Model (Negbin) where the variance is given by $\mu + \alpha\mu 2$.

However, the Negbin model assumes that there is a single process underlying all of the observed values of the dependent variable, whether y equals 0 or is greater than 0.

The model (3)

In the hurdle model, the demand for health services can be specified as follows:

$$I_{ik} = 1(Y_{ik} > 0) = f_{1ik}(Z_{ik}, \varepsilon_{1ik}) \quad [1]$$

$$Y_{ik} = f_{2ik}(X_{ik}, \varepsilon_{2ik}) \quad [2]$$

Table 3 – Description of variables

Dependent variables	*Description*
DVISITS	Number of consultations with a doctor or a pediatrician in the past 4 weeks
SVISITS	Number of consultations with a specialist in the past 4 weeks
Explanatory variables	
-Socioeconomic	
MALE	1 if male
AGE	Age in years
LTEXP	ln(monthly family total expenditure)
EDUC	Education in years
UNEMPLOY	1 if person unemployed
OUTOFLABOR	1 if person out of labour force
NWEST	1 if living in North-western region
NEAST	1 if living in North-eastern region
SOUTH	1 if living in Southern region and islands
- insurance	
INSUR	1 if covered by private health insurance
- health status (short term)	
ACTDAYS	Number of days of reduced activity in past four weeks due to illness or injury
BEDDAYS	Number of days IN BED in past four weeks due to illness or injury
OUTWORKDAYS	Number of days off in past four weeks due to illness or injury
- health status (long term)	
POOR_HEALTH	1 if self-perceived health is poor
DAILYDIFF	1 if the person suffers from a condition that limits activities in daily life
WALKDIFF	1 if the person suffers from walking troubles
SENSDIFF	1 if the person suffers from hearing and eye troubles
HANDICAP	1 if the person suffers from other disabilities
PHYS_LIM	1 if limitation of activity due to chronic illness
SMOKE	1 if smoker
- supply side	
PHYSDENS	Number (per 10.000 inhabitants) of general practitioners and paediatricians (regional)
DOCDENS	Number (per 10.000 inhabitants) of specialists in public and private institutes (regional)
PUBEXP_GEN	Per-capita public health expenditure for general practitioners and paediatricians (regional)
PUBEXP_SPEC	Per-capita public health expenditure for outpatients facilities (regional)
- rationing	
WAIT_DVISITS	Waiting days for visits with a general practitioners or a paediatrician
WAIT_DVISITS	Waiting days for visits with a specialist doctor

REFERENCE INDIVIDUAL: female, employed, living in Central Region, without private insurance, with no physical limitations or disabilities, no smoking, in good health

Comments and results: the Negbin Model

Differences between generic and specialist visits:

- the variables income (total expenditure) and education have different impacts on the two equations. Education may correlate with medical knowledge, so that higher educated persons tend to favour specialists over general practitioners.
- Private insurance is not significant in determining visits to a GP while has a positive effect on specialist consultations.
- Finally, being a smoker increases specialists visits while a non-smoking behaviour apparently determines a higher number of generic consultations.

Comments and results: the Negbin Model

Common results for both equations:

- Women appear to seek more medical care than men, as usually found in empirical studies.
  Individual age play a significant role in both equations: the effect is strictly increasing.
  Being out of the labour force increases the demand of both consultations compared with being employed: composition of the group and opportunity cost of spending time for visiting a doctor.
- Regional-specific factors make both kind of services more accessible in Northern than in Central Italy, while the contrary is true for the south and the islands.
- Not surprising: individuals who were ill (with days of reduced activity, out-of-work, in poor-health conditions) require more treatment both from a general doctor and from specialists.
- Finally, the last set of variables aimed to proxy the accessibility to medical services show the expected signs with the physician (specialist) density increasing the number of generic (specialist) consultations.

Table 5 - Estimates of the Negative Binomial Model

	Generic visits		Specialist visits
MALE	-0.061**		-0.268***
	(-3.043)		(-12.110)
AGE	0.005***		0.004***
	(9.761)		(5.469)
LTEXP	-0.225***		0.093*
	(-7.381)		(2.537)
EDUC	-0.065***		0.026***
	(-27.302)		(11.054)
UNEMPLOY	-0.108*		-0.051
	(-2.183)		(-1.050)
OUTOFLABOR	0.111***		0.081**
	(4.354)		(2.871)
NWEST	0.185***		0.062*
	(6.721)		(2.122)
NEAST	0.184***		0.159***
	(7.201)		(5.425)
SOUTH	-0.023		-0.043
	(-0.649)		(-1.224)
INSUR	0.051		0.305***
	(1.556)		(9.280)
ACTDAYS	0.051***		0.044***
	(26.544)		(22.528)
BEDDAYS	0.004		0.003
	(0.991)		(0.859)
OUTWORKDAYS	0.044***		0.038***
	(9.542)		(8.507)
POOR_HEALTH	0.505***		0.621***
	(15.627)		(16.712)
DAILYDIFF	-0.142*		-0.255**
	(-1.965)		(-3.116)
WALKDIFF	-0.066		-0.086
	(-0.922)		(-1.015)
SENSDIFF	0.025		-0.154
	(0.311)		(-1.494)
HANDICAP	0.014		0.105
	(0.160)		(1.211)
PHYS_LIM	0.294***		0.481***
	(7.689)		(11.934)
SMOKE	-0.135***		0.082**
	(-4.972)		(2.981)
PHYSDENS	0.098***	DOCDENS	0.032***
	(7.833)		(5.699)
PUBEXP_GEN	0.006***	PUBEXP_SP	-0.005***
	(6.307)		(-4.640)
_cons	0.644		-3.941***
	(1.362)		(-7.028)
_alpha	0.570***		1.201***
	(21.167)		(51.061)
N	140011		140011

* p<0.05, ** p<0.01, *** p<0.001
Robust t-statistics in parentheses

Comments and results: the double hurdle model for generic visits

- The regressors mostly exert on the modelled probability of contacting a generic/specialist doctor a similar effect to what is found in the Negbin model.
- However, some variables (gender, age, supply-side factors) which are relevant for passing the hurdle are not significant in determining the frequency of the treatment.
- The variable “waiting time” to proxy a possible rationing effect in case of GP visits is not significant.

