



Interfaces with Other Disciplines

## Introducing competition in healthcare services: The role of private care and increased patient mobility

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## ABSTRACT

We study the operational implications from competition in the provision of healthcare services, in the context of national public healthcare systems in Europe. Specifically, we study the potential impact of two alternative ways through which policy makers have introduced such competition: (i) via the introduction of private hospitals to operate alongside public hospitals and (ii) via the introduction of increased patient choice to grant European patients the freedom to choose the country they receive treatment at. We use a game-theoretic framework with a queueing component to capture the interactions among the patients, the hospitals and the healthcare funders. Specifically, we analyze two different sequential games and obtain closed form expressions for the patients' waiting time and the funders' reimbursement cost in equilibrium. We show that the presence of a private provider can be beneficial to the public system: the patients' waiting time will decrease and the funders' cost can decrease under certain conditions. Also, we show that the cross-border healthcare policy, which increases patient mobility, can also be beneficial to the public systems: when welfare requirements across countries are sufficiently close, all funders can reduce their costs without increasing the patients' waiting time. Our analysis implies that in border regions, where the cost of crossing the border is low, "outsourcing" the high-cost country's elective care services to the low-cost country is a viable strategy from which both countries' systems can benefit.

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### 1. Introduction

Designing a healthcare system which is accessible, provides care of high quality and is financially viable, is a key challenge with which both advanced as well as emerging economies are confronted. In advanced economies, spending on healthcare accounts "for about half of the rise in total spending over the past forty years" (Clements, Coady, & Gupta, 2012). Hospital operations in specific, absorb a significant amount of this spending. Among OECD countries, approximately 33% of health expenditures can be categorized as hospital spending (Maier-Rigaud, 2012).

Despite such high levels of spending, obtaining access to timely care can be challenging due to increasing waiting times, especially in the context of elective care. For example, in the UK, waiting times for elective surgery are considered by the public as the "second most important failing of the health care system" and "mean waiting times for elective surgical procedures are above three months in some countries and maximum waiting times can stretch

into years" (Hurst & Siciliani, 2003). More generally, in half of OECD countries, tackling accessibility challenges in elective care is a central policy concern.

However, the presence of waiting times (or waiting lists) for elective care also provides a form of rationing device when patients are covered by public health insurance and capacity is constrained. In that case, waiting times "take over from price rationing as a means of equilibrating demand and supply" (Hurst & Siciliani, 2003). Consequently, in managing waiting times, health systems' planners need to balance two types of costs. On the one hand, they need to consider the costs that arise from the deterioration in the health condition of patients, who are put on a waiting list and any associated utility losses. On the other hand, they need to consider the high costs associated with expanding capacity and delivering care. This discussion then suggests that some waiting will always exist at systems, where patients are required to pay little or no fees for accessing elective care services (Cullis, Jones, & Propper, 2000).

Therefore, how to design effective policies to tackle waiting times for elective care while controlling the associated costs is not clear. The introduction of competition between healthcare providers is increasingly considered as a means towards the creation of incentives that will induce healthcare delivery systems to

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offer high quality and efficient care (Cooper, Gibbons, Jones, & McGuire, 2011). In this work, we focus on elective care in countries with predominantly public healthcare systems and develop a unified framework to analyze the impact on waiting times and the overall cost of care, of two popular means of introducing competition: (i) allowing private care providers to enter the market for elective care services alongside the public system and (ii) increasing the choice of providers where patients can receive elective care.

The first possibility, i.e., the presence of a private system alongside the public system, provides to patients a faster but typically costlier way to receive access to care. Patients have to bear the full or part of the cost of receiving treatment in the private sector (Hoel & Sæther, 2003). Nevertheless, the presence of a private sector can be beneficial for two reasons: (i) it provides faster access to care for more severely ill patients who are in need of more urgent care and (ii) it reduces the demand for care and the overall load that the public system faces. In the European Union (EU), recent years have seen an increase in the number of private providers (European Hospital & Healthcare Federation, 2011).

