

Competition and efficiency in health care: an analysis of the Italian case^{*}

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Abstract

In this paper we look at the Italian National Health System as a case study, in order to investigate whether competition exerts positive effect on the efficiency of the system. Using the DEA technique we measure the efficiency of accredited hospital production at the regional level; secondly, we take a cross-section regression analysis approach to analyse the determinants of efficiency. A general conclusion stemming out of the analysis is that competition is not a value *per se* and that its effects on the performance of the system are affected by the rules governing it.

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1. Introduction

The issue of the efficiency of the National Health System (NHS) is highly debated at the moment in Italy. Very recently¹, the Government has reformed relevant features of the system, with the aim of improving its *value for money*. A detailed analysis of the Italian NHS is outside the scope of this paper; however some of its main features will be outlined to analyse how a crucial economic concept, such as competition, can be applied to the health sector and how it affects the performance of the system.

In this paper we try to point out that competition is not a "value" *per se*, and that its effects on the performance of the system are affected by the rules governing it. With respect to the Italian NHS, attention is focused on accredited hospitals. The analysis is organised in two steps: firstly, we measure the efficiency of accredited hospital production at regional level, using Data Envelopment Analysis (DEA), and secondly, we analyse some of its determinants, taking a cross section regression analysis approach. We reach the conclusion that, given the existing rules, competition affects negatively the performance of the system.

The analysis goes as follows: in section 2 the main institutional features of the Italian NHS are analysed and the solutions provided for competition are examined. In section 3 measures of efficiency are provided and discussed; in section 4 the results of regression analysis are presented and in section 5 some comments and concluding remarks are offered.

2. The Italian National Health System: Institutional Features and Economic Implications

2.1 In the last two decades, the Italian NHS has been subject to different changes. To appreciate the meaning of its evolution and its economic implications, it is useful to trace briefly the main features of its recent history, characterised by three reforms. Not all the features of the NHS will be reviewed but, according to the main objectives of the paper, attention will be concentrated on the rules governing the performance of accredited hospitals², trying to outline what is the real content of competition in the Italian NHS.

The first reform led to the creation of the NHS in 1978³, with the aim of providing universal, comprehensive health services to all citizens. The main features of the system were:

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² Hospital care represents a quite large share of health expenditures in Italy (46,7%), as well as in other European countries (the OECD European countries' average is 46,1%). On the relevance of hospital care, and on the features of the Italian NHS, see Dirindin, Vineis (1999).

³ The National Health Service, instituted by Law 833/78, represents the continuation of a decentralisation process that had begun with the transfer of hospital services (Law 386/1974) and health care services

- public financing (by payroll taxes, contributions from the self-employed, and general revenues);
- central role of public production, with the possibility of purchasing services provided by private accredited providers;
- system of payment for hospitals, characterised by a per in-patient day basis;
- the functions within the NHS are exercised at three different levels⁴: national (the Ministry of Health), regional, and local (the Local Health Units – USL - which were operational structures of the local governmental authorities);
- different financial and managerial responsibilities for its three separate levels of authorities.

The essential objectives that inspired the institution of Italian NHS were health care planning, equality of treatment, public care provision, decentralisation, democratisation, and the coverage of the health expenditure out of general revenues⁵. The system did not turn out to be effective in the spheres of preventive care, planning of health services, providers accountability. Management decentralisation without effective financial responsibility for decisions was frequently responsible for low *value for money*.

2.2. A second reform was undertaken in 1992⁶ and in subsequent Acts, aiming at introducing incentives to efficiency and reduction in public spending. It is worth mentioning here the following changes:

- Cost sharing, as a means of reducing the effect of patients demand on health services, by making patients more “cost conscious”⁷;
- USL structure is modified and a managerial organisation has been introduced;
- Partial split between providers and purchasers, with the creation of independent hospitals, i.e., Hospital Trusts (HTs), bearing full responsibility for their own budgets, management and technical functioning⁸;
- Enhancement of *competition* through the drawing up of identical technical, functional and qualitative criteria for all providers;

(Law 382/1975) to regional authorities. The reason for decentralisation was mainly to match health service provisions with needs, which vary with the particular geographical and social context. The reform thus further adjusted administrative structures to conform with the political decentralisation mandated by the Constitution.

⁴ At the national level, Parliament and Government establish the legal, operative and financial context for the health care service. Some constraints on the role of the Ministry of Health stem from the treasury which presents the Annual health Budget to the Parliament, as a part of the General Budget. The National Health Fund (NHF), once determined at the national level, is, then, re-distributed to the Regions on a per-capita basis, adjusted for needs. Regional Authorities are responsible for framing the provision of health service in the region. The local level is the operational part of the system.

⁵ According to Artoni (1999), the reform achieved some relevant results with respect to the reduction of territorial disparities: in 1977 the Region with the highest expenditure was above the average of 24% while in 1993-95 such a percentage decreased to 14%. The same reduction of disparities occurred for those Regions below the average.

⁶ With the Legislative Decrees 502/1992 and 517/1993 “the reform of the reform” has been launched. Subsequent Acts have introduced marginal specific changes.

⁷ Cost sharing in Italy refers to specialists, some drugs and X-ray. As a consequence, private expenditure has increased in 1994 of 13.6%.

⁸ All hospitals not reorganised as independent entities will be accorded economic and financial autonomy, with separate accounts within the overall budget of their respective USLs.

- Freedom for patients to choose any accredited hospital (i.e. public and private hospitals which provide services paid for by NHS) for the provision of health services;
- More responsibilities to Regional governments⁹;
- A system of payment per case, where fees are set prospectively according to diagnosed medical conditions and standardised treatment costs¹⁰.

