

## INTRODUCTION

A huge process of reorganisation invested hospital industries worldwide in the last decades. At a macro level, in order to curb the presence of excess capacity, public producers' number of beds has been reduced by Central or Regional governments almost anywhere (e.g. Kroneman and Siegers, 2004; Hensher et al., 1999). At a micro level, a number of M&As - interesting both private and public hospitals - has been observed in several countries, not only as a response to bed reduction, but also to exploit scale and scope economies, and improve effectiveness and quality of care. The process has been originated on two basic premises: on the one hand, the need to contain public health care expenditure imposed governments to find new ways on how to improve the efficiency (and the effectiveness) in the provision of health services. As expenditure for hospital services represented (and still represent) a significant share of total health expenditure, it is not surprising that hospitals were clearly at the core of policies aimed at controlling expenditure growth. On the other hand, the perception that an ageing population would have different needs (especially chronic illnesses) with respect to past years caused traditional hospitals - which focus typically on acute care - not to be tailored to answer these structural changes in the epidemiological context.

This massive ongoing reshaping of the hospital industry raises of course a number of questions, that only in recent years the academic literature has started to ask. A first problem to address is to understand whether M&As are justified both from an efficiency and an effectiveness point of view. In this perspective, as discussed in Posnett (1999), results are somewhat mixed. As for efficiency, for instance, studying the Canadian Province of Ontario, Preyra and Pink (2006) find large scale unexploited gains from consolidation in the hospital sector, while Bilodeau *et al.* (2002), concentrating on Québec, show the presence of both economies and diseconomies of scale, with some establishments operating at constant returns to scale. As for effectiveness, for example, focusing on U.S. surgical procedures, Birkmeyer *et al.* (2002) find that mortality rates are lower the higher the volume of patients treated, whereas Grilli *et al.* (1998) challenge this view, by surveying literature on cancer patients. A second question to focus on is the strategic reply of hospitals to bed reductions implemented by Central and Regional governments. For instance, Kroneman and Siegers (2004) find that behavioural responses are related to the hospital financing system: in particular, in global budget systems, occupancy rates appear to decline after a reduction in hospital bed supply, while in

per diem financing systems, admission rates did not drop following bed downsizing. In both systems, no effects are detected on average length of stay.

In this framework, in order to understand the potential role of industry restructuring on health expenditure growth, an important issue to be discussed concerns workforce management after bed reductions. In the U.S., where the share of private producers is higher than elsewhere, bed downsizing has been sometimes accompanied also with job reductions, with no clear effects on hospital performance. Chadwick *et al.* (2004) find for example that Human Resource Management practices are important determinants of successful downsizing, of both beds and the workforce. In particular, looking at financial performance of hospitals, they find a positive impact of consideration for employees' morale and welfare during downsizing (like more extensive communication and advance notice, respectful treatment of laid off employees, attention to survivors' concerns on job security). Somewhat contrary to this view, Aiken *et al.* (2002a, 2002b) find that better staffing is positively associated with higher nurse-assessed quality of care, lower risk-adjusted and failure-to-rescue rates, lower level of dissatisfaction and burnout, hence suggesting a deterioration of performance following downsizing. However, in other countries, especially in Europe, where the share of public producers is higher, the restructuring of the industry has been limited in most cases to bed downsizing, while workforce management and planning has been conducted using fixed ratio relationships (e.g. physicians to patients) that have no empirical validity (e.g. Bloor and Maynard, 2003). Of course, this one-factor restructuring process has caused a consistent change in the input-mix, in particular an increase in medical staff per bed.

Several factors can help explain observed variations in input-mix. For instance, a higher need of labour can be related to a higher severity of illness in acute care patients. This might be linked to the increase in patients turnover and the reduction in average length of stay (endogenously determined by clinicians), which characterised hospital industries in countries that adopted a Prospective Payment System. Or it might be a signal of the increase in the quality of services, both perceived by nurses or measured in terms of mortality rates (e.g. Aiken *et al.*, 2002a, 2002b).

In this paper, we aim at understanding whether this change in input-mix is economically rational, by focusing on the production technology of hospital services. We estimate different cost function models and derive factors elasticity of substitution, considering a sample of regional Italian hospitals. Like other countries, Ital-