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ON THE IMPACT OF OWNERSHIP STRUCTURE AND HOSPITAL EFFICIENCY IN ITALY

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Abstract

In the paper we evaluate the technical efficiency of Italian hospitals for the years 1995 to1998. We adopt parametric and non-parametric approaches to evaluate the impact of different ownership structures on the hospital technical efficiency. We use Data Envelopment Analysis with an output oriented model (more appropriate within a PPS system) for the non-parametric approach. We also adopt a parametric approach using COLS technique to estimate a translog output distance function, to accommodate multiple inputs and outputs.

Our findings suggest that public owned hospitals are more efficient than their not-for-profit counterpart when the number of discharged patients is considered as one of the outputs (together with the number. of day hospital treatments and that of emergency room treatments); this result is robust to the two different approach. On the contrary, the two techniques of estimation produce different results when the number of in-patient days is considered as output.

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1. Introduction

Over the last ten years, the health systems of many Western European countries have experienced reforms aimed at increasing efficiency and reducing the cost of service provision. In order to achieve these results, reforms have made efforts to create markets for health services, increasing competition among suppliers of services as well as among suppliers and (direct and indirect) consumers.

This reform effort has been particularly strong in those countries, such as the United Kingdom and Italy, characterized by complete public provision of health services through vertically integrated production units. In these countries, competition has sometimes been created through the division of a monopolistic public provider into separate (public) suppliers and (public) buyers with different economic incentives. In other circumstances, the same result has been pursued permitting private providers to enter the market for health services, especially in the hospital sector; as a consequence, public providers of hospital services have been forced to compete with private firms (both for-profit and nonprofit ones).

Increased competition in the hospital sector and the entry of new firms, have induced greater attention on nonprofit organizations. Nonprofit organizations represent about 60% of hospitals in the United States, but in most European countries they serve a very limited share of the market, with a few notable exceptions, such as the Netherlands (Sloan, 2000).[1]

The increasing role of private nonprofit hospitals in Western European countries represents an excellent opportunity to test theories that deem nonprofit organizations as more efficient than for-profit or public providers when asymmetric information and uncertainty prevail in a market (e.g., Glaeser and Shleifer, 2001); a circumstance that perfectly fits the hospital sector, as originally explained by Arrow (1963).

The alleged higher efficiency of nonprofit organizations as compared to private and public ones is generally explained with two different arguments. On one hand, the non-distribution constraint reduces the incentive to exploit any information advantage the producer may have, therefore making nonprofit organization more trust-worthy that for-

[1] The limited role of nonprofit hospitals is often explained by differences in legal provisions regulating the creation of private firms in the hospital sector.

profit ones (Hansmann, 1980 and 1996). On the other hand, the private nature of nonprofit organizations makes them free from the so called *categorical constraints* (the legal commitment of public organizations to provide the same service to all citizens; see e.g. Douglas, 1983) and allows them to satisfy demands of particular groups of citizens for the production of public goods (Weisbrod, 1998).

However, nonprofit organizations present some disadvantages too, the most relevant one being the lack of any residual claimants; this reduces managerial incentives to minimize production costs and makes nonprofit organizations (as well as public ones) less efficient than their for-profit counterparts. In other words, the primacy of efficiency or inefficiency arguments for nonprofit organizations is all but unambiguous in theoretical studies.

Empirical results supporting the idea that nonprofit are more efficient than public or private for-profit producers in the hospital sector would then be very relevant from a policy point of view. In fact, providing hospital services through private nonprofit organizations instead of public firms may allow a government to reduce public spending without decreasing the amount of services provided. This is the main objective of several empirical studies, which have tested the impact of ownership on hospital performance. We present a brief overview of these studies in section 2.

The aim of this paper is to test the impact of ownership structure on hospital performance using a data-set providing structural data for about 800 Italian public and nonprofit hospitals for the years 1995 to 1998. We describe the data-set in section 3, together with both parametric and non parametric techniques of efficiency estimation. We hence estimate an output distance function using DEA and COLS. Section 4 illustrates the results of our analysis while section 5 draws some preliminary policy conclusions.