More adequate forms of control, at different management levels, have been introduced, involving substantive quality control rather than formal legal checks. For instance, the National Health Plan, which is an instrument for the central regulation of services, must now specify indicators to measure results in terms of health care costs and benefits. These control instruments should be consistent with the uniform levels of assistance set by the Government.

2.3. Italian NHS has achieved significant positive accomplishments and it still suffers from serious shortcomings. Among the accomplishments it is possible to include universal comprehensive health care, linked with the concept of *minimum standard* of care, and equitable access to a wide range of health services. There is, however, a great deal of room for improvement of hospitals efficiency¹¹ and for the containment of hospital, diagnostics, and pharmaceuticals costs. At the same time, the new payment system can induce a decline in quality and an increase of the overall amount of service.

The evolution of the system is marked by the idea of implementing "quasi markets", i.e. a system where NHS is publicly financed but the share of public production decreases, competition among producers is increased, the freedom of choice of citizens is enhanced allowing for the choice between public and private accredited producers. This is in line with the reforms carried out by many OECD countries (see, OECD, 1998), even if it retains some peculiarities¹².

2.4 Major shortcomings of the present system have been pointed out and the Government has very recently approved a new reform. The following points have been introduced:

- Enlarged autonomy of accredited public hospitals;
- New payment system for providers, based on the negotiation of volumes of services, as a means of controlling costs and decreasing supply of unnecessary services;
- New incentive scheme for physicians working in public hospitals: top positions will be assigned on a 5 years base and performance will be monitored;

⁹ The regions must fund any overspending by the USLs out of their own resources. Moreover, the regions shall finance additional expenditure by scaling back exemptions from prescription charges or by increasing the percentage of costs covered by patients contributions or, in part, raising the rate of existing regional health contributions.

¹⁰ The Italian system follows the model of the Diagnostic Related Groups system, (DRGs), introduced in the Medicare program in the United States in 1983.

¹¹ See below, Table 3.2.

¹² See below, section 2.5.

- Restrictions for physicians, working in public hospitals, to sell their services in the private sector¹³.

Such an Act is too recent to allow for any comment about its impact, and intense debate is ongoing. In what follows, therefore, we shall try to outline how a crucial concept such as competition is shaped according to the existing rules of the Italian NHS.

2.5. Competition is used by many OECD countries as a means of improving the quality and efficiency of health care services. Most of the competition initiatives have been focused on the split between purchasers (both public and private insurers) and providers.

From the theoretical point of view, however, the issue of whether competition is beneficial in terms of efficiency is, indeed, controversial. In the literature¹⁴, there is some support for the hypothesis that, because of asymmetrical information, providers may be able to induce private demand and, therefore, competition, rather than lowering prices, may have the effect of increasing them. Such a negative impact of quasi-markets on efficiency, however, is likely to be reduced if a managed care scheme is adopted, i.e., if demand is exerted at an aggregate level, rather than at the level of individual patients. This allows for insurance companies and/or public purchasers to select providers that offer a good range of services at an affordable price, and effectively sets up competition amongst providers¹⁵. A somehow different approach has been recently enacted in the United Kingdom: even if the 1997 reforms preserve the purchaser/provider split established in 1991, the focus is now on co-operation between providers rather than on competition, in the interests of equity, continuity of care and reduced transaction costs.

With respect to such an issue, the evolution of the Italian NHS has moved towards increased competition, but with some peculiarities. Two different types of competitors can be distinguished: the accredited and the non-accredited. The former group includes public hospitals and private hospitals that sell their services to the Region and are reimbursed on a DRG basis. The second group is composed by all private hospitals that sell their services to private clients and are financed by direct payments or reimbursement from private insurers.

Both groups compete each other and the degree of effective competition is due to vary according with the development of private insurance: the more widespread the use of private schemes the greater the degree of competition is likely to be. At the moment, the alternative to the public scheme is rather weak. According to some empirical evidence, private insurance companies are not yet specialised in the field, do not offer specific products, most of them provide coverage mainly for hospital benefits and only very few contract on a general basis with

¹³ Those offering *extra-moenia* services will not be allowed to cover positions within the public accredited hospitals.

¹⁴ For a survey, see Belli (1996).

¹⁵ One example of this is the 1995 reform in Australia, which allowed private health insurance companies to negotiate contracts with individual hospitals, ambulatory care clinics, and health care providers regarding fees charged and services offered. This will enable them to offer better benefits packages to their consumers.

private hospitals¹⁶. Absent any pooling risk system, the market is highly segmented and cream skimming is likely to arise.

As a consequence, in Italy, private schemes only complement public schemes at the margin. Private health sector is still small, financed partly by direct payment and partly by private insurance under the reimbursement model¹⁷. Unlike other countries, where opting out for private insurance is allowed¹⁸, in Italy such a choice is not yet possible on a general basis, though the long-term objective of the reform is to make the participation to the NHS voluntary, rather than compulsory.

Moreover, a rather peculiar issue, related to the competition between public accredited hospitals and private non-accredited hospitals, deserves to be mentioned. Physicians working for the former are allowed to offer their services also in the latter¹⁹. Given the crucial role that doctors play in inducing demand, this implies that such co-existence of roles may lead doctors to compete with themselves. This is especially true for those covering top positions within public hospitals and, as a consequence, perverse effects are likely to arise. In fact, given the ineffective system of rewards and penalties existing within public hospitals, physicians will have stronger incentives to invest effort in the private sector activities and, in doing so, public hospital performance is likely to be severely penalised. In other words, with the existing rules²⁰, competition between the public and the private sector is distorted. As a consequence, if the private sector grows because of the development of the insurance market, as many scholars and commentators hope for, such an evolution is likely to exert a negative impact on the performance of the public sector and of the system, as a whole.

