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Efficiency and institutional arrangements in the Belgian nursing home industry

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1. Introduction

In the recent years, the performance of non-profit firms has been extensively studied, essentially by comparison with for-profit firms. The nursing home industry is a typical example of this tendency, mainly in the United States. The aim of the present paper is to evaluate the productive efficiency of the Belgian nursing home industry by using a production frontier approach. Emphasis is placed on the influence of institutional arrangement, health of patients and size of facility.

Productive efficiency is widely considered as one of the best yardsticks to evaluate the performance of production units, notably public and private, for-profit and non-profit firms[2]. The productive efficiency approach rests on the construction of a production frontier, also called a 'best practice' frontier, which provides the efficient input-output combinations accessible to the firm under scrutiny. The distance between that frontier and the actual level of production provides a measure of efficiency in the firm. This is wholly operational to the extent that this measure represents the proportion of the possible production that was actually obtained or per contra, it represents the loss of output from anything less than an efficient utilization of the resources employed by the firm.

Usually, the derived efficiency slacks are attributed to the management itself or to the institutional arrangements such as ownership, regulation and so on[3].

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2 See for instance Pestieau & Tulkens (1993). In the literature on performance assessment, the terms "productive" or "technical" or even "X" (in)efficiency are often used indifferently.

In Belgium, the nursing home industry is organized according to different schemes. They can be managed by private owners, by private non-profit organizations or by municipal agencies. It is therefore tempting to take advantage of this variety of institutional arrangement to test their respective influence on firms performance.

This paper is organized as follows. In the next section, we briefly present previous works conducted in the United States on the same issue. Section 3 explains the methodology used in the estimation of productive efficiency. The presentation of the data set appears in section 4. In section 5, we derive our indicators of efficiency for a sample of Belgian nursing homes and show how they are influenced by alternative institutional forms. The final section offers some concluding remarks.

2. Literature survey

Most studies in the field compare for-profit and non-profit firms operating the activity under the same environmental setting. A chronological analysis of these studies is interesting from more than one viewpoint. At first, these studies focused on a non-profit vs. for-profit comparison using costs as yardstick [Frech & Ginsburg (1981), Ullmann & Holtmann (1985)]. Usually, the private sector appeared to be the winner in that comparisons game. Nevertheless, it appeared quickly that such an approach was too narrow: when analyzing the opposition '*non-profit vs. for-profit*', regulation and competition should have been taken into account as well. The regulatory settings and the market structure are indeed important factors conditioning performance [Tuckman & Chang (1988), Nyman (1988)]. Recent developments in the economics of information show that within a setting of uncertainty and asymmetric information, competitive pressures are a more effective way to foster performance than ownership change.

Moreover, these cost-based studies do not measure neither productive efficiency nor allocative efficiency because, in most cases, prices do not reflect the social value of inputs and outputs. The two most recent studies on nursing home industry have to be considered in the light of this last observation. The papers of Nyman & Bricker (1989) and Fizel & Nunnikhoven (1992) use the concept of production frontier and productive efficiency to get performance measures that seem to be immune of the usual critiques on cost-based performance approaches[4].

This evolution is presented on Table 1 which offers a synthetic survey of the literature on nursing home performance. From this survey we can conclude that in general for profit homes appear more efficient than non-profit ones. This is at odds with what is generally found in other service industries such as hospitals or day care centers where the results are quite mixed as illustrated in Pestieau & Tulkens (1993).