2. Ownership structure and performance in the hospital sector: a brief survey

In order to assess the impact of ownership on performance, one should develop a reliable system of performance measurement. In this paper we consider technical efficiency as a good proxy of the performance of a production unit.

A vast literature deals with empirical analysis of technical efficiency in the hospital sector. Efficiency is generally measured as the distance between a single unit and the (unknown) efficient production or cost frontier. The latter is estimated with several techniques, either a version of the deterministic DEA approach or the stochastic frontier approach. A comprehensive review of estimation methodologies can be found, e.g., in Fried *et al.* (1993).

In general, the empirical evidence is inconclusive. Indeed, as showed by a recent paper, "overall, the empirical evidence demonstrate no systematic differences in efficiency between for-profit and not-for-profit hospitals." (Sloan, 2000). This statement is coherent with former research results, as in Marmor, Schlesinger and Smithey (1987). In fact, studies using different techniques to estimate efficient frontiers get different results. Wilson and Jadlow (1982), using a linear programming technique, found that nonprofit hospitals were less efficient than for profit hospital but more efficient than public ones. Using stochastic frontier regression, Vitaliano and Toren (1996) could not find any relevant difference in efficiency between hospitals with different ownership structures. On the contrary, Zuckerman, Hadley and Iezzoni (1994) and Puig-Junoy (1998) found public and nonprofit hospital more efficient than for-profit ones.

A few studies have been undertaken to measure technical efficiency of Italian hospitals. However, these studies are generally not interested in the relationship between efficiency and ownership structure, in terms of a distinction between public hospitals and private for-profit and not-for-profit ones. For instance, Cellini *et al.* (2000) distinguish among five types of hospital, but do not separate private nonprofit hospitals from private lucrative ones, a difference that economic theory deems to be important. An exception is the paper by Barbetta and Turati (2001)that finds a weak impact of the nonprofit ownership structure on efficiency considering a sample of hospitals located in Lombardia, an Italian region.

A potential weakness of the frontier techniques lies in the use of the appropriate input and output measures. In fact, differences in efficiency may simply convey divergence in the quality of services provided by different units. This is particular relevant in the hospital sector, given the difficulties in measuring the real output of the process (improvement in the health condition of a patient) and the connected need to rely on proxies such as the number of patients or the number of medical treatment without any clear measure of service quality.

Quality measurement has been undertaken using different methodologies. Some scholars rely on facilities or input measure (implicitly assuming that larger and more comfortable facilities together with a larger number of personnel means better quality of services provided); others use process measures, such as number of complaints; some other try to develop outcome measures (survival rates, functional status of patients, etc.), concentrating on a limited number of patients and pathologies. Studies concentrating on quality do not show a significant correlation between quality of services provided and ownership structure.

3. The empirical analysis

3.1. Data description

The empirical implementation of the paper to test the impact of ownership on technical efficiency is based on the Italian hospitals operating in the period 1995-98. We have been able to obtain information on public and non-profit hospitals.[2] The data was provided by the National Ministry of Health and consists of information on different inputs and outputs. We were able to obtain disaggregated data on personnel at different levels and a rough measure of capital, the number of beds available for patients' hospitalization. For outputs, we have data on the number of patients in day hospital and emergency rooms. In addition, we have two different and alternative specifications of hospital output, the number of discharged patients and the number of in-patient days (table 1).[3]

[2] We could not obtain data on private for profit hospitals.

[3] Unfortunately we could not obtain information regarding the Diagnosis Related Group (DRG) weights to adjust the output of hospitals with different output mix.

Table 1. Variables

Outputs:	Number of discharged patients; no. of in-patient days; no. of day hospital treatments; no. of emergency room treatments.
Inputs	Number of doctors & dentists; no. of other personnel with a Bachelor (Laurea) degree; no. of nurses of 1st class; no. of nurses of 2nd class; no. of personnel with teaching/organizational duties; no. of health personnel with rehabilitation duties; other health personnel; no. of available beds for regular hospital; no. of available beds for day hospital.