Shifting now our attention to the former group, i.e. the accredited (public and private) hospitals, some features deserve attention. Even in this case, the forms of competition are rather peculiar. Firstly, it should be noticed that the separation between providers and purchasers is only partially enacted. The Local Health Authorities, USL, still manage minor hospitals and provide services. Moreover, it should be pointed out that private accredited hospitals, according to the existing system where the volumes of activities are not contracted, may be able to practice cream skimming on a generalised basis. Broadly speaking, the competition implemented in the system does not seem to offer powerful incentives to stimulate the performance of the system itself.

Summing up, because of the existing rules the competition within the NHS is rather peculiar: opting out is constrained, distortions are introduced by the co-existence, for physicians, of public and private roles, and the market is highly segmented within the accredited sector, giving rise to cream skimming phenomenon. In such a framework, any attempt of enhancing the role of

¹⁶ 133 insurance companies operate in the health sector and 20% of them raise the 80% of the overall amount of premia. Only 5 contract on a general basis with private hospitals (Nuti, 1998).

¹⁷ Supplementary insurance is available from private insurers for better physical surroundings (private rooms) and for care of private providers.

¹⁸ For instance, Germany and the Netherlands offer some freedom of choice for consumers. In Germany, people may change funds if the contribution rate is increased; in the Netherlands, people may change funds once every six months. The possibility of opting out can be different for different social groups.

¹⁹ They are prevented to do so in the accredited private hospitals.

²⁰ This aspect has been taken into account in the reform just approved.

private producers, both accredited and non-accredited is likely to exert a negative effect on the performance of the system. Such an issue is explored in the following sections.

3. The efficiency of the regional production of hospital services

In this section, we measure the technical efficiency of accredited hospital production in the twenty Italian regions. The reason why we concentrate on technical efficiency is that it can be regarded as an “intrinsic” objective of any organisation, either public or private. The achievement of technical efficiency is also beneficial to other objectives, like the control of health expenditures, which has been one of the main worries in many developed countries in the last few years. However, the pursuit of technical efficiency has its own relevance in the public sector, since it implies that the (scarce) resources employed in the production of health services yield the maximum “output”. This also means that any gain in technical efficiency allows for treating an increasing number of patients, giving effectiveness to the principle of universality of service, which can be regarded as a founding principle of many National Health Services.

The measurement of technical efficiency of hospital services, carried out in this paper, is made with respect to the overall accredited production in each region, dispensed within the NHS. In other words, we will compute the differential efficiency of the twenty Italian regions in delivering the total regional accredited hospital output, using the total amount of inputs available in each region²¹. There are several reasons why we choose to measure the technical efficiency of hospital services on a territorial basis, instead of evaluating it at the single hospital level. The main purpose of this paper is to estimate the impact of competition and of the public-private mix of producers, on the efficiency of the aggregate supply of hospital services. In other words, we address the question of whether a higher degree of competition among producers and a larger share of private producers in the production of hospital services are beneficial to the system as a whole. Since the provision of health services in the NHS in Italy is regionally based, the regions are the best territorial units to measure the overall efficiency of supply. In addition, the use of an aggregate entity is consistent with the second step of our empirical analysis, in which we try to estimate the impact of aggregate measures, related to the demand and supply of health services, on efficiency.

3.1 The data

The measurement of technical efficiency is carried out through DEA. DEA is a non parametric technique, very useful to estimate efficiency in a multiple-output multiple-input context, like the provision of health services. It allows for measuring the potential maximum radial reduction in inputs, achievable to keep production levels unchanged, or, conversely, the

²¹ We will consider, in each region, the inputs used and the output produced by all the accredited hospitals.

potential maximum radial expansion of outputs, achievable with the available inputs. The measures are computed by the solution of a linear programming problem, under the hypotheses of constant returns to scale (CRS) or variable returns to scale (VRS). The use of DEA for measuring technical efficiency in the health sector is quite widespread. Sherman (1984) and Ehreth (1994) have also shown that the applications of DEA to the hospital sector give better results than other techniques. The application of DEA, however, requires, first of all, the definition of outputs and inputs.

As a measure of hospitals' output, we have considered the total number of acute care discharges in each year, from all the public and accredited private hospitals in each region. There is no widespread consensus on which is the best measure of output for hospitals. In principle, any measure of hospital production should reflect the change in health status of admitted patients. Number of patient days²², stay or adjusted bed days or other measures are also used as proxies of the ideal measure. However, the number of discharges is among the most common measures²³ used in empirical studies, testing for the technical efficiency of hospital production. Moreover, it is directly connected to the DRG tariffs system, which is used to build up the aggregate measure of output for each region. In fact, as Gerdtham, Lothgren, Tambour, Rehnberg (1998) put it, "due to severity of illness the amount of inputs required to produce services for a patient ready for discharge can vary considerably". Therefore, for the measurement of efficiency, we have used, for each region, an aggregate measure of output, built up as a weighted sum of discharges, differentiated for DRGs, using the relative costs attached to DRGs as aggregation weights.

As far as inputs are concerned, we use the number of physicians, the number of nurses, the number of other personnel and the number of beds, the latter as a proxy of capital used in the hospital production. For each variable, we sum up, in each region, the relevant figures for public hospitals and private accredited hospitals.