3 See for instance Gathon & Pestieau (1995).

4 See on this Pestieau & Tulkens (1993).

Table 1

The nursing home industry: survey of different studies

1. COST APPROACH

AUTHORS & SECTOR	NUMBER OF UNITS	TYPE AND PERIOD OF DATA	METHODS	DEPENDENT VARIABLE	EXPLANATORY VARIABLES	FINDINGS
Frech & Ginsburg (1981).	600 nursing homes in US (462 for profit & 138 non-profit homes).	Annual, 1973-74.	Total cost function.	Total operating expenses.	Output: patient days. Input prices. Firm ownership dummy. State regulatory variable. Medicaid reimbursement type.	Non-profit firms have higher costs than for-profit firms. Within the non-profit sector government-owned firms have higher costs than private firms.
Ullmann & Holtmann (1985).	1153 nursing homes in US (749 for profit & 404 non-profit homes).	Annual, 1977.	3 variable cost functions.	Variable costs.	Outputs: various patient days. Input prices (hourly wage). Location (region) variable. Number of beds.	Private homes have lower costs than non-profit homes. Facilities exhibit no economies of scope. Nursing homes have overinvested in capital. Differences in care are attributable to ownership forms.
Tuckman & Chang (1988).	115 & 185 nursing homes in Tennessee (136 for profit homes in 1977 & 187 in 1984).	Annual, 1977 & 1984.	Average cost function.	Total operating cost per patient day.	Output: patient days. Occupancy rate. Average employee salary. Share of part-time employees. Proportion of patients confined to their bed & proportion of semi-ambulatory patients. Size variable. Firm ownership dummy.	Non-profit firms have a higher cost level in 1977; the same conclusion cannot be confirmed for 1982. The growing presence of for-profit homes and a decline in market concentration may cause a convergence of the cost structure of the two ownership types over the 1977 - 1982 period.
Nyman (1988).	419 nursing homes in New York.	Annual, 1983.	Total cost function.	Total costs.	Outputs: number of days that a patient resides in the home, visits to the home on an out-patient basis, visits by nursing home personnel to the residences of patients. Average hourly wage of four personnel categories. Market competitiveness variable.	Presence of economies of scope (inpatient days & home health visits) and diseconomies of scope (outpatient visits & home health visits). Difference in the average dependency of patients affects total costs. Market competitiveness has apparently no significant influence on costs.
McKay (1988).	82 for-profit nursing homes in Texas.	Annual, 1983.	Total cost functions.	Total costs.	Output: patient days. Prices of four inputs: nursing hours, aide hours, building & equipment and other services.	Industry exhibits economies of scale. Quality-adjusted cost function yields essentially the same results as the cost function assuming constant quality across homes.

2. *PRODUCTIVE EFFICIENCY APPROACH*

AUTHORS & SECTOR	NUMBER OF UNITS	TYPE AND PERIOD OF DATA	METHODS	DEPENDENT VARIABLE	EXPLANATORY VARIABLES	FINDINGS & REMARKS
Nyman & Bricker (1989).	184 nursing homes in Wisconsin (81 for profit & 103 non-profit homes).	Annual, 1979.	DEA production frontier.	Five categories of output according to needed types of care, in patient days.	Nursing hours. Social worker hours. Therapist hours. Other workers hours.	For-profit firms have higher efficiency scores. For-profit homes use about 4.5% fewer labor resource. The quality of care in non-profit firms is higher. There may be a tradeoff between quality and efficiency in the for-profit firms, but clearly no tradeoff in the non-profit firms.
			Regression of efficiency scores on different explanatory variables.	DEA efficiency score.	Ownership dummy. Hospital affiliation dummy. Proportion medicaid patients. Occupancy rate. Average length of stay. Age of the patients. Quality variables. Socio-economic & location variables.	
Fizel & Nunnikhoven (1992).	163 nursing homes in Michigan (104 for profit & 59 non-profit homes).	Annual, 1987.	DEA production frontier.	Outputs: skilled & intermediate-care patients days.	Registered nurse hours. Licensed practical nurse hours aides and orderlies hours	Mean efficiency level of non-profit homes is less than for-profit homes. Tradeoff between quality and efficiency. The industry exhibits economies of scale. Increased competition tends to increase efficiency Ownership status of a home influences efficiency.
			Regression of efficiency scores on different explanatory variables.	DEA efficiency score.	Quality indexes. Market competition index. Size variable: number of beds. Location (urban/rural) dummy. Ownership dummy.	

3. Methodology

Estimating productive efficiency would be a simple exercise if the production frontier were known. Unfortunately this is not the case, which means thant the frontier must be constructed from a sample of observations. Two considerations have to be taken into account when estimating this frontier. First, not all the observations are productively efficient. Second, the data are contaminated by noise. Thus any estimation procedure should allow for omitted variables, measurement error,...