Source: Italian Ministry of Health

In the period under consideration, the number of hospitals has decreased due to some mergers, especially among public hospitals (table 2).[4] The average size has increased over time, both in terms of inputs and outputs. It is worth noticing that on the output side the larger growth is in the number of treatments in day-hospital and the number of discharged patients.[5]

Comparing among ownership forms, we can see that on average the nonprofit hospitals appear larger, in particular in terms of beds capacity, than the public ones (tables 2-A and 2-B). However, public hospitals have more doctors and beds for day-hospitals treatment. On the output side, public hospitals perform more emergency room and day-hospital treatments, while nonprofit ones have more discharged patients and days of hospital treatment. Average length of stay is decreasing over time, with a bigger change for nonprofit hospitals that have - however - a longer average stay. [6]

3.2. The non-parametric approach

DEA has been used in management science to evaluate *ex post* the efficiency of achieving an objective from a given level of inputs (Banker, Charnes, and Cooper, 1996). Its applications in the economics profession build on the work of Debreu (1951), Koopman (1951, 1957) and Farrell (1957). DEA employs linear programming techniques to measure efficiency as the distance of each firm from a nonparametric

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[4] We have an unbalanced panel, with the number of hospitals decreasing over time. Besides mergers, a second reason explains the change of the panel size over time: we considered only those observations with no missing or unreliable data.

[5] In 1995 a new Prospective Payment System was introduced. This new policy changes the incentives facing hospitals, now trying to decrease the length of stay and increase the number of discharged patients.

[6] This difference may be explained by different reasons. In a PPS system based on a DRG system of reimbursement, there could be some cream-skimming problems and nonprofit could attract patients with

production frontier constructed from convex combinations of observed input-output combinations.

Let $x \in \Re_{+}^{K}$ be a vector of inputs and $y \in \Re_{+}^{M}$ be a vector of outputs. Feasible input-output combinations are represented by the production possibilities set, $T \subset \Re_{+}^{K} \times \Re_{+}^{M}$,

(1) $$T = \{(x, y):\ x \text{ can produce } y\}.$$

We assume that T satisfies standard axioms listed, e.g., in F@re (1988) or Chambers (1988). For a given input-output vector (x, y), the output distance function (Shephard, 1953) is the minimum proportional expansion of all outputs such that the output combination can still be produced from the original input vector,

(2) $$D_O(y, x) = \inf\left\{\boldsymbol{a}: \left(x, \frac{y}{\boldsymbol{a}}\right) \in T\right\}.$$

The output distance function is a measure of efficiency which is non-decreasing, homogeneous of degree 1 and convex in y, decreasing in x and lying between zero and one, where a value of one represents technical output efficiency.

The calculation of the output distance function requires solution of a nonlinear programming problem, but an easier approach is available. Indeed, the reciprocal of the output distance function is the Farrell's measures of output efficiency defined by $F_O(y, x) = \sup\{g : (x, g\ y) \in T\}$ where $F_O(x, y) \geq 1$. This measure is easily obtained as solution to a linear programming problem (F@re, Grosskopf, and Lovell, 1994).

Farrell efficiency measures were calculated for each hospital under alternative assumptions on returns to scale using linear programming. Given that the constant returns to scale assumption is more restrictive than an assumption of non-increasing returns to scale, distance functions calculated under constant returns (C) can be no more efficient than those subject to non-increasing returns (N) (F@re, Grosskopf, and Lovell, 1994). The variable returns to scale assumption (V) is less restrictive still. This leads to an ordering of the output distance function for the hospital j^{th} under alternative assumptions on returns to scale:

(3) $$0 < D_O(y^j, x^j | C) \leq D_O(y^j, x^j | N) \leq D_O(y^j, x^j | V) \leq 1.$$

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more complex dinical situations. Another reason is that patients with difficult situations may prefer or trust more nonprofit hospitals than public ones on average.

F@re, Grosskopf, and Lovell (1994) suggest an informative decomposition of the most restrictive constant returns to scale technical efficiency measure into components based on scale efficiencies and the (least restrictive) variable returns to scale technical efficiency measure. Using the output distance function, the output scale efficiency measure is defined $\overline{S}_O\left(y^j, x^j\right) = D_O\left(y^j, x^j \middle| C\right) / D_O\left(y^j, x^j \middle| V\right)$, j = 1,…,J . The jth hospital is output scale efficient if it is equally efficient with respect to constant and variable returns technologies $\left(\overline{S}_I\left(x^j, y^j\right) = 1\right)$.

