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Two-part payments for the reimbursement of investments in health technologies

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ABSTRACT

The paper studies the impact of alternative reimbursement systems on two provider decisions: *whether to adopt* a technology whose provision requires a sunk investment cost and *how many patients* to treat with it. Using a simple economic model we show that the optimal pricing policy involves a two-part payment: a price equal to the marginal cost of the patient whose benefit of treatment equals the cost of provision, and a separate payment for the partial reimbursement of capital costs. Departures from this scheme, which are frequent in DRG tariff systems designed around the world, lead to a trade-off between the objective of making effective technologies available to patients and the need to ensure appropriateness in use.

1. Introduction

Although there is agreement that the diffusion of new health care technology has led to substantial improvement in patient outcomes [1], the sustainability of its impact on health care expenditure is often questioned [2,3]. For the US, Smith et al. [4] estimate that medical technology diffusion is responsible for 27–48% of total expenditure growth. It is often argued that at least part of this increase is due to inappropriateness in use [5].

Both adoption decisions and subsequent use of the new technology contribute to determining overall efficiency in this field. In the quest to improve value for money of technological diffusion, regulators have employed a wide range of instruments, both direct – *ex-ante* assessments by HTA national agencies, *Certificates of Need* like those employed in several U.S. states – and indirect – price regulation in (quasi-)competitive markets. The impact of these policies on adoption and use of the technologies has been widely investigated within two largely independent strands of literature.[1] Adoption is studied regardless of use, whereas appropriateness is studied conditional on an adoption decision. In this paper we argue that if adoption requires a sunk investment cost, the regulatory issues concerning the decisions on whether to adopt the new technology and to whom the treatment should be provided should be studied

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[1] The literature related to technology diffusion is mainly empirical. For example, the impact of the introduction of "managed care" in the U.S. on technology adoption has been widely studied [6–9]. Schreyögg et al. [10] provide an overview of regulatory measures in use in some European countries for medical devices and discuss their implications with respect to the balance between adoption and affordability. Theoretical analyses of the impact of regulation on investments that enhance the quality of the treatment can be found in [11–13]. Most of the empirical analyses of appropriateness are specific to one technology (recent examples include [14–17]). A more general analysis of appropriateness can be found in [18]. The impact of regulation on the efficient selection of treatments is theoretically studied in [19–21].

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together. The most obvious example of technology requiring an investment cost is equipment. However, from the technical point of view, our results are equally relevant to any other situation where a fixed cost (e.g. training) must be paid before some kind of treatment is provided to patients.

We study indirect regulation, through prices. A specific fee-for-service tariff may exist for the reimbursement of treatments involving one technology (e.g. diagnostics for outpatient care), or the reimbursement can be part of the DRG price. Our analysis applies to both situations, as long as at least part of the DRG price is meant to reimburse the treatment provided with the technology of interest.

The efficiency of purely prospective prices has been thoroughly investigated. The literature has shown that it is optimal to add a cost sharing component to the contract if the provider has better information about costs than the purchaser [22–25]. The presence of a sunk investment cost is in principle another specific economic condition of interest, which seems to have been overlooked in the literature so far.

This paper uses a very simple model to highlight some of the fundamental policy implications derived in a fully stochastic and dynamic framework by Levaggi et al. [13], and to compare them with existing approaches to regulation in this area. We show that when the cost to invest in a technology is sunk, the optimal pricing policy involves a two-part payment: a price equal to the marginal cost of the patient whose benefit of treatment equals the cost of provision, and a separate payment for the partial reimbursement of capital costs. Departures from this scheme, which are frequent in health care systems, lead to a trade-off between the objective of providing patients with effective technologies and the need to ensure appropriateness in use. In particular, wider diffusion can only be achieved at the price of reduced appropriateness in use. However, a two-part payment is not *per se* sufficient to achieve efficiency, because the levels of the two parts should also be efficiently set. Failures to do so may lead to under- or over-provision of equipment with costly duplications, as well as under- or over-provision of treatments. The variability of tariffs that can be observed, sometimes even within the same health care system, suggests that this may be a further area of regulatory failure.

In the following section we describe the regulatory solutions adopted in a number of countries for the reimbursement of treatments provided with technologies that have the characteristics of interest. Section 3 presents the simple model and Section 4 describes the characteristics of an optimal reimbursement policy. Section 5 links the theoretical results of Section 4 to the real world reimbursement policies introduced in Section 2 and discusses the implications of departing from the optimal rule. Section 6 concludes.

2. Capital cost reimbursement around the world

The recent completion of the Euro-DRG project[2] has shed light on implementation of DRG systems across several European countries along a number of dimensions [26].[3] Table 1 integrates a similar table reported in the appendix to Scheller-Kreinsen et al. [27] with additional sources [28–30], to compare capital cost reimbursement policies.

Table 1
Capital cost reimbursement across Europe.

Country	Capital cost financed through DRG	Capital cost financed outside
Austria	Yes	No
Denmark	No	Yes
England	Yes	No
Estonia	Yes	No
Finland	Yes	No
France	Yes	Yes
Germany	No	Yes
Ireland	No	Yes
Italy	Yes	Yes
Netherlands	Yes	No
Norway	No	Yes
Poland	Yes	Yes
Portugal	No	Yes
Spain	No	Yes
Sweden	Yes	No
Switzerland	Yes	No

It should be noted that the table is meant to reflect the main tendency of national systems. Ambiguity in the classification may arise from funding coming from sources other than DRG or fee-for-service payments,[4] and interjurisdictional differences in decentralised systems.[5] The first observation that can be made is that no clear prevalence of one scheme emerges. Seven countries fund capital costs exclusively through the DRG system (Austria, England, Estonia, Finland, Netherlands, Sweden and Switzerland); six use only separate payments (Denmark, Germany, Ireland, Norway, Portugal and Spain); three use both (France, Italy and Poland). It is also interesting to note that some health care systems (Spain, Portugal) are not using a fully local system, because they import from other countries either the weight system or the cost base. In this case, although the capital cost is formally reimbursed separately, it may well be that a part of the DRG tariff is available for the reimbursement of capital cost.[6]

Outside Europe, a first look at the policies adopted by two large countries suggests that a similar variability might be a worldwide characteristic: within the U.S. Medicare programme, capital costs are reimbursed within the DRG system [32]; Australia, on the other hand, is implementing a system where they are separately reimbursed [33], and the price for outpatient services aims to reflect the marginal cost.

The system of some countries cannot be satisfactorily described using only the two dimensions of Table 1

[2] See also http://www.eurodrg.eu.

[3] Health Economics has devoted a full supplement to presentation of the results of the project. See also http://onlinelibrary.wiley.com/doi/10.1002/hec.v21.S2/issuetoc.

[4] See, for example [31].

[5] This is the case, for instance, for Austria and Italy.

[6] This would be the case if the variable cost in that country were lower than in the one where the cost has been estimated.