The approach adopted here relies on the methodology initially proposed by Aigner, Lovell & Schmidt (1977) and by Jondrow, Lovell, Materov & Schmidt (1977) for the estimation of stochastic production functions. This approach is compatible with the two above considerations.

In order to estimate the frontier, we assume a production technology represented by the following production function:

$$(1) \qquad \ln y_i = \alpha + \beta \ln x_i + \varepsilon_i,$$

where the i subscript denotes a firm; y is an indicator of the output; x is an indicator of the input[5] and ε_{it} represents the error term.

The error term ε_{it} can be decomposed into two elements:

$$(2) \qquad \varepsilon_i = v_i - u_i$$

where v_i is white noise [$v_i \rightarrow$ iid $N(0, \sigma_v^2)$] and u_i [$u_i \geq 0$] allows for productive inefficiency . To be clearer, the term v represents the effects of measurement errors, missing explicative variables, and random shocks out of control of the firm management. This stochastic term — which is symmetric — corresponds to the usual disturbance term in econometrics.

Consequently, the stochastic production frontier function can be written as:

$$(3) \qquad \ln \tilde{y}_i = \alpha + \beta \ln x_i + v_i.$$

The rate of productive efficiency r_i can then be expressed as follows:

$$(4) \qquad r_i = y_i/\tilde{y}_i = \exp(-u_i)$$

[5] x is generally a vector

In order to decompose ε_i into v_i and u_i, it is necessary to assume a specific distribution for the inefficiency term u_i. Following Aigner et al (1977) we will assume that u_i $[u_i \geq 0]$ is distributed half-normally. This half-normality assumption — which is the most often used in the literature — is a matter of choice in the sense that the distribution of u_i could also be exponential, gamma, Weibull, etc.[6]

From (2), the variance of ε can easily be decomposed as follows:

$$(5) \qquad \sigma_\varepsilon^2 = \sigma_v^2 + \sigma_u^2$$

Furthermore, according to Jondrow et al. (1982) the conditional distribution of u_{it} given ε_{it} can be written as follows:

$$(6) \qquad E(u_i|\,\varepsilon_i) = (\,\sigma_v\ \sigma_u/\sigma_\varepsilon)\,\{[f(\,\varepsilon_i\,\lambda/\sigma_\varepsilon)/\,1\text{-}F(\,\varepsilon_i\,\lambda/\sigma_\varepsilon\,)]\text{-}\,\varepsilon_i\,\lambda/\sigma_\varepsilon\}$$

where $\lambda = \sigma_u/\sigma_v$, is a measure of the relative variability of the two sources of error indicating whether most of the variance from the frontier is due essentially to randomness or to inefficiency; f is the standard normal probability density function and F the cumulative distribution function.

4. The data

Our data set is based on a survey conducted in 1993-94 among 149 nursing homes caring 6,018 old people in the Province of Liège in Belgium. This survey aimed at collecting data over the various outputs and inputs of each home for the year 1992. Its main support was a 12 page questionnaire including nearly 250 questions that have been answered by the managers in nursing homes[7]. These questions concerned each aspects of the everyday life of the homes, such as: character of residents, meals, staff of employees, management characteristics, structure of the building, recreational activities,...[8]

Our sample of 149 nursing homes is divided up in three groups: 109 for profit private (73%), 18 non-profit private (12%) and 22 non-profit public services (15%). By comparison, the nursing homes of the *Walloon Region* of Belgium which includes the Province of Liège were divided up as follows at the end of 1993: 701 for-profit private

6 See for instance Judge et al. (1985), p.827-828.

7 First, the questionnaire was mailed to the nursing home. It was then completed by face to face interview with the manager. The survey was conducted by the authors and by the «*Centre Liégeois d'Etudes de l'Opinion*» (CLEO).

8 For more details see Boveroux (1994) and Debrule (1994).

(73%), 118 non-profit private (12%) and 141 non-profit public (15%)[9].