The construction of this measure enables the decomposition of the constant returns output distance function measure into sources of output scale and technical efficiency under variable returns to scale,

(4) $$D_O\left(y^j, x^j \middle| C\right) = D_O\left(y^j, x^j \middle| V\right) \times \overline{S}_O\left(y^j, x^j\right), \quad \text{j = 1,…,J} .$$

3.3. The parametric approach

Following Coelli and Perelman (2001), we empirically model the multi-input-multi-output production function of hospitals in a parametric setting as an output distance function. This allows us to avoid output aggregation that can bias efficiency scores estimates.

In this paper, we specify Eq. (2) using the translog functional form. Hence, our general empirical model can be written as:

(5) $$\begin{aligned} \ln D_O = {} & \alpha_0 + \sum_{i=1}^{M} \alpha_i \ln y_i + \frac{1}{2} \sum_{i=1}^{M} \sum_{j=1}^{M} \alpha_{ij} \ln y_i \ln y_j + \sum_{h=1}^{K} \beta_h \ln x_h + \\ & + \frac{1}{2} \sum_{h=1}^{K} \sum_{k=1}^{K} \beta_{hk} \ln x_h \ln x_k + \sum_{h=1}^{K} \sum_{i=1}^{M} \delta_{hi} \ln x_h \ln y_i \end{aligned}$$

Since homogeneity of degree 1 in output implies $D_O(x,\omega y) = \omega D_O(x,y)$, $\forall \omega > 0$, we choose $\omega = 1/y_M$ and normalise Eq. (2) with respect to the m-th output:

$$
(6)\quad \begin{aligned} \ln\left(\frac{D_O}{y_M}\right) = {} & \boldsymbol{\alpha}_0 + \sum_{i=1}^{M} \boldsymbol{\alpha}_i \ln\left(\frac{y_i}{y_M}\right) + \frac{1}{2}\sum_{i=1}^{M}\sum_{j=1}^{M} \boldsymbol{\alpha}_{ij} \ln\left(\frac{y_i}{y_M}\right)\ln\left(\frac{y_j}{y_M}\right) + \sum_{h=1}^{K} \boldsymbol{\beta}_h \ln x_h + \\ & + \frac{1}{2}\sum_{h=1}^{K}\sum_{k=1}^{K} \boldsymbol{\beta}_{hk} \ln x_h \ln x_k + \sum_{h=1}^{K}\sum_{i=1}^{M} \boldsymbol{\delta}_{hi} \ln x_h \ln\left(\frac{y_i}{y_M}\right) \end{aligned}
$$

Clearly, symmetry of cross-partial derivatives entails further restrictions, namely $\alpha_{ij}=\alpha_{ji}$ and $\beta_{hk}=\beta_{kh}$. In order to ease estimation, we rewrite Eq. (3) as:

$$
(7)\quad \begin{aligned} -\ln y_M = {} & \boldsymbol{\alpha}_0 + \sum_{i=1}^{M} \boldsymbol{\alpha}_i \ln\left(\frac{y_i}{y_M}\right) + \frac{1}{2}\sum_{i=1}^{M}\sum_{j=1}^{M} \boldsymbol{\alpha}_{ij} \ln\left(\frac{y_i}{y_M}\right)\ln\left(\frac{y_j}{y_M}\right) + \sum_{h=1}^{K} \boldsymbol{\beta}_h \ln x_h + \\ & + \frac{1}{2}\sum_{h=1}^{K}\sum_{k=1}^{K} \boldsymbol{\beta}_{hk} \ln x_h \ln x_k + \sum_{h=1}^{K}\sum_{i=1}^{M} \boldsymbol{\delta}_{hi} \ln x_h \ln\left(\frac{y_i}{y_M}\right) - \ln D_O \end{aligned}
$$

where the output distance function D_O is interpreted as an error term that satisfies standard OLS assumptions.

