



# How payment systems affect physicians' provision behaviour—An experimental investigation<sup>☆</sup>

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## ABSTRACT

Understanding how physicians respond to incentives from payment schemes is a central concern in health economics research. We introduce a controlled laboratory experiment to analyse the influence of incentives from fee-for-service and capitation payments on physicians' supply of medical services. In our experiment, physicians choose quantities of medical services for patients with different states of health. We find that physicians provide significantly more services under fee-for-service than under capitation. Patients are overserved under fee-for-service and underserved under capitation. However, payment incentives are not the only motivation for physicians' quantity choices, as patients' health benefits are of considerable importance as well. We find that patients in need of a high (low) level of medical services receive larger health benefits under fee-for-service (capitation).

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## 1. Introduction

A central concern in health economics is to understand the influence of institutions on the behaviour of health care markets. Effects from changing institutions like the payment system during a health care reform are *ex ante* not necessarily known to policy makers and may influence behaviour in an undesired way. Main addressees of reforms on the supply side are physicians whose behaviour is assumed to be influenced by the payment system. The theoretical literature highlights the different incentives of commonly used physician payment systems like fee-for-service (FFS) or capitation (CAP). Under FFS, physicians are paid for each medical procedure

or service dispensed to a patient, whereas under CAP, physicians receive a fixed payment for each patient, irrespective of the quantity of medical services provided. In the former system, there is, in general, an incentive to deliver more care in order to increase own income. On the contrary, incentives from CAP can reduce the provision of health services (e.g., Pauly, 1990). Moreover, FFS embeds an incentive to overserve patients, whereas CAP may lead to underprovision of medical services (e.g., Ellis and McGuire, 1986; McGuire, 2000).

Empirical evidence on the impact of payment schemes on physicians' supply of medical services is mixed. Some studies support physicians' responsiveness to payment incentives (e.g., Croxson et al., 2001; Devlina and Sarma, 2008). In particular, physicians seem to provide a higher output in FFS than in CAP schemes (e.g., Gaynor and Gertler, 1995). Some studies do not corroborate the strong link between payment method and physician behaviour, however (e.g., Hurley and Labelle, 1995; Grytten and Sørensen, 2001). Causal inferences on the direction and the strength of an effect are rather difficult, as, for example, many studies vary more than one component of the payment system simultaneously. Moreover, behavioural data is gathered from country-specific institutional settings that are hardly comparable (Gosden et al., 2001).

An empirical method is called for that allows to investigate behaviour in a controlled manner and under *ceteris paribus* conditions—as a complement to field studies and surveys. The

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experimental economics method provides the requested features and has been used for studying behaviour in a wide range of fields within economics. In areas like industrial organization, public choice and labour economics controlled laboratory experiments became commonplace (Camerer, 2003; Plott and Smith, 2008). In health economics, laboratory experimentation is rather in its infancy.<sup>1</sup> This is surprising, as Fuchs (2000) already argued ten years ago that incorporating methods of experimental economics into health economic research might lead to great benefits.<sup>2</sup>

In the present paper, we follow the research agenda proposed by Fuchs (2000). Our main research goal is to improve the understanding on how incentives from the payment systems FFS and CAP influence physicians' behaviour by means of a laboratory experiment. We investigate how both payments systems affect the supply of medical services at the level of the individual physician. Further, we analyse whether overprovision occurs in FFS and underprovision arises in CAP. We study whether the patient's state of health is influential for the individual physician's quantity choices, and what effects the payment system has on the patient health benefit—in particular for those with different health status.

To meet our research goals, we designed an experiment that captures the main features of the theoretical literature and provides results comparable to findings of field and survey studies.

In our experiment, medical students in the role of physicians choose quantities of medical services they want to provide for their patients. The number of patients and their state of health is given and constant under both FFS and CAP. The quantity a physician (she) chooses for a patient (he) determines her own profit and the patient's benefit. When deciding upon the quantity of medical services for a given patient, the physician knows about the consequential profits and the patient benefits for all quantity alternatives. The patient benefit is measured in monetary terms representing a monetary equivalent of benefits from the provision of medical services. For each patient, there exists a unique quantity indicating the best treatment for the patient as it renders the highest benefit to the patient. Optimal quantities vary across patient types. The physician's profits increase in the quantity provided under FFS and decrease under CAP. The physician faces a tradeoff between her own maximal profit and the optimal patient benefit. Patients in our experiment are abstract in that only subjects deciding as physicians take part, and no patients are present. Physicians' quantity choices have real consequences for patients outside the lab, however: the money corresponding to the benefits of the abstract patients is transferred to a charity caring for real patients. Except for the mode of payment, we kept all experimental parameters constant.

Our main finding is that physicians' supply of medical services is affected by the incentives from the payment systems. Physicians supply about 33% less medical services under CAP than under FFS. In line with theoretical considerations, patients are overprovided under FFS and underprovided under CAP. Financial incentives—and thus physicians' profits—are not the only motivation for their quantity decisions, though. The patient benefit is of considerable importance as well. However, the patient benefit is affected differently by the two payment systems; patients in need of a low level of medical services are better off under CAP, whereas patients in

need of a high level of medical services gain a higher benefit when physicians are paid by FFS.

The paper is organised as follows. In Section 2, we give a brief overview of the theoretical and empirical literature on physician payment and incentives most relevant to our research topic and provide a rationale for an economic experiment. Section 3 states our research questions. In Section 4, we present the experimental design and procedure. Section 5 provides the behavioural results. Section 6 discusses our results and concludes.

## 2. Related literature and rationale for an experiment

The theoretical literature widely analysed how physicians respond to incentives from payment schemes (McGuire, 2000). In particular, the relationship between incentives from FFS and CAP and physicians' supply of medical services has been studied (e.g., Ellis and McGuire, 1986, 1990; Selden, 1990). Using a principal-agent framework where the physician is the agent of the hospital and her supply of medical services is influential for her own profit and the patient's health benefit, Ellis and McGuire (1986) show that FFS embeds an incentive for overprovision whereas CAP provides an incentive for underprovision of medical services.<sup>3</sup> The theoretical analysis includes the individual patient's health benefit as a major determinant of physicians' behaviour (see also Woodward and Warren-Boulton, 1984; Chalkley and Malcomson, 1998; Ma and Riordan, 2002; Jack, 2005).<sup>4</sup> Other authors found that besides causing underprovision of necessary medical services (Blomqvist, 1991), CAP may lead to cream-skimming of patients with a good state of health (e.g., Newhouse, 1996; Barros, 2003).

Evidence from empirical analyses on the impact of payment schemes on physicians' supply of medical services is mixed. Note that these studies relate to different institutional and country-specific settings (e.g., US physician group practice, UK fundholding system) and various measures of output (e.g., weekly patient visits, number of laboratory tests).

There is empirical evidence that physicians do respond to financial incentives (see Hillman et al., 1989; Hemenway et al., 1990). Gaynor and Pauly (1990), e.g., find that payment incentives affect the 'produced' quantity of medical services in US medical group practices. Gaynor and Gertler (1995) show that physicians in group practices reduce their effort, i.e., the number of weekly office visits, when physicians' payment is changed from FFS to CAP.

Davidson et al. (1992) observe a similar behavioural pattern for US office-based primary care physicians. In their randomized controlled trial, the frequency of visits in a FFS group with high fees is