Table 2
Structure of the data set
Average values[a] by institutional arrangement

	For-profit private organizations	Non-profit private organizations	Non-profit municipal public services
Number of homes	109 (73%)	18 (12%)	22 (15%)
Output			
Number of residents	33.67	45.5	71.95
	(24.40)	(22.99)	(35.58)
Output characteristics			
Weakly dependent (*"0"* & *"A"*)	14.88	22.61	38.81
	(11.83)	(17.27)	(20.77)
Strongly dependent (*"B"* & *"C"*)	18.82	20.06	33.13
	(15.31)	(17.07)	(21.23)
Inputs			
Registered skilled nurses	2.33	3.47	5.27
	(1.98)	(3.04)	(3.31)
Other nurses (aides)	4.74	6.54	13.02
	(2.76)	(5.14)	(7.43)

[a] Standard errors are presented in brackets.

The residents represent the key component of the nursing home output. Consequently we have to take into account their number but also the nursing care they need and which can greatly vary from one person to another. In Belgium, residents of nursing homes are ranked, after medical examination[10], into four categories according to their health condition: category *"0"*, *"A"*, *"B"* and *"C"*. Healthy residents are ranked *"0"*, others *"A"*, *"B"* or *"C"*, *"C"* being assigned to residents whose health condition needs the most attention. In Table 1 residents are grouped into two class: *weakly dependent* (*"0"* and *"A"*) and *strongly dependent* residents (*"B"* and *"C"*) on nursing

[9] According to a report of the Social Affairs and Health Department of the Belgian French speaking Government, see Conseil de la Communauté Française (1993), p. 2.

[10] This ranking is made according to the so-called *"Index of Katz"*, which refers to the needs of the elderly patients and to their ability to cope with various everyday life situations. Social Security subsidies to nursing homes depend on these categories.

care.

Table 1 presents some average values of our sample by institutional arrangement. As can be seen from this table, the average size of public homes (indicated by the number of residents) is far more important than the average size of private homes. This have some consequences as we will see below.

5. Estimates

In the estimation of the production function we adopt the Cobb-Douglas form which can be written in a logarithmic form:

$$(7) \qquad \ln y_i = \alpha_0 + \beta_1 \ln x_{1i} + \beta_2 \ln x_{2i} + \beta_3 \ln x_{3i} + \beta_4 \ln x_{4i} + \gamma \ln h_i + \varepsilon_i$$

where i denotes a nursing home, y is the indicator of the output expressed as the number of residents, x_1 is the number of registered skilled nurses, x_2 the number of other (practical) nurses, x_3 is the administrative staff and x_4 represents the other employees (catering, cleaning, maintenance,...).

The variable h is designed to take into account a key factor: the health of the residents. This variable is expressed as the proportion of patients ranked *"0"* and *"A"* in the total of residents. The γ and β's are the coefficients of the associated independent variables.

Considering that the output corresponds to the number of patients, we implicitely assume that all homes provide the same quality care. This is of course a strong assumption. Even if this is a common practice to many econometric studies in the field, and even if government quality checks of each nursing home should induce some convergence in that respect, we should keep in mind this assumption when interpreting the results[11].

On the input side, we decided to select as many as four types of labour since this factor is the keystone of the operation in the present industry. The capital input has been deleted mainly because of the well-known difficulty to express this input satisfactorily[12]. As a result, the efficiency levels represent efficiency with respect to

[11] We can mention here the finding of Nyman & Bricker (1989) about the link between poor management and bad quality: « *Homes with incompetent managers will have more violations and less efficient operations...* » (the *violation* variable represents negative quality). More on quality and efficiency can by found in Ullmann & Holtmann (1985).

[12] Another reason for deleting the capital stock, given by Nyman & Bricker (1989), is that efficiency with respect to the capital input seems to be largely beyond the ability of managers.

labour resources alone.

Using the econometric package LIMDEP of Greene (1980, 1992) we estimate equation (7) through Maximum Likelihood method and then measure productive efficiency for each nursing home. Alternative measures using the same data set are presented in Boveroux (1994) and Debrule (1994), who respectively present Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH) estimates of productive efficiency.

The estimates of equation (7) are presented in Table 2. We find that λ is equal to 0.31, which indicates that a large part of the variance is not due to inefficiency.