The data used to measure technical efficiency refer to the Italian accredited hospitals, whose inputs and output, as defined above, are aggregated on a regional basis. Table 3.1 shows the main data for the twenty regions, in 1996 and 1997²⁴. We can observe that, at the country level, the number of discharges is increased in 1997, while all the inputs have been reduced. This national trend is common to almost every region, even if on a differentiated scale. This observation leads us to the prediction that the level of technical efficiency must be increased in 1997.

²² See Galizzi, Novara, Vassallo (1999) who study efficiency of regional hospital production, measured as *non-weighted* number of patient days.

²³ See Zwanziger, Melnick (1988), Burgess, Wilson (1996), Gerdtham, Lothgren (1998), Gerdtham, Lothgren, Tambour, Rehnberg (1998), Giuffrida, Lapecorella, Pignataro (1999), Fabbri (1999). The latter two papers present empirical analysis on Italian hospitals.

²⁴ We miss data for the output produced in Sicily in 1996 (SI96) and for the inputs available in Valdaosta in 1997 (VA97).

Table 3.1 - Output and Inputs

Regions	Discharges		Beds		Physicians		Nurses		Other pers.	
	1996	1997	1996	1997	1996	1997	1996	1997	1996	1997
Piemonte	851690	909840	23709	23240	7154	7130	16824	17052	19039	17650
Valdaosta	21434	22141	513	512	218	N/A	471	N/A	468	N/A
Lombardia	2037102	2147359	57388	54131	13982	13355	37081	36820	43322	38411
Trentino	169183	206195	38461	35015	1335	1029	4632	3518	4480	3876
Veneto	788458	927341	29964	25618	7003	7331	20934	22421	16185	17106
Friuli V. G	262462	245142	7698	7314	1975	1992	5932	5815	5865	5838
Liguria	412609	411734	11521	10470	2604	3044	6809	7626	6148	6525
Emilia R.	1018744	1000110	24424	22208	7522	2943	19452	7606	17488	6691
Toscana	760030	704982	20384	19144	6571	5455	17182	14489	13351	10588
Umbria	220164	210326	4531	4156	1695	1580	3664	3382	3197	2846
Marche	348100	329828	10128	9705	2497	2452	6494	6159	5656	4948
Lazio	990830	1067463	42173	37866	7842	7935	18389	21129	20550	19244
Abruzzo	289637	283779	9905	9395	1647	1913	4408	5092	3458	4067
Molise	67339	66386	1947	1870	598	563	1255	1262	1085	1091
Campania	1096762	1121595	30215	28940	8432	6980	18224	14607	16189	12361
Puglia	872480	932801	28329	24506	4870	5794	12370	14682	11856	13128
Basilicata	108734	111396	4076	2937	775	755	2415	2065	2280	1888
Calabria	399546	409964	11511	11260	3211	2703	6862	5445	7309	5850
Sicilia	N/A	324198	25058	23738	7092	7128	15455	14771	14848	15034
Sardegna	102243	271833	10598	9823	2513	2630	5754	5693	8003	4855
Italy	10817547	11704413	392533	361848	89536	82712	224607	209634	220777	191997

3.2 The efficiency measures

Table 3.2 shows the main results from the application of DEA to the data depicted in the previous section. First of all, we have estimated the efficiency measures under the hypotheses of both constant and variable returns to scale, also to be able to disentangle the pure component of technical efficiency. Secondly, when the VRS hypothesis has been employed, the measures of efficiency have been computed according to an input minimisation model and an output maximisation model. The results are almost unchanged from one model to the other²⁵. We have chosen, therefore, to use the input oriented measure, since we noticed a significant degree of variability in the amounts of inputs available for each region, between 1996 and 1997.²⁶

²⁵ On average, the difference between the two measures is about 1%.

²⁶ See Table 3.1. Even if hospitals are constrained in the variation of the amount of inputs they use, they retain, however, some control over them as they can refrain, for example, from replacing the retired personnel.

Table 3.2 - Efficiency results

Regions	OE		Δ OE	PE		Δ PE
	1996	1997		1996	1997	
Abruzzo	58,01	60,30		58,54	60,65	
Basilicata	50,92	73,09		54,43	74,88	
Calabria	63,67	67,85		63,77	68,00	
Campania	68,45	73,97		69,31	74,52	
Emilia R.	89,71	100,00		91,25	100,00	
Friuli V. G.	74,57	74,76		74,75	74,91	
Lazio	48,01	57,01		48,21	57,42	
Liguria	77,53	83,85		77,59	84,41	
Lombardia	75,64	85,72		89,61	100,00	
Marche	72,27	70,86		72,28	70,89	
Molise	68,00	70,22		71,31	73,55	
Piemonte	74,53	81,62		75,61	82,88	
Puglia	56,26	70,17		56,35	70,75	
Sardegna	20,20	53,97		20,72	54,18	
Sicilia		26,23			26,23	
Toscana	78,35	79,88		79,58	80,83	
Trentino	33,65	54,25		43,82	66,88	
Umbria	94,50	100,00		94,53	100,00	
Valdaosta	87,68			100,00		
Veneto	57,07	77,97		57,52	79,05	
Italy	65,74	71,67		68,38	73,69	
North	68,67	76,36		74,13	81,36	
Center	76,57	81,55		77,17	81,83	
South	48,19	61,98		49,30	62,85	
OE: overall technical efficiency (CRS)						
PE: pure technical efficiency (VRS – input oriented)						

The average national overall technical efficiency does not score very high, 65% in 1996 and 71% in 1997. The regional values range from a minimum of about 20%, for Sardinia in 1996, to a maximum of 100% for Emilia Romagna and Umbria in 1997. Actually, these are the only observations on the efficiency frontier, globally estimated for the two years. However, a significant improvement in the 1997 values of efficiency can be pointed out, which is exceptionally high for those regions presenting efficiency scores, in 1996, below the national average. Looking at the different geographical areas, Central regions turn out to be the most efficient, while the Southern ones are the least efficient. As far as the source of inefficiency is concerned, it is mainly due to the pure technical component.

