ESTIMATION OF ROMANIAN HOSPITALS EFFICIENCY IN RELATION TO HOSPITAL MARKET COMPETITION

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Abstract: *The study examines a sample of 20 teaching and research Romanian hospitals, located in Bucharest, during the period 2001 – 2005, in terms of their efficiency and influence on their neighbouring health care units, expressed as an idiosyncratic form of market competition. Perspectives in case price competition will become a differentiation factor among hospitals, as health care migrates from the public to the for-profit sector will be addressed to, as well as the analysis of a possible switch, in the teaching and research hospitals' (TRH) policy, from focusing on technical efficiency to trying to compensate their low operating margins by offering more unverifiable quality, which will be appreciated by the patients suiting a different, now emerging, customer profile.*

Key words: efficiency estimates, hospital market, Lewin Group model.

1. Objectives of the study

The aim of the present study is to apply econometric methods for estimating hospital efficiency models on a sample of 20 Romanian TRH (Teaching and Research Hospitals), to draw conclusions regarding the frontier of efficiency, and suggest ways of action for the health care units which fall below the frontier. Additionally, we are interested in the proportion in which the level of hospital performance influences its market share which, in its turn, influences costs, and whether there can be set a multiple correlation, using appropriate concepts of public sector efficiency and social marketing. In the process of privatization and marketization of what used to be public goods, in what Michael Power (1997) named „the audit society", this relationship, between objective and accountable level of hospital efficiency, and its subjective image, „sold" to the patients, is extremely important for the perspectives of a medical system undergoing substantial transformations.

The European competition (patients choosing foreign clinics for diagnosis and, more and more, for treatment), the wider availability of information – via the internet, via marketing policies of competing hospitals, and the changing preferences of the patients who begin to act as consumers, demanding quality they can afford become challenges to be considered by the Romanian Teaching and Research Hospitals, formerly bastions of prestige and exclusivity on the market. As Trogen and Yavas (2002) point out, the once sacrosanct image of the hospital is eroding.

In this context, the questions about their efficiency and cost-effectiveness, which have always, diffusely, existed, become sound and necessary research premises.

2. State of the Art

The emergence of the New Public Management, which adapts to the public sector managerial models functioning in the private organizations (Ferlie et al., 1996), led to a reconsidering of the concepts of efficiency and effectiveness in public institutions. They are, no longer, unlimitedly autonomous, as they have to account, by meeting a specific quality threshold, for the budget they spend, and for the loyalty they demand. Still, the rendering of these institutions accountable doesn't follow as the night the day. The process is particularly difficult because, as McNulty (2002, pp. 445-446) states, hospitals combine, in their culture, „values of both clinical autonomy and managerial control", which results in a high potential for power conflicts, as „doctors resist managerial attempts to make their activity predictable, transparent, and standard." As an anecdote, which is not at all amusing, Lagasse et al. reported, in 1995, that 8% of the anaesthetic errors in the world are due to human faults, and 92% to system malfunctions. Under these conditions, the need to see why good professionals do not perform to their maximum capacity, considering the restrictions of a given system, becomes of key interest to the management of healthcare institutions.

Quality in healthcare, which is the never approached priority of all political programs, was defined by Øvretveit (2000) as the exceeding of costumer expectations by patient quality, professional quality and management quality. These three components correspond, roughly, to the relational (consumer) capital, human capital and structural capital, the branches of the intellectual capital (Roos and Roos, 1997). As hospitals are moving, like any other organization, from the intensive use of tangibles to the intensive use of intangibles, this intellectual capital existing at their disposal has to be defined and evaluated, and strategies for its adequate development must be put in place. Habersam and Piper (2003) have shown that intangible resources are highly relevant, in the case of hospitals, as patients are more involved than other categories of customers, demanding a higher quality of service and, also, their level of education tends to become higher, only if we take into consideration the information they gather from alternative sources, regarding their disease.

Still, having in mind that hospitals can hardly evaluate their costs and find ways to reduce them, by applying principles which proved salutary in other types of organizations, the evaluation of the intangibles can't be done in the first place. A manager who would like to know in which way the hospital he/ she manages can become an intelligent architecture which integrates patients quality, professional quality and management quality, by reconciling all the three forms of intellectual capital, has to start with knowing exactly what is cost-effective and what is not, considering that patients are spending less time in hospitals than they used to, and out-patient care tends to be preferred.