The second possibility introduces competition by giving patients a wider choice of providers. At the national level, this situation is common in countries where provision of care takes place in public-sector facilities whereas funding of care occurs through taxation such as, among others, the United Kingdom or Sweden (Propper, Wilson, & Burgess, 2006). It is hoped that when patients have a wider choice of where to receive elective care they will “move from areas with high waiting times to areas with low waiting times, leading to a fairer distribution” (Hurst & Siciliani, 2003). At an international level, starting in 2013 and partly in order to address access to care issues, the European Union (EU) has decided to grant European citizens with the freedom to choose the member-state, where they receive care while being entitled to reimbursement from their home insurance systems (Commission of the European Communities, 2008b). The term that is typically used to describe such provision of care services is “cross-border healthcare”. While some conflicting evidence exists regarding the likely consequences of introducing patient choice at a national level, the possible effects of cross-border healthcare are virtually unknown. With this work we aim to make a first step towards better understanding them.

We model a country’s public healthcare system according to three basic entities: the health funder (e.g., the NHS in the UK) who reimburses the public provider for treating patients; the public provider (a public hospital or a private, non-profit hospital willing to provide elective care at the rate determined by the health funder); and the patients. In our model, we assume that each patient will select the treatment option that yields the highest utility. The funder of each country is responsible for setting its reimbursement rate and the capacity of its public provider so as to minimize its reimbursement cost. However, the funder’s decisions must satisfy two constraints: (1) the public provider’s participation constraint (i.e., the public provider’s profit must be non-negative); and (2) the public welfare constraint (i.e., the patient surplus provided by the public system must exceed a certain threshold).

While our unit of analysis is the national public healthcare system and we discuss inter-national patient movement in the context of cross-border care, our models are applicable to intra-national settings as well. Specifically, our models would apply to decentralized national healthcare systems which are organized into different “regions”, each of which is responsible for funding the care of the patients that reside within its borders. In that case, cross-border patient movement would imply crossing a region’s borders to receive care at a provider within a different region. Such provision of care would then require a monetary transfer across the health authorities of different regions to cover the costs of

the provided care. Examples of such systems include Sweden, Italy and outside the EU, Canada with its provinces.

To capture the interactions among the patients, the providers, and the healthcare funders we use a queueing framework, which we embed in two different sequential games. Each of the games is meant to examine the impact of a treatment option additional to the public system: the first game deals with the private provider and the second deals with the cross-border healthcare policy. We obtain closed form expressions for the patients’ waiting time and the funder’s reimbursement cost in equilibrium for each of these two games.

For the game that deals with the private provider, we show that both private providers and the public system will co-exist. Also, we show that the presence of a private provider can be beneficial to the public system because of the underlying “symbiotic relationship”: the patients’ waiting time at the public provider will decrease, the funder’s cost can decrease under certain conditions, and the private provider can generate profits.

For the game that is intended to examine the impact of the cross-border healthcare policy, we develop a model of two countries, each of which has its own public system. We show that when the welfare requirements across countries are sufficiently close, the cross-border healthcare policy is beneficial to the public systems of both countries: both funders can reduce their costs without increasing the patients’ waiting time. This result is due to the flexible patient movements enabled by the cross-border healthcare policy. These allow the high-cost country to exploit the low-cost structure of the other country. They further allow the low-cost country to benefit from absorbing patients from the high-cost country due to the presence of an “economies of scale” effect. Alternatively, if the cost of crossing the border is not high (an assumption that is satisfied primarily in border regions) and the high-cost country “outsources” its elective-care services to the low-cost country then both countries stand to benefit.

This paper is organized as follows: Section 2 reviews relevant literature. In Section 3, we present the base model of a single country in which the public system operates in a monopolistic environment. In Section 4, we extend our base model to the case when there is a private provider competing with the public system. Section 5 deals with the cross-border healthcare policy where we extend our base model to the two-country case in which each patient can choose the country that yields the highest utility. Finally, Section 6 presents some numerical examples and Section 7 concludes the paper.

## 2. Literature review

From a modeling perspective, our work falls within the operations management literature that studies competition between service systems. Hassin and Haviv (2003) provide an introduction and general survey of this body of literature. Moreover, because the cross-border movement of patients can be interpreted as “outsourcing” a country’s health services to a different country (Glinos, Baeten, & Maarse, 2009), our paper is also relevant to the stream of literature that studies the outsourcing of services under competition. Cachon and Harker (2002) is one of the early papers in this area. The reader is referred to Allon and Federgruen (2005) for a literature review of this relatively new stream of work. From a contextual perspective, our work touches upon issues which have been examined primarily in the health economics literature and specifically in two research streams that correspond, roughly, to the two settings that we consider. The first stream studies how the presence of private providers impacts the operation of a public healthcare system. The second, studies the impact of increased patient choice.

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