4. Regression analysis

In this section we analyse some determinants of the efficiency of the accredited health care system at the regional level, taking a cross-section regression approach. The sample is constituted by 20 observations, corresponding to the 20 Italian regions.

The dependent variable is the index of efficiency, obtained as the average value of its figures for 1996 and 1997.²⁷ As it can be seen in section 3.2, efficiency indexes do not vary significantly with respect to the hypothesis about returns to scale. The simple pair-by-pair correlation between different series of efficiency indexes, computed under alternative hypotheses on returns to scale, is larger than 0.95 in any case - so that our results do not change, using the different indexes of efficiency we have computed. When not specified, we therefore rely on the overall efficiency index, that is, the index computed under the CRS hypothesis.

The explanatory factors may be listed in three groups. The first group includes macroeconomic and demographic variables: GDP per capita, the average propensity to consumption of families, the share of population aged over 65. These variables aim at capturing some aspects of the demand for health care services. The second group regards the structure of the health care system in the regions; it includes the total number of hospitals (normalised to the population), the mix of accredited and private hospitals, the composition of accredited hospitals, and the presence of peculiar forms of public hospitals (hospital trusts or teaching hospitals, THs). We will interpret these variables as indicators of the degree of competition inside the region. The third explanatory factor measures the mobility of patients across regions; in particular we will investigate how mobility (specifically, the attraction rate) interacts with efficiency.

All explanatory variables are provided by Italy's National Statistical Institute, ISTAT (1998, 1999), and refer to 1995. Thus, the issue we address is how structural elements in 1995 affect efficiency observed in 1996-97.²⁸ All considered variables are listed in Table 4.1.

It is worth stressing some general remarks about our regression analysis. First, the limited size of the final sample (20 observations) calls for a great deal of caution. Moreover, it must be pointed out that the dependent variable is an index, lying between 0 and 100, and therefore the R^2 -statistics will be rather low. Given the data at hand, we will be unable to perform all usual diagnostic tests about correct specification, and we shall limit ourselves to comment upon the sign and significance of the coefficients for explanatory factors. In fact, we will reach only few conclusions, but they will appear to be very robust (to different indicators and different regression specifications) and consistent.

²⁷ For Sicily and Valdaosta we have only one datum, for 1997 and 1996, respectively. Since most regions experienced an increase in the efficiency index for 1997 compared to 1996, it is likely that our data overstate the efficiency of Sicily and understate the efficiency of Valdaosta.

²⁸ This choice, apart from considerations on the data availability, may be easily justified: explanatory variables really are of "structural type", and they vary sharply across regions, but they are rather stable over time.

TABLE 4.1- Variables

EFFCRS = index of efficiency under the hypothesis of constant returns to scale
 EFFVAIN = index of efficiency under the hypothesis of variable returns to scale, oriented to input
 EFFVAOUT = index of efficiency under the hypothesis of variable r.t.s., oriented to output

HPU = number of public hospitals
 HPRIV = number of private hospitals (accredited and non accredited)
 HPRAC = number of accredited private hospitals
 HPRN = number of non accredited private hospitals
 $HPRIVPU = HPRIV/HPU$
 $HPRNACC = HPRN/(HPU+HPRAC)$
 $HPRACACC = HPRAC/(HPU+HPRAC)$
 $HPRNPU = HPRN/HPU$
 $HPRAPU = HPRAC/HPU$
 HPOP = number of hospitals for 1000 inhabitants
 BEDPRIV = number of beds (for 1000 inhabitants) in private hospitals
 BEDPU = number of beds (for 1000 inhabitants) in public hospitals
 $BEDPRIVPU = BEDPRIV/BEDPU$

POP65 = share of population aged over 65
 GDPPC = GDP per capita
 PMS = average propensity to savings of families
 DEMAND = POP65 or GDPPC or PMS, according to the specification

AZOSP = number of HTs
 POLICL = number of THs
 $AZOSPPU^{**} = AZOSP/HPU$ in year **
 EMIGR = emigration rate
 ATTR = attraction rate

Note: not all series are used in the reported regressions. However, all series are in the databank, available from Authors upon request

4.1 The effects of demand

It is well known that, at the individual level, personal income is positively correlated with the expenditure for health care services - with a high elasticity, so that health care is generally regarded as a luxury. This holds also at the macroeconomic level. In fact, it is widely known that the aggregate expenditure for health care services increases with the level of GDP. On the other hand, health care demand is driven by needs, and the share of old population likely represents a good proxy for such need.

In regressions of Table 4.2 we aim at evaluating how these determinants of the demand for health care services affect the efficiency index. Specifically, we consider the GDP per capita, and the share of population aged over 65.

TABLE 4.2
 Ordinary Least Squares Estimation - Dependent variable: EFFCRS
 20 observations

	(1)	(2)	(3)
CONST	40.4809 <i>2.7436</i> [.013]	13.8735 <i>.69496</i> [.496]	11.8414 <i>.57974</i> [.570]
GDPPC	<i>.9468E-3</i> <i>1.9862</i> [.062]		<i>.3870E-3</i> <i>.72463</i> [.479]
POP65		3.4119 <i>2.7947</i> [.012]	2.8191 <i>1.9005</i> [.074]
R2	.17977	.30261	.32350
F STATISTICS	F(1,18)=3.9450 [.062]	F(1,18)=7.8105 [.012]	F(2,17)= 4.0648 [.036]

Note: t-statistics in italics; P-values inside squared brackets.