Table 6 – Double Hurdle Model: GP visits

	First hurdle	Second hurdle
MALE	-0.085***	0.071
	(0.021)	(0.040)
AGE	0.005***	0.000
	(0.001)	(0.001)
LTEXP	-0.271***	-0.143*
	(0.034)	(0.057)
EDUC	-0.064***	-0.048***
	(0.003)	(0.005)
UNEMPLOY	-0.178***	0.284**
	(0.052)	(0.107)
OUTOFLABOR	0.058*	0.348***
	(0.026)	(0.067)
NWEST	0.282***	-0.157**
	(0.029)	(0.056)
NEAST	0.328***	-0.259***
	(0.029)	(0.053)
SOUTH	-0.078*	0.102
	(0.036)	(0.065)
INSUR	0.067	-0.095
	(0.035)	(0.071)
ACTDAYS	0.056***	0.028***
	(0.003)	(0.003)
BEDDAYS	0.007	0.002
	(0.006)	(0.006)
OUTWORKDAYS	0.054***	0.017*
	(0.007)	(0.007)
POOR_HEALTH	0.524***	0.396***
	(0.040)	(0.051)
DAILYDIFF	-0.191*	-0.093
	(0.085)	(0.116)
WALKDIFF	-0.037	-0.063
	(0.085)	(0.111)
SENSDIFF	0.094	-0.180
	(0.102)	(0.124)
HANDICAP	-0.025	0.154
	(0.088)	(0.157)
PHYS_LIM	0.296***	0.151*
	(0.045)	(0.066)
SMOKE	-0.148***	-0.026
	(0.028)	(0.063)
PHYSDENS	0.126***	-0.037
	(0.014)	(0.024)
PUBEXP_GEN	0.007***	-0.000
	(0.001)	(0.002)
WAIT_DVISITS		-0.000
		(0.007)
_cons	0.853	1.375
	(0.533)	(0.884)
_alpha		0.369*
		(0.163)
N	140011	19284

Note: Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Comments and results: the double hurdle model for specialist visits

- There is a positive effect on the propensity to contact a specialist of being a female, highly educated, out of the labour force, living in Northern Italy, with a poor health status. Moreover, this probability increases with age and household income.
- Demographic characteristics, which play a major role in passing the first hurdle, are not significant in determining the frequency of visits which depends mainly on a patient's health status including being a smoker.
- Holding a private insurance is relevant in both stages of demand. It may be the effect of an adverse selection process making the frequent health services users to look for supplementary coverage. Another interpretation could be represented by moral hazard where there are incentives by the patient and the physicians for over-treatment (supplier induced demand).
- Supply side variables are relevant in the contact but not in the frequency decision as in the case of generic visits.
- The waiting time negatively affects the intensity of treatment thus suggesting that the specialist health care demand can be somewhat rationed.

Table 7 – Double Hurdle model: Specialist visits

	First hurdle	Second hurdle
MALE	-0.299***	-0.032
	(0.022)	(0.041)
AGE	0.003***	-0.000
	(0.001)	(0.001)
LTEXP	0.114**	-0.082
	(0.036)	(0.070)
EDUC	0.030***	0.005
	(0.002)	(0.005)
UNEMPLOY	-0.064	0.037
	(0.047)	(0.087)
OUTOFLABOR	0.129***	-0.046
	(0.027)	(0.053)
NWEST	0.068*	-0.029
	(0.029)	(0.055)
NEAST	0.179***	0.015
	(0.029)	(0.055)
SOUTH	-0.071*	0.105
	(0.034)	(0.062)
INSUR	0.308***	0.146*
	(0.032)	(0.060)
ACTDAYS	0.050***	0.013***
	(0.002)	(0.003)
BEDDAYS	-0.002	0.012*
	(0.005)	(0.005)
OUTWORKDAYS	0.048***	0.022***
	(0.006)	(0.006)
POOR_HEALTH	0.644***	0.327***
	(0.042)	(0.060)
DAILYDIFF	-0.416***	-0.068
	(0.090)	(0.134)
WALKDIFF	-0.066	-0.033
	(0.089)	(0.143)
SENSDIFF	-0.235*	0.017
	(0.109)	(0.174)
HANDICAP	0.058	0.075
	(0.092)	(0.139)
PHYS_LIM	0.562***	0.140
	(0.046)	(0.073)
SMOKE	0.006	0.288***
	(0.027)	(0.050)
DOCDENS	0.038***	0.004
	(0.006)	(0.010)
PUBEXP_SPEC	-0.003***	-0.004*
	(0.001)	(0.002)
WAIT_SVISITS		-0.003**
		(0.001)
_cons	-4.685***	-0.886
	(0.553)	(1.151)
_alpha		2.122***
		(0.410)
N	140011	19048

Note: Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

What next?

- There is not a clear supremacy of the hurdle model on the count model.
- However, some differences in the two step decision-making could be found thus indicating that this approach could deserve a supplementary analysis.
- How can this modelling approach be reconciled with our multisectoral models? Potential difficulties are:
  - the available dataset has no information about health individual expenditure which is the variable of our demand system;
  - the analysis is performed at the individual level while our cross-section/time-series demand system is at the household level.