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## Volume 12, Issue 3 / 2010 - Hospital Downsizing

### Is Hospital Downsizing an Effective Way to Control Health Expenditure?

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Hospital downsizing is a phenomenon characterising almost all western economies in the last decades, from the US to Europe. As a matter of definition, downsizing policy is related to a reduction in the total number of acute care beds, generally pursued by central or regional governments imposing crude ratios of beds per population, which are not based on any empirical supporting evidence on real healthcare needs. This massive ongoing restructuring of the hospital industry has to be understood in the framework of changing population needs – an ageing population increases the demand for long-term care with respect to the past – and a search for a more efficient healthcare provision aiming at controlling health expenditure growth, as hospital costs represent the most relevant share of total spending.

As for the control of health expenditure growth, an important issue to be discussed concerns the reaction of hospital managers to the beds reduction imposed by the government, in particular in terms of workforce management. Indeed, while in the US bed downsizing has been typically accompanied with a medical staff reduction, in other countries - such as the European ones - the restructuring has been limited mainly to beds. In this article we try to understand whether this latter policy is effective in reducing hospital costs, or if it generates potential inefficiencies that require paying more attention to workforce management.

#### Hospital Downsizing Italian Style

To discuss the effectiveness of controlling health expenditure using hospital downsizing as a policy tool, here we concentrate on Italy, one of the countries where bed cutting was more severe. Italy is characterised by a National Health Service, which is a universalistic public scheme covering a wide array of health risks in place since 1978. Total public expenditure outstripped 100 billion euro in recent years, reaching about seven percent of GDP, a figure less than other comparable western countries, like Germany, France, and the UK. Given pressures on public finances coming from European constraints, particularly severe during the nineties (because of the Maastricht Treaty), Italian governments tried to establish a tight control on health expenditure with a number of different policy measures. Given the regional responsibility for the management of healthcare services, a naive form of fiscal decentralisation to regions has been introduced, in order to curb regional expectations of bailouts. Bed downsizing needs to be understood in this framework, as a way to design a more effective and less costly NHS.

The way central government pursued downsizing was by using beds to population ratios. In 1980, according to OECD data, the hospital network was characterised by eight beds per thousand inhabitants; the Law 595/85 defined the standard of six acute care beds per thousand population. The Laws 537/93 and 549/1995 further reduced this standard, by fixing the new one at 4.5 acute care beds per thousand, plus 1% bed for rehabilitation and long-term care. Since the year 2000, the standard has been changed two more times. In 2001, the acute care beds should not have exceeded the number of four per thousand inhabitants, plus again 1% bed for rehabilitation and long-term care. In 2005, after an agreement between the central government and the regional governments, the standard was fixed to 4.5% beds without any distinction between different types of beds. Despite these centrally defined mandatory standards since 1985, regional differences were marked in 1996 (the first year we have data on different types of beds in Italy), and still persist at least to some extent also in 2005 (Figure 1).

If the evolution of the number of beds is clear, the evolution of the workforce followed a completely different pattern. Indeed, despite turnover being blocked several times starting from the Nineties, the number of medical staff (physicians and nurses) out of the number of ordinary beds shows a steady increase, from 1.82 in 1996 to 2.85 in 2005 (Figure 2). How can we rationalise this sharp change? One first possibility is that the quality of care improved during the period. A second related explanation is the increase in the need of care: if hospitals are to be limited to cure acute patients, then the complexity (and the associated need of care) necessarily increases. Of course, there is a third possibility: namely, that workforce was not managed properly after downsizing, so that there are potential inefficiencies to be exploited in order to cut expenditure. This is an argument analysed by Piacenza, Turati and Vannoni (2010, PTV from now on), that we now briefly discuss.

#### Simple Economics: the Elasticity of Substitution in Hospital Services

##### Definition of Input Elasticity of Substitution

According to standard applied microeconomics, the usual way of assessing the flexibility in managing the different resources within a given production process and the efficiency of substantial changes in the input mix – e.g., in the ratio between medical staff and beds – relies on the statistical estimation of a cost function model for the firms included in the analysis and the computation of the related elasticities of substitution for the different input pairs. A cost function is a mathematical relationship between production costs – on one side – and output levels – on the other side, where the firm is assumed to minimise the cost needed to provide each amount of production, adopting a given technology and facing given prices for the production factors. Parameter estimates from this model can be exploited to derive important measures of technological characteristics, such as - amongst others - input substitutability.