We estimate Eq. (4) following Corrected Ordinary Least Squares (COLS) methodology. Consequently, we first estimate Eq. (4) by OLS; then, by using $-\varepsilon_{max}$ (the largest negative OLS residual), we correct the intercept parameter α_0 so that the function envelope all the observations as a frontier. The distance measure for the i-th hospital is thus defined as:

$$
(8)\quad D_O = \exp\{-\boldsymbol{\varepsilon}_{\max} - \boldsymbol{\varepsilon}_i\}
$$

It is evident from Eq. (5) that D_O=1 for the observation with the largest negative residual, that represents the most efficient hospital.

For both methodologies, i.e., DEA and COLS, we consider two version of our distance function model, according to different output specifications. In particular, model 1 considers the number of discharged patients, whereas model 2 regards as output the number of in-patient days. All the models include also the number of first-aid cases and the number of day-hospital treatments as outputs of the production process.

For COLS, results seem to show a reasonable fit to observed data. Adjusted R-squared are in excess of 97% for all the years considered in the sample and for both models.

Estimated coefficients on output first-order terms are always statistically different from zero and present the expected sign. Most of the estimated coefficients on input first-order terms are also statistically significant, even in the presence of multicollinearity among the nine inputs.[7]

4. Ownership structure and efficiency

In this section we present our efficiency score estimates, concentrating first on DEA results (table 3). The estimates presented in this section refer to a variable returns to scale specification of the technology. We rejected the null hypothesis of constant returns to scale[8] and hence we report the results of VRS to disentangle the technical efficiency not due to the returns to scale, i.e., the pure technical efficiency (F@re, Grosskopf, and Lovell, 1994). With model 1, using as output the number of discharged patients, the average efficiency is relatively high and growing over time, going from 74% to 81%.[9] It is worth noting that the most relevant change happens after 1995, presumably because of the introduction of the Prospective Payment System. In the first two years, the mean efficiency scores are higher for public hospitals than for nonprofit ones; on the contrary, over the last two years nonprofit organizations get either higher (1997) or equal (1998) mean efficiency scores when compared to public hospitals. This seems to indicate that nonprofit firms responded more to the introduction of the new payment system, system which gives more incentives toward the increase of the number of patients and the reduction in the length of stay, other things equal.[10]

With model 2, which uses as output the number of inpatient days, the average efficiency is higher, going from 0.81 in 1995 to 0.86 in 1998. With this model, the non profit hospitals are consistently more technically efficient than public ones.

[7] Regressions results are not included here; all tables are available from authors upon requests.

[8] We rejected the null using a Banker (1996) test with a confidence interval of 1%. Complete results are not reported but are available from the authors upon request.

[9] At this stage, we can not distinguish whether and to what extent the increase in efficiency is due to the reduction in the sample size.

[10] Note that over time the sample size for the public sector decreased, while it increased for non profit hospitals.

Table 3. Mean efficiency scores (DEA estimates)

Efficiency scores		**1995**	**1996**	**1997**	**1998**
Model 1	All	0.74 (0.19)	0.80 (0.18)	0.79 (0.18)	0.81 (0.18)
	Public	0.75 (0.19)	0.80 (0.17)	0.79 (0.18)	0.81 (0.18)
	NPO	0.69 (0.26)	0.77 (0.23)	0.82 (0.22)	0.81 (0.23)
Model 2	All	0.81 (0.16)	0.83 (0.14)	0.84 (0.14)	0.86 (0.13)
	Public	0.81 (0.16)	0.83 (0.14)	0.83 (0.14)	0.86 (0.13)
	NPO	0.92 (0.11)	0.91 (0.12)	0.94 (0.11)	0.93 (0.1)

Standard deviation in parentheses.

On the contrary, mean efficiency scores derived from the output distance function estimated with COLS (table 4) appear to be quite low for all the years in the sample and for both models. Results show a declining trend in efficiency of Italian hospitals; the drop in technical efficiency is particularly severe for both public and private not-for-profit hospitals considering model 1 in 1998. An interesting result emphasized by both models with different output specifications is that public hospitals are always more efficient on average than their nonprofit counterparts.