Table 3
Stochastic production frontier
for the nursing homes sector in Belgium

Independent variables[a]	Estimated coefficients[b]
$\ln x_1$	0.51171 (0.0272)***
$\ln x_2$	0.14057 (0.0406)***
$\ln x_3$	0.13576 (0.0490)***
$\ln x_4$	0.06200 (0.0307)**
$\ln h$	0.25699 (0.0322)***
intercept	3.0847 (0.8719)***
$\lambda = \sigma_u / \sigma_v$	0.31044 (6.008)
σ_e	0.19533 (0.2027)
Log-likelihood	27.205

*** significant at the level of 1%; ** significant at the level of 5%; * significant at the level of 10%.
[a] The variables are defined in the text; after deleting observations with missing data, we are left with 112 observations.
[b] Standard errors are presented in brackets.

Given the form chosen for the frontier function, we can first get an estimation of the returns to scale by summing up the estimated coefficients of the input variables appearing on Table 3. It turns out that the industry displays decreasing returns to scale, the sum of the coefficients adding up to 0.85004. This result is rather surprising since the literature indicates that nursing home cares should display economies of scale [see for instance McKay (1988)]. Our results suggests the existence in Belgium of a second form of inefficiency: scale inefficiency. This could be a spurious inefficiency as those economies of scale can be due to the absence of capital stock in our model.

From the estimates of equation (7), we can infer the degree of productive

efficiency for each nursing home in our sample. Efficiency scores are pretty high as they range from 93.30 to 96.61%. The average degree of efficiency is 95.60% for the whole sample, 95.45% for *for-profit* private organizations, 95.23% for *non-profit* private organizations, and 96.61% for public municipal services. These statistics and others are presented in Table 4.

Table 4
Structure of the productive efficiency
by institutional arrangement

	For-profit private organizations	Non-profit private organizations	Non-profit municipal public services	All sample
Average efficiency	0.95453	0.95230	0.96614	0.95597
Standard error	0.00651	0.00538	0.00682	0.00656
Minimum	0.93302	0.94726	0.93925	0.93302
Maximum	0.96467	0.96412	0.96614	0.96614

Non-profit municipal public services seem to be, overall, slightly more productively efficient than other ones. Nevertheless, this difference in efficiency is not very statistically significant given the standard errors associated to the average degrees of efficiency. We can therefore conclude from our computations that there is no strong evidence of difference in efficiency within the nursing home sector, between private or public, for-profit or non-profit firms.

Finally, the sign of the γ coefficient confirms the fact that the health of residents is indeed an important factor in the explanation of the input requirement.

6. Conclusion

Public authorities show a particular interest in the efficiency reached by nursing homes because they support a good deal of the nursing home expenditures through Welfare, Social Security subsidies or making up of budget deficits.

The findings of this paper suggest that, all else being equal, nursing homes managed by the public sector are at least as efficient as private ones. They also indicate that, within the private sector itself, there are few differences in efficiency between profit

and non-profit organizations.

7. References

Aigner, D., C.A.K. Lovell & P. Schmidt, (1977), « Formulation and estimation of stochastic frontier production function models ». Journal of Econometrics, 6-1, 21-37.

Bjurek, H., U. Kjulin & B. Gustafsson, (1992), « Efficiency, productivity and determinants of inefficiency at public day care centers in Sweden », Scandinavian Journal of Economics, 94, 173-187.

Boveroux, Ph., (1994), « Efficacité des maisons de repos: une approche par la méthode DEA », Mémoire de fin d'études en science économique, Université de Liège, mimeo.

Bruning, E.R. & C.A. Register, (1989), « Technical efficiency within hospitals: do profit incentives matter ? », Applied Economics, 21, 1217-1233.

Charnes A., W.W. Cooper & E. Rhodes, (1978), « Measuring the efficiency of decision making units », European Journal of Operational Research, 1, 429-444.

Conseil de la Communauté Française (1993), « Projet de Décret modifiant le décret du 10 mai 1984 relatif aux maisons de repos pour personnes âgées, Rapport présenté au nom de la Commission de la Santé, des Affaires sociales et de la Jeunesse, Exposé introductif », Document du Conseil 124 (1993-1994) - N°2.

Corbo, V. & J. de Melo, (1985), « Measuring technical efficiency: A comparison of alternative methodologies with census data », in Measurement Issues and Behavior of Productivity Variables, edited by Ali Dogramacy, Kluwer-Nijhoff Publishing, 1-40.

Cutler D., (1993), « Policy options for long-term care », Department of Economics, Harvard University, Cambridge, Working Paper # 4302, March 1993.

Debrule, F., (1994), « Efficacité des maisons de repos: une approche par la méthode FDH », Mémoire de fin d'études en science économique, Université de Liège, miméo.

Donni, O., (1994), « Efficiency of day care centers in Belgium », CREPP, Université de Liège, mimeo.

Dusansky, R., (1989), « On the economics of institutional care of the elderly in the U.S.: the effects of a change in government reimbursement », Review of Economic Studies, 56, 141-150.

Farrel, M.J., (1957) « The measure of productive efficiency », Journal of the Royal Statistical Society, 120, 253-285.

Fizel, J. L. & T.S. Nunnikhoven, (1992), « Technical efficiency of for-profit and non-profit nursing homes », Managerial and decision economics, 13, 429-439.

Forsund, F., (1980), « Survey of frontier production functions and of their relationship to efficiency neasurement », Journal of Econometrics, 13, 5-25.

Forsund, F., C.A.K. Lovell & P. Schmidt, (1980), « A Survey of frontier production functions and of their relationship to efficiency measurement », Journal of Econometrics, 13-1, 5-25.

Frech III, H.E. & P.B. Ginsburg, (1981), « The cost of nursing home care in the United States: Government financing, ownership, and efficiency », in Health, Economics and Health Economics, edited by J. Van der Praag & M. Perlman, North-Holland Publishing Company, 67-81.

Gathon, H.-J. & P. Pestieau, (1995), « Decomposing efficiency into its managerial and its regulatory components : the case of european railways », European Journal of Operations Research, 80, 500-507.

Gathon, H.-J. & P. Pestieau, (1993), « The implications of European Union for the performance of public enterprises », Administration, 41-2, 149-165.

Greene, W.H., (1980), « On the estimation of a flexible frontier production models », Journal of Econometrics, 13, 101-16.

Greene, W.H., (1992), LIMDEP Version 6.0, Econometric Software, Castle Hill, 894 p.

Holtmann, A.G. & S.G. Ullmann, (1991), « Transactions costs, uncertainty and not-for-profit organisations : the case of nursing homes », Annals of Public and Cooperative Economics, 62-4.

Jondrow, J., C.A.K. Lovel, I.S. Materov & P. Schmidt (1982), « On the estimation of technical inefficiency in the stochastic frontier production function model », Journal of Econometrics, 19-2/3, 233-38.

Judge, G.G., W.E. Griffiths, R. Carter Hill, H.Lutkepohl & T.-C. Lee, (1985), The Theory and Practice of Econometrics, Second Edition. New York: John Wiley & Sons.

McKay, N.L., (1988), « An econometric analysis of costs and scale economies in the nursing home industry », Journal of Human resources, 23-1, 57-75.

McKay, N.L., (1989) « Quality choice in medicaid markets : the case of nursing homes », Quarterly Review of Economics and Business, 27-40.

Nyman, J.A., (1988), « The marginal cost of nursing home care », Journal of Health Economics, 7, 393-412.

Nyman, J.A., (1989), « The private demand for nursing home care », Journal of Health Economics, 8, 209-231.

Nyman, J.A. & D.L. Bricker, (1989), « Profit incentives and technical efficiency in the

production of nursing home care », Review of Economics and Statistics, 586-594.

Pestieau P. & H. Tulkens, (1993), « Assessing and explaining the performance of public enterprises; some recent evidence from the productive efficiency viewpoint », Finanz Archiv, 50-3, 293-323.

Tuckman, H.P. & C.F. Chang, (1988), « Cost convergence between for-profit and not-for-profit nursing homes: Does competition matter ? », Quarterly Review of Economics and Business, 50-65.

Ullmann S.G. & A.G. Holtmann, (1985)., « Economies of scope, ownership and nursing home costs », Quarterly Review of Economics and Business, 25-4, 83-94.

Weisbrod, B.A., (1988), The nonprofit economy, Harvard University Press.

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