There are different concepts of elasticity of substitution available for the analysis of the flexibility in managing inputs, i.e., Allen, Morishima and Shadow elasticities. Generally, all these measures aim at assessing, for each couple of productive factors, how the input mix reacts to a change in the input price ratio, which modifies the relative convenience in using the two factors. For instance, considering the particular topic we are

discussing here, these measures assess how the "medical staff-beds" mix responds to an increase (or a decrease) in the average wage of physicians and nurses compared to the average cost of beds. Estimated values for such elasticities very close to zero indicate a quite rigid technology, with difficulties for managers in substituting between inputs, and highlight potential cost inefficiencies in managing downsizing processes focusing only on the reduction of a particular factor (e.g., the number of beds), while maintaining the unchanged usage of other inputs (e.g., the number of physicians and nurses).

## Evidence Available for Hospital Industry

In the context of hospital industry, the strand of empirical studies investigating input substitutability is rather scant and mostly based on US data, where the provision of healthcare services is prevalently managed by private hospitals and financed with private funds. Overall, the available evidence points to a very low degree of substitution between beds and medical staff, both for nurses and physicians, suggesting that bed downsizing should be accompanied by a proportional workforce reduction in order to avoid wastes of resources. However, it is important to test whether this result holds also in Europe, where – differently from the US – there is a prevalence of public providers and public funding in healthcare provision, and the process of restructuring of hospital industry has been limited mostly to bed downsizing, causing a large increase in medical staff per bed. The study by PTV (2010) provides first evidence on input substitutability in the European context, relying on the estimation of a cost function model for a representative sample of public hospitals in Italy.

## Main Findings for Hospitals in Piedmont

The data used in the analysis refer to all the public hospitals operating in the Local Health Units of Piedmont (Regione Piemonte), a highly industrialised area in North-Western Italy representing one of the 21 administrative entities that are responsible for the regional healthcare systems. The full sample is a panel of 29 productive units observed over the period 2000-2004. The estimated cost function is based on a very general mathematical specification (the Generalised Composite) and includes the total annual number of patients (both inpatients and outpatients) as output indicator and the sum of the operating costs associated to the inputs more closely related to the production of healthcare services as dependent variable: labour – distinct in medical staff (physicians and nurses) and other residual workers (technicians, professional and administrative staff), drugs, and beds – usually adopted as a proxy for the capital stock in the empirical studies on hospital efficiency. Moreover, a variable measuring the average DRG weight is introduced in the model, in order to control for the role played by the severity of illnesses and the composition of the production volume. The robustness of the results is also tested by extending the analysis in several directions, so as to consider some critical issues not tackled in the basic model (e.g., the potential reduction of operating costs following an increase in the number of outpatients beds).

Looking at the estimates of input substitutability – assessed using all the available concepts (i.e., Allen, Morishima and Shadow elasticities) – the evidence obtained highlights that substitution possibilities in the production of hospital services are in general very limited. This is especially true for the input pair "medical staff-beds", for which the measure of Shadow elasticity computed at mean values of the output (22,072 annual patients) and average DRG weight (1.12) is 0.14 (not statistically different from zero at 10 percent of significance level), meaning that a 10 percent increase in the price of capital relative to the average wage of physicians and nurses implies the ratio of medical staff to beds to rise by 1.4 percent only. Notice also that considering output volumes higher than the sample mean - for instance a tripled production (66,216 annual patients) - a slight decrease of the substitutability between medical staff and beds, emerges when increasing the complexity of treated patients from 0.56 up to 2.24 average DRG weight. The latter finding is consistent with a more marked rigidity of the production process starting from high levels of output.

## Final Remarks

Overall, the results from PTV (2010) on Italian hospitals confirm previous evidence on small input substitutability obtained in the literature on North-American countries, thus validating the difficulties for hospital managers to substitute between productive factors, in particular between medical staff and beds. This technology rigidity casts some doubts on bed downsizing policies as an effective tool for controlling hospital costs and public healthcare expenditure in countries, like the European ones, where the share of public providers and public funding is significantly higher than in the US.

A restructuring of the hospital industry limited to the cut of the number of beds, without also properly managing the workforce to avoid excess staffing – such as the downsizing carried out in Italy during the last decades – is likely both to limit the production possibilities and to preclude potential savings in operating costs. The latter could be effectively exploited, for instance, by re-allocating excess medical staff after bed reductions, from the hospitals towards the provision of other health services on the territory, such as home and community care.

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