Both variables turn out to have a positive impact on the efficiency. They are highly statistically significant when considered one-by-one in separate regressions, while statistical significance shrinks when they are considered together in the same regression. This is consistent with our point that both variables are related to the dimension of demand. Obviously, the conclusion is that a larger demand leads to a higher efficiency. This is of course due also to the definition of efficiency, which is strictly connected with the amount of services provided. Not surprisingly, the effects of both regressors are larger if we consider the efficiency index computed allowing for variable returns (Table 4.2 bis).

TABLE 4.2.bis
Ordinary Least Squares Estimation - Dependent variable: EFFVAIN
20 observations

	(1)	(2)	(3)
CONST	32.1085 <i>2.2453</i> [.038]	14.4096 <i>.67987</i> [.505]	9.9241 <i>.48310</i> [.635]
GDPPC	.0012878 <i>2.7874</i> [.012]		.8542E-3 <i>1.5904</i> [.130]
POP65		3.4923 <i>2.6943</i> [.015]	2.1837 <i>1.4638</i> [.162]
R2	.30150	.28740	.37969
F	F(1,18)=7.7697 [.012]	F(1,18)= 7.2595 [.015]	F(2,17)= 5.2027 [.017]

Note: t-statistics in italics; P-values inside squared brackets.

In the subsequent regression analysis we always keep one of these variables, in order to capture the effect of the demand upon the efficiency index. We choose to take the variable that performs better, on the basis of statistical criteria. However, results would not change if we considered the other variable, or even alternative economic variables (for instance, family consumption per capita, or the families' average propensity to savings, which are positively correlated with GDP per capita)²⁹.

4.2. The effects of composition

In this section we deal with two different points. First, how the presence of non-accredited (n.ac.) private hospitals affects the efficiency of the accredited system. In other words, we investigate whether the competition "from outside" affects the efficiency of accredited hospitals. Second, we analyse the competition "inside" the accredited hospitals, taking into account the number and composition of its "members".

Table 4.3 leads to a strong conclusion: it shows a negative effect of the presence of n.ac. private hospitals upon the efficiency of the accredited system. This conclusion is robust to different ways of measuring the presence of non accredited hospitals, and it holds also when considering the number of beds instead of the number of hospitals.

²⁹ The simple correlation between POP65 and GDPPC is 0.55; of course, the correlation between the mentioned economic variables is much higher: for instance, the simple correlation between GDP per capita, on one side, and consumption per capita or propensity to savings on the other side is 0.93 and 0.84, respectively.

Table 4.3
Ordinary Least Squares Estimation - Dependent variable: EFFCRS
20 observations

	(1)	(2)	(3)	(4)
CONST	37.8203 <i>2.6890</i> [.016]	59.1341 <i>9.9010</i> [.000]	37.3255 <i>2.6249</i> [.018]	49.7275 <i>2.7539</i> [.014]
DEMAND (#=GDPPC;§=PMS)	# .0011840 <i>2.5099</i> [.022]	§ 98.0988 <i>2.8674</i> [.011]	# .0012179 <i>2.5170</i> [.022]	# 8.150E-3 <i>1.6261</i> [.122]
HPRNPU	-56.9719 <i>-1.7447</i> [.099]	-70.1575 <i>-2.1468</i> [.047]		
HPRNACC			-111.1466 <i>-1.6535</i> [.117]	
BEDPRIV				-19.0322 <i>-.89809</i> [.382]
R2	.30433	.35735	.29341	.21692
F STATISTICS	F(2,17)=3.7185 <i>[.046]</i>	F(2,17)=4.7266 <i>[.023]</i>	F(2,17)=3.5296 <i>[.052]</i>	F(2,17)= 2.3546 <i>[.125]</i>

Note: t-statistics in italics; P-values inside squared brackets.

Our explanation is straightforward: competition in market for health care in Italy is not really sound: several times -just to give an already mentioned example- physicians in public hospitals also work in (or are involved with the interests of) private hospitals (or, more generally, private health institutions). Thus, it is far from being paradoxical that a larger presence of n.ac. private hospitals is associated with a more inefficient public system, at the regional level. Admittedly, this is a strong -perhaps embarrassing- result; however, it may represent good evidence in favour of the proposals to forbid physicians to cumulate public and private jobs, in order to enhance the efficiency of the public system, currently supported by the Italian government.

Of course, the negative effect of the n.ac. hospitals upon the efficiency of the accredited system could be due -at least partially- to the obvious fact that a high presence of n.ac. private hospitals simply reduces the demand met by the accredited system, so reducing its output and its efficiency, globally measured. This motivation does not call for opportunistic behaviour of workers in accredited hospitals. However, on the basis of the evidence at hand, we may state that accredited system does not benefit from possible "imitation phenomena" originated by the nearby presence of private institutions.

Table 4.4 looks at the balance between accredited-private hospitals and public hospital within the accredited system. Our analysis shows that the presence of accredited private hospitals has a non-significant (negative) impact on the efficiency of the accredited system.