Table 4. Mean efficiency scores (output distance function, COLS estimates)

Efficiency scores		**1995**	**1996**	**1997**	**1998**
Model 1	All	0.22 (0.19)	0.21 (0.18)	0.19 (0.18)	0.15 (0.15)
	Public	0.22 (0.19)	0.22 (0.19)	0.20 (0.18)	0.15 (0.15)
	NPO	0.16 (0.17)	0.16 (0.17)	0.13 (0.15)	0.09 (0.11)
Model 2	All	0.19 (0.17)	0.18 (0.16)	0.16 (0.14)	0.14 (0.15)
	Public	0.19 (0.17)	0.18 (0.16)	0.16 (0.15)	0.15 (0.15)
	NPO	0.14 (0.14)	0.13 (0.14)	0.11 (0.12)	0.09 (0.11)

Standard deviation in parentheses.

5. Concluding remarks

Due to the rising costs and an aging of population, the health sector in many countries is subject to many reform attempts. Among the different policy options under consideration, in this paper we consider the opportunity for a greater role of the non-profit sector in the production and provision of health services in the hospital sector. Advocates of nonprofit firms claim that they would contribute to reducing public spending on health services and could increase overall efficiency. But critics argue that nonprofit are not more efficient than public or private for-profit hospitals, thus questioning this policy option. Fact is that the evidence is not conclusive.

In this paper we test whether nonprofit hospitals are more efficient than public ones. We use two different methodologies to compare technical efficiency, and we find that we get opposite results. With a non parametric method, i.e., DEA, we find that on average public hospitals have better performances when considering discharged patients as output, while nonprofit organizations appear more efficient when considering the length of stay. With a parametric method, i.e., COLS, we find that public hospitals are consistently more efficient than non profit organizations.

It is worth stressing that the results of this research depend in part on the output specification, which we recognized is far from being satisfactory. The ideal proxy for the hospital outcome should be the health status of the patients. Unfortunately this information is very difficult to obtain especially for a large sample of hospitals. We believe it would important to consider, for example, the DRG weights for the different output mix. In addition, notice that not any agreement exists concerning what methodology provides better results in estimating technical efficiency. Moreover, while some empirical studies comparing results produced by different methodologies support the idea that efficiency scores do not differ greatly with estimation techniques, some other do not confirm this conclusion.[12] We believe that further research in this area is needed.

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[12] See, for example, Linna (1998) and, for a different result Giuffrida and Gravelle (1999).

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Table 2. Inputs and outputs, all hospitals

	1995	1996	1997	1998
No. of observations	831	845	819	758
Inputs				
No. of doctors & dentists	99.48 (129.05)	104.66 (130.5)	108.66 (132.5)	116.98 (144.9)
No. of personnel of 1st class	209.65 (263.8)	223.3 (277.7)	235.37 (286.3)	261.7 (328.8)
No. of personnel of 2nd class	40.9 (50.7)	40.21 (50.6)	40.45 (48.9)	40.25 (50.1)
No. of personnel in teaching/administration	1.44 (3.1)	1.46 (2.8)	1.35 (2.5)	1.41 (2.8)
No. of other personnel with a college degree	7.81 (12.2)	8.14 (12.3)	8.25 (12.1)	9.32 (14.1)
No. of personnel for rehabilitation	9.55 (13.1)	9.87 (13.7)	11.07 (14.5)	12.81 (19.1)
Other health personnel	33.44 (49.3)	34.79 (51.4)	37.52 (56.1)	40.72 (60.5)
No. of beds for regular hospital	289.28 (320.9)	290.98 (316.4)	284.79 (309.6)	296.85 (341.8)
No. of beds for day hospital.	17.1 (32.4)	20.68 (35.9)	24.31 (44.2)	27.18 (39.8)
Outputs				
No. of in-patient days	76948.9 (91640.7)	78922.5 (91475.2)	78017.23 (90072.2)	82468.28 (98949.4)
No. of day hospital treatments	4622.1 (11747.4)	6048.65 (13128.3)	7433.99 (15535.7)	8889.4 (16308.9)
No. of emergency room treatments.	24226.38 (23522.6)	26052.44 (24950.9)	27526 (27799.6)	30937.68 (35163.2)
No. of discharged patients	9847.31 (11295.6)	10703.38 (11940.2)	11009.75 (12182.7)	11720.9 (13289)