The concern for measuring teaching and research hospitals efficiency arose as, from a moment on, the social mission of these institutions, rather than organizations (North, 1990), which, at a time, provide healing services and promote academic excellence, is at risk (Reuter, 1998). A study conducted in the United States, between 1994 and 2000 (The Lewin Group Analysis, 2000) proves that the decrease in the TRH aggregate financial performance was more significant than the one experienced by non-teaching hospitals, even after adjusting the results with an index of case severity, given that, usually, TRH treat more complicated cases (Koenig, Dobson, Book and Chen, 2005). This means that the academic functions a TRH pursues are endangered, in a market-driven society, because they are not cost-efficient, since less than half of the American TRH were able, in 2000, to keep their positive operating margins, as shown in Figure 1 below.
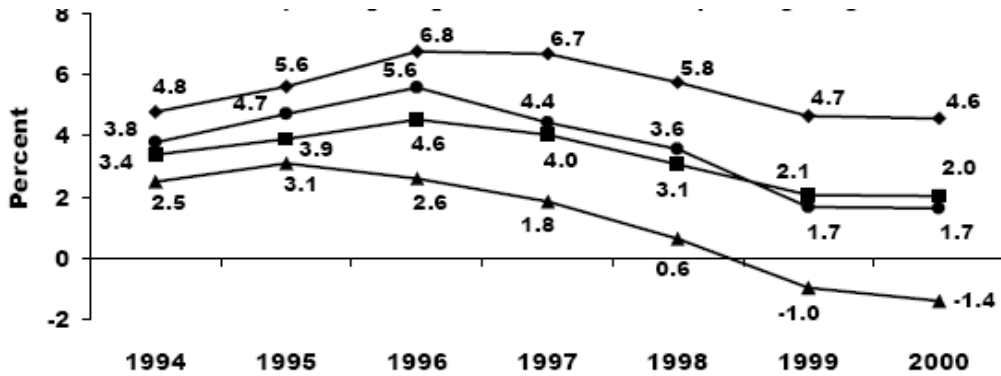

Figure 1. *Operating margins for hospitals*

Source: The Lewin Group Analysis of the AHA Annual Survey Data, 2000
where: ━◆━ All Hospitals' Total Margins; ━●━ TRH Total Margins; ━▲━ TRH Operating Margins; ━■━ All Hospitals' Operating Margins.

Based on these findings, and on the presumption that the performance of the public, committed to teaching and research activities, hospitals will grow even worse in the coming years, the Lewin Group developed an econometric regression efficiency model, measuring efficiency as average cost per case, taking into account the case mix index (intensity of care), the teaching intensity, and the payer mix index (who pays for the medical services).

In Romania, the state, by the system of national health assurance, is the most prominent payer for the services offered by public hospitals. Still, as private assurance systems emerge, patients will be redirected towards hospitals with lower costs, and

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this influences a hospital's market share and, consequently, the level of total discharges made to the hospital. But this is not the only issue to be taken into account, in terms of patients' preference for a hospital. A service a hospital sells in a market, at a price P, has both a verifiable quality, from the point of view of the customer, Q_1, and a non-verifiable quality – staff behaviour, attention given to patients, general climate etc., which the clients expect to be high. Glaeser and Shleifer (1998) developed a model for the analysis of not-for-profit hospitals position in the market. After selling a service, the hospital may choose to spend effort E to make an innovation, reducing costs by K (E). The total costs after the innovation will be C (Q_1) – K (E). But, the innovation may reduce non-verifiable quality by mE (m = constant), while verifiable quality remains Q_1. For instance, an information system designed to report in real time the free beds available and to place new comers accordingly, saving time, may create the patients the impression they are not sufficiently looked after. If E denotes the patient's expectation of the level of unverifiable effort, then his/her willingness to pay for the services equals q+ Q_1 – mE, where q is a constant of the market. In this case, a hospital entrepreneur's choice for operating the hospital as a not-for-profit organization (that is, selling at a higher price, with a lower cost reducing effort than a for-profit), depends on the clients' willingness to pay for non-verifiable quality. This can be approximated, in the market, as proportion of high-income and high-educated people (Duggan, 1998). Accordingly, flow demand models have been designed (Oliveira, 2002). As far as hospital competition is concerned, hospitals in competitive markets have 20% higher costs than hospitals with little or no neighbouring competition (Dranove, Shanley and White, 1993). The relationship found by the three researchers between hospital mark-up, hospital characteristics and hospital concentration is:

$$M_{it} = B_t + B_z\, Z_{it} + B_x\, X_{it} + B_H\, H_{it} + E_i \qquad (1)$$

where M_{it} is the hospital's mark-up for a mix of hospital services sold by hospital i during the period t. Z_{it} is a vector of hospital's i characteristics, permitting it to charge a certain price. X_{it} is the vector of other hospitals' characteristics, which might affect the mark-up. H_{it} is the Herfindahl index in hospital i's market. The healthcare market differs from other markets in some important respects (Gaynor and Vogt, 2000): services are highly differentiated, information is imperfect, government regulation is extensive, and most of the services are provided by not-for-profit organizations. This is way competition on this market doesn't necessarily lead, as we would expect, to lower prices and better quality. In fact, hospital competition rather results in social waste (Propper et al., 2004), as the price is not paid directly by each client, for the particular services he/she bought, so that the decision to employ better equipments and to invest in costly procedures burdens the state budget and is paid by all the insured, indistinctly.

These are sensitive problems, especially for the Romanian healthcare system, were the correlation between efficiency measurement, impact on market share, and the influence of competition on the overall costs which, in their turn, influence performance, needs to be investigated.

3. Data and methodology

In this study, in order to prove how the increased competitiveness in the healthcare market reduces the market share of the teaching and research hospitals, which have a rather low cost efficiency, and to suggest ways of counterbalancing this tendency by offering more non-verifiable quality, we used data from the National Statistics Institute, from the Department of Medical Statistics, and longitudinal data collected from a sample of 20 teaching and research hospitals, located in Bucharest, out of which five are also emergency care units. For estimating the market competition among competitors, the usual measure is the Hirschman- Herfindahl index:

$$HHI_k = \Sigma_j \, s_j^2 \, I \, (d_{jk} \leq R_k) \qquad (2)$$

where d_{jk} is the distance between hospital j and hospital k, R_k is the distance boundary defining hospital k's market, and I is an indicator equal to 1 when hospital j is located nearer than the distance boundary. S is the share of the market owned by each of the competitors.

In our case, the use of this index is problematic, since it is difficult to estimate the market share of a large, teaching and research hospital, given that more than 60% of the patients (according to a survey we have conducted in 2004/2005 in Fundeni Hospital) of such a health care unit located in a particular site from Bucharest come, actually, from all over the country, and the distance between hospitals is a good predictor of the competition among them only in the case of emergencies. In this latter case, out of a) accessibility and b) economic reasons – transportation costs, the closest emergency care hospital is preferred, unless the severity of the case (estimated by the Charlson index) asks for a particular destination (for instance, Floreasca Emergency Care Unit). This Charlson index includes 19 categories of co-morbidities, with their associated weight, measuring the risk to decease within a certain time interval. Still, we may assume that a teaching and research hospital competes with the same type hospitals located in the same geographical area, in our case, with the other TRH from Bucharest. A profile of the patient flow in each hospital should also be predicted, but this again rises problems because of the fragmentation of services: some patients are acute cases and, if they cure and, after a period, come again for a different illness, are recorded as different patients, some other are chronic patients, and their coming backs to hospital are recorded as revisits, but they may change, for various reasons, the

treating hospital in the meanwhile. Some other patients are fidelized because they need a particular treatment (for chronic leukemia, for instance), which they can't obtain unless they are under regular supervision in a national clinic in charge with the prescription of that medication, and so on. Recent studies (Town, 2003) have proved that the best solution in these cases would be the use, in the formula of the index, of a fixed R of 75%, which translates as „which are the other hospitals in the region from which 75% of hospital k's patients are drawn?".

Let us assume that HO represents the health outcomes of the hospitalization in a certain healthcare unit, depending on the care intensity, which is related to the teaching intensity of that hospital (computed as students and residents to beds ratio), in the sense that the DME (direct medical education) costs should be subtracted (Lewin Group, 2000) for computing the cost per case, which is an indicator of the intensity of care. The resulting equation, adapted from the Lewin Group's model, is the following:

$$\text{Log } C/C_i = \alpha_0 + \sum_j \alpha_j \log(X_{ji}) + \varepsilon_{ii} \tag{3}$$

where C/C is the cost per case, α_0 and α_j are estimated coefficients, and X_{ji} are independent variables. ε_{ii} is the error.

The health outcomes verify the equation:

$$HO = \alpha X_{ji} + \beta HHI_{kt} + u_k + \varepsilon_{it} \tag{4}$$

where X_{ji} are the independent variables, HHI_{kt} is the Hirschman- Herfindahl index for hospital k in period t, u_k is the unverifiable quality delivered by hospital k, and ε_{it} is the error.