Table 4.4
Ordinary Least Squares Estimation - Dependent variable: EFFCRS [(1), (2)], EFFVAIN [(3), (4)]
20 observations

	(1)	(2)	(3)	(4)
CONST	50.4670 <i>2.4090</i> [.028]	21.0584 <i>.79749</i> [.436]	44.8571 <i>2.2318</i> [.039]	28.2771 <i>1.0215</i> [.321]
DEMAND (#=GDPPC;§=POP)	# 8.547E-3 <i>1.7011</i> [.107]	§ 3.2327 <i>2.4540</i> [.025]	# .00117 <i>2.4276</i> [.027]	§ 3.1464 <i>2.2783</i> [.036]
HPRAACC	-22.0243 <i>-.68185</i> [.505]	-13.0960 <i>-.42951</i> [.673]	-28.1169 <i>-.90727</i> [.377]	-25.2762 <i>-.79077</i> [.440]
R2	.20160	.31010	.33376	.31268
F STATISTICS	F(2,7)= 2.1463 <i>[.148]</i>	F(2,17)= 3.8205 <i>[.043]</i>	F(2,17)= 4.2582 <i>[.032]</i>	F(2,17)= 3.8668 <i>[.041]</i>

Note: t-statistics in italics; P-values inside squared brackets.

Overall, all evidence and observations lead to conclude that competition from private hospitals –irrespective of whether they are accredited or not– did not play any role in enhancing the efficiency of public system, in Italy. On the contrary, its effect has a negative –and sometimes significant– sign.

More generally, competition has no important role in enhancing efficiency in Health Service: Table 4.5 shows a negative impact of the density of hospitals upon the efficiency indexes. This holds both when we consider the total number of hospitals (normalised to population), and when we focus on the accredited hospitals alone. Also in this case we believe that the result is not surprising: the number of providers describes how strong is competition in a market of a "standard good". In the case of health care services, and in Italy in particular, the issue of competition is hard to be dealt with, and the number of providers does not capture the true essence of competition. Furthermore, different hospitals offer different services: more serious treatments are offered by public hospitals, while private hospitals are often specialised in light interventions. The outcome is that the presence of a high number of private institutions takes (light) cases away from public hospitals, so hampering the measured efficiency of the public system.³⁰

Table 4.5
Ordinary Least Squares Estimation - Dependent variable: EFFCRS [(1), (2)], EFFVAIN [(3), (4)]
20 observations

	(1)	(2)	(3)	(4)
CONST	35.5057 <i>1.5599</i> [.137]	30.0308 <i>1.3828</i> [.185]	40.0607 <i>1.6945</i> [.108]	34.4536 <i>1.5363</i> [.143]
POP65	3.3205 <i>2.8604</i> [.011]	3.8172 <i>3.1805</i> [.005]	3.3839 <i>2.8066</i> [.012]	3.9951 <i>3.2234</i> [.005]
HPOP	-645.8298 <i>-1.7179</i> [.104]		-765.8158 <i>-1.9613</i> [.066]	
HPUPOP		-1167.6 <i>-1.5845</i> [.132]		-1448.5 <i>-1.9034</i> [.074]
R2	.40577	.39234	.41889	.41259
F STATISTICS	F(2,17)= 5.8042 [.012]	F(2,17)= 5.4882 [.014]	F(2,17)= 6.1271 [.010]	F(2,17)= 5.9702 [.011]

Note: t-statistics in italics; P-values inside squared brackets.

This result is not at odds with apparently contrasting evidence provided by other authors. Dalmau-Matarrodona and Puig-Junoy (1998), for instance, using the same two-stage approach to analyse the determinants of technical efficiency of hospitals in Catalonia, show that "the presence of competitors in the local market, independently of their market share, improves technical efficiency". Apart from the obvious institutional differences, it is worth noticing that they focus on the efficiency at the single hospital level, while we analyse efficiency at an aggregate level.

³⁰ Consider that the ratio between n.ac. private hospitals and accredited hospitals is 6.4/100; the ratio n.ac. private hospitals over public hospitals is 10.4/100; the ratio between accredited private hospitals and public hospitals is 62.6/100. Remember also that private hospitals have much smaller dimension than public hospitals: the average of the ratio between the number of private to public hospitals is 73.0/100, whereas the ratio computed on the beds is 31.6/100. The beds in accredited private hospital are, relatively to beds in public hospitals, about 24.8/100. This means that that the accredited private hospitals have a limited weight in shaping the index efficiency of the whole accredited system. (Data from Istat, 1998, Tab. 1.5, pp.42-43).

Let us move to consider the effects of particular forms of public hospitals - namely, the HTs and the THs on the efficiency of the accredited system. A priori we expect a positive effect of the former, and a negative effect of latter. As to THs, our expectation is motivated by the fact that their output is mainly constituted by "scientific knowledge", which is not taken into account by our measure of efficiency. As to HTs, their independence from the purchasing authority, should lower the organisational costs and improve efficiency. Consider, however, that the number of these peculiar hospitals is very limited: THs are only 10 all over Italy (located in only 5 regions); the number of HTs was equal to 59, out of 1737 accredited hospitals, in 1995.³¹ Although the limited number of these peculiar forms of public hospitals, the effect of their presence upon the efficiency index emerges clearly in our regressions - see Table 4.6. A significant negative effect emerges for the presence of THs. This result is robust to all considered specifications. Evidence concerning the correlation between HTs and overall efficiency is a little bit more complex. If we consider the datum concerning the HTs in 1995, the (expected) positive -and significant- coefficient emerges. However, this result vanishes if we consider the datum for 1997. We explain this evidence as follows: transformation from "integrated" public hospital to HTs required some time to be implemented. In 1995 not all the regions already had HTs (for instance, Sicily and Sardinia had no HTs). We guess that only regions with efficient Public Administrations succeeded in establishing HTs in 1995. These regions have also higher indexes of efficiency in Health care system - so that the positive correlation emerges. This correlation disappears if we consider the presence of HTs in 1997, when all (large) regions had established the new institutions. By the way, Sicily -the most inefficient region as for the accredited health care system according to our index- presents the highest number of HTs in 1997, both in absolute terms (17 out of 87 Italian HTs are located in Sicily), and in relative terms (17.0% of the public hospitals are HTs, in Sicily, compared to the average percentage of 6.7% for all Italian regions).