Standard deviation in parentheses

Table 2-A. Inputs and outputs, public hospitals

	1995	1996	1997	1998
No. of observations	793	802	774	711
Inputs				
No. of doctors & dentists	98.99 (127.8)	104.04 (129.2)	108.39 (131.7)	117.4 (144.8)
No. of personnel of 1st class	209.17 (261.9)	222.11 (275.6)	234.8 (284.4)	262.95 (329.9)
No. of personnel of 2nd class	40.74 (50.4)	40.21 (50.4)	40.39 (48.6)	40.43 (50.2)
No. of personnel in teaching/administration	1.42 (3)	1.43 (2.8)	1.33 (2.5)	1.39 (2.8)
No. of other personnel with a college degree	7.83 (12.2)	8.11 (12.3)	8.25 (12)	9.33 (14)
No. of personnel for rehabilitation	9.41 (13)	9.81 (13.7)	10.88 (14.4)	12.76 (19.4)
Other health personnel	33.27 (48.9)	34.64 (51.1)	37.54 (56)	40.94 (60.8)
No. of beds for regular hospital	286.36 (320.9)	288.2 (315.8)	282.53 (309.2)	295.71 (343.7)
No. of beds for day hospital.	17.42 (32.9)	20.76 (35.6)	24.76 (44.7)	27.98 (39.9)
Outputs				
No. of in-patient days	75501.92 (90912.5)	77681.29 (90822.3)	766862.31 (89432.4)	81717.4 (99086.2)
No. of day hospital treatments	4661.75 (11884.6)	6062.24 (13135.8)	7501.52 (15541.8)	9091.54 (16296.2)
No. of emergency room treatments.	24494.57 (23672.9)	26385.13 (25077.5)	28037.95 (28055.2)	31760.34 (35732.5)
No. of discharged patients	9746.29 (11197.4)	10602.4 (11823.4)	10911.4 (12022.5)	11663.84 (13208.3)

Standard deviation in parentheses

Table 2-B. Inputs and outputs, non profit hospitals

	1995	1996	1997	1998
No. of observations	38	43	45	47
Inputs				
No. of doctors & dentists	109.74 (155.2)	116.26 (154.7)	113.36 (146.3)	110.72 (148.4)
No. of personnel of 1st class	219.79 (304.6)	245.6 (316.5)	245.04 (320.8)	242.72 (314.7)
No. of personnel of 2nd class	44.26 (56.1)	40.21 (55.5)	41.44 (53.8)	37.6 (48.9)
No. of personnel in teaching/administration	2.03 (4.1)	1.91 (4)	1.69 (3.9)	1.68 (3.8)
No. of other personnel with a college degree	7.42 (11.6)	8.74 (12.35)	8.18 (12.5)	9.06 (14.9)
No. of personnel for rehabilitation	12.63 (15.4)	10.81 (14.8)	14.29 (15.9)	13.61 (15.1)
Other health personnel	36.87 (58.9)	37.67 (58.9)	37.22 (58.1)	37.38 (56.4)
No. of beds for regular hospital	350.05 (319.4)	342.79 (326.2)	323.58 (316.7)	313.98 (314.9)
No. of beds for day hospital.	10.53 (20.4)	19.05 (42.2)	16.56 (34.2)	15.15 (34.5)
Outputs				
No. of in-patient days	107145.1 (102416.2)	102072.5 (101286)	97881.8 (99439.3)	93827.36 (97185.1)
No. of day hospital treatments	3794.5 (8463.6)	5795.23 (13138.9)	6272.53 (15559.2)	5831.49 (16370)
No. of emergency room treatments.	18629.63 (19562.9)	19847.47 (21795.6)	18720.49 (21346.6)	18492.74 (21718.8)
No. of discharged patients	11955.5 (13172.7)	12586.72 (13966.5)	12701.31 (14726.4)	12584.66 (14582.5)

Standard deviation in parentheses