The independent variables include rate of bed occupancy, number of hospital services offered, length of stay, and age of physical plant (Lewitz and Brooke, 1985). By using a DEA technique, for each hospital k we found a set of weights, w^k, and an efficiency score, θ_k, where the weights are those conditions which maximize the apparent performance of the observed hospital. This measurement refers basically to technical efficiency, with variable returns to scale:

$$F_1(y, x \mid V, S) = \min \{\lambda : \lambda \cdot x \in L(y) \mid V, S\} \tag{5}$$

$0 \leq F_1(y, x \mid V, S) \leq 1$, where $L(y)$ represents all possible input x combinations, given the output vector y. If $\lambda^* = 1$, than the inputs can't be further reduced while keeping output constant, so the hospital is technically efficient. If $\lambda^* < 1$, than the hospital is technically inefficient.

The effect of the neighbouring hospitals' efficiency on a hospital's efficiency is expressed by:

$$Eff_k = \beta_0 + \beta_1 Eff_{-k} + \gamma X_k + \varepsilon_i \tag{6}$$

where Eff_{-k} is the mean efficiency of the other hospitals in region, X_k stays for other factors influencing a hospital's efficiency, and ε_i is the error. The assumption is that a better technical efficiency of the hospitals in the region lowers the costs inferred by a given hospital, and thus increases its technical efficiency.

4. Results

For our sample of 20 teaching and research hospitals located in Bucharest, a mean technical efficiency score of 0.5674 was found, with a standard deviation of 0.2343, meaning that, on average, the hospitals observed could have reduced their inputs by almost 57%, while obtaining the same outputs then before, on the condition that they were more efficient (in other words, 57% of the hospitals from the sample fell below the efficiency frontier). It was also proven that differences in costs per case in various hospitals result from variations in the length of stay. But costs are not significantly influenced by market concentration, measured by the Hirschman – Herfindahl index. We may presume that a monopolistic market is likely to induce the use of cheaper equipments, or less complex procedures, while a real competition in the hospital market would force the players to increase their level of efficiency, in order to offer more at the same production costs, but there is no evidence on that. The only accountable fact is that a 10% increase in the average efficiency levels of its neighbouring hospitals leads to a 5% increase in the efficiency level of an individual hospital. Another observation is that Romanian hospitals tend to overproduce quantity, by accommodating, on average, 15% more patients than their normal capacity, by increasing the length of stay, which leads to an overcharging of the services they offer, which, nevertheless, for severe cases, may be perceived as unverifiable quality by the family of the patient, which is thus excepted from nursing activities. In addition, for teaching and research hospitals uncompensated care (charity cases), represented on average 6% of their total costs, in the studied period, which significantly burdened their budgets. The efficiency index for teaching and research hospitals, computed using the Lewin Group model, varied as following, for the considered interval:

Table 1
Efficiency index for the TRH sample in Bucharest

Year	Efficiency index for TRH
2001	1.029
2002	1.014
2003	1.030
2004	1.035
2005	1.021
Variation over the period	-0.80%

The value 1 indicates the average efficiency level of Romanian hospitals. Hospitals scoring below 1 are efficient, while hospitals scoring above one are inefficient. The results obtained show that the teaching and research hospitals in Bucharest are rather inefficient, although the tendency is of decrease in overall inefficiency scores.

There aren't any private teaching and research hospitals in Romania, so a comparison between the public not-for-profit and the private not-for-profit and for-profit organizations in the field, taking into account the corresponding market orientation, couldn't be performed. A hypothesis to be tested is that, in case such private units appear, their operating margins are likely to be higher than those of the state-owned hospitals, with a larger market share.

5. Conclusions

According to their mission, teaching and research hospitals are dedicated to educating students and residents, which may be regarded both as inputs (valuable medical force prepared to deliver quality health care services), and outputs (TRH offer both health and training outcomes). In order to assure a proper medical education, they need expensive, last generation equipment and, due to their particular clinical research interests, they usually attract the most complicated and severe cases from all over the country. This leads to corresponding increases in the length of stay, and in the cost per case, making them score poorly in the efficiency tests, falling below the efficiency frontier. In a competitive market, these elements would gradually leave them out of business.

But the hospital market, even under the circumstances of emergence of private businesses, remains idiosyncratic, in the sense that patients appreciate also the unverifiable quality, not directly connected with efficiency scores, but with subjectively perceived excellence, which may indeed influence the market share of a hospital. The future of the teaching and research hospitals resides in this unverifiable quality, which may attract, in the future, paying customers, and private medical

insurances agents, equilibrating their payment-to-costs balance. In other words, they must overproduce quality, instead of quantity, and this goal must replace the normal one, pursued by any other business, of maximizing profits.

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