TABLE 4.6
Ordinary Least Squares Estimation - Dependent variable: EFFCRS
20 observations

	(1)	(2)	(3)	(4)	(5)
CONST	31.1067 <i>2.4084</i> [.028]	35.2673 <i>2.0349</i> [.058]	39.4054 <i>1.9589</i> [.067]	52.2508 <i>3.4303</i> [.003]	36.9843 <i>2.0784</i> [.054]
DEMAND (#GDPPC;\$POP65)	# .8942E-3 <i>2.2137</i> [.041]	# .0010075 <i>2.0327</i> [.058]	§ 2.1170 <i>1.7912</i> [.091]	# .5411E-3 <i>1.2485</i> [.230]	§ 1.7350 <i>1.6433</i> [.120]
AZOPSPU95	222.3884 <i>2.8495</i> [.011]				163.4804 <i>2.4073</i> [.029]
AZOSPPU97		50.2386 <i>.60324</i> [.554]		90.9082 <i>1.3090</i> [.209]	-8.3213 <i>-2.5481</i> [.021]
POLICL			-9.3661 <i>-2.5556</i> [.020]		
R2	.44490	.19696	.49617	.49362	.63014
T STATISTICS	F(2,17)= 6.8125 <i>[.007]</i>	F(2,17)=2.0848 <i>[.155]</i>	F(2,17)= <i>8.3709</i> [.003]	F(3,16)= 5.1990 <i>[.011]</i>	F(3,16)= 9.0864 <i>[.001]</i>

Note: t-statistics in italics; P-values inside squared brackets.

³¹ HTs increased to 85 in 1997).

The conclusion is that THs exert a negative effect on the efficiency index (based on discharged patients) of the regional system. Furthermore, the presence of HTs has no effect on the efficiency of the regional system. Likely, the creation of HTs has not yet originated the expected positive effects.

4.3. The interaction with mobility

Mobility of patients across regions is an important phenomenon. On average, 6.1% of patients of all accredited hospitals live in a different region (see ISTAT, 1998, Tab. 1.7). We aim at evaluating how mobility and efficiency interact. In particular, we rely on the attraction rate, which is defined as the ratio between immigration rate and emigration rate (see Ugolini, Fabbri, 1998).

Of course, a high attraction rate for a region means a larger demand to be met, and this gives a positive contribution to the efficiency index. On the other hand, we may expect that people are attracted by regions that are supposed to be "more efficient". This turns out to be the case indeed.

The simple correlation between the efficiency index and the attraction rate of Italian regions is above 49%.³² In regression analysis, the attraction rate results to have a positive and significant impact on the efficiency index, and -more interesting- efficiency seems to affect attraction. Given the endogenous nature of regressors in this case, OLS estimator is biased, and we present also the IV estimation, in Table 3.7. Interestingly, efficiency appears to affect attraction, while attraction is not highly significant in explaining efficiency.

TABLE 3.7
Ordinary Least Squares and Instrumental Variable Estimation
20 observations

	(1)	(2)	(3)	(4)	(5)
Dept. Variable	EFFCRS	ATTR	ATTR	EFFCRS	ATTR
Estimation	OLS			IV	
CONST	53.9584 <i>7.5061</i> [.000]	-.14091 <i>-.24836</i> [.807]	-1.0843 <i>-2.1600</i> [.045]	18.7003 <i>.49975</i> [.624]	-2.5001 <i>-1.798</i> [.089]
ATTR	12.6361 <i>2.3950</i> [.028]			-29.4190 <i>-.73162</i> [.474]	
EFFCRS		.019125 <i>2.3950</i> [.028]	.0084962 <i>1.2617</i> [.224]		.053412 <i>2.6740</i> [.015]
GDPPC			.5598E-4 <i>3.7227</i> [.002]	.0028303 <i>1.0574</i> [.305]	
R2	.24167	.24167	.58223	.82875	.53507
F STAT or Instruments List	F(1,18)= 5.7362 <i>.028</i>	F(1,18)= 5.7362 <i>.028</i>	F(2,17)=11.8463 <i>.001</i>	Ins.List: CONST, EMIG, GDPPC	Ins.List: CONST, POP65, GDPPC

Note: t-statistics in italics; P-values inside squared brackets.

³² It is $Cor(ATTR, EFFCRS) = .4916$, $Cor(ATTR, EFFVAIN) = .5278$, $Cor(ATTR, EFFVAOUT) = .5320$.

5. Concluding remarks

In this paper, looking at the Italian NHS as a case study, we have tried to investigate whether competition exerted positive effect on the efficiency of the system. Using DEA, the efficiency of accredited hospital production at the regional level has been measured and, taking a cross-section regression analysis approach, some of its determinants have been analysed.

A general conclusion stemming out of the analysis is that competition is not a value *per se* and that its effects on the performance of the system are affected by the rules governing it. Indeed, the competition within the NHS is rather peculiar: opting out is constrained, distortions are introduced by the co-existence, for physicians, of public and private roles and the market is highly segmented within the accredited sector, giving rise to cream skimming phenomenon.

Such framework provides some ground for explaining our main result: the absence of any significant positive role for private providers in stimulating the efficiency of the accredited hospitals. Moreover, we have shown that the recent reforms aimed at introducing managerial criteria in the public hospitals do not seem to have been effective so far.

A policy implication, therefore, is that -with the existing rules- any attempt of enhancing the role of private producers, both accredited and non-accredited, is likely to exert a negative effect on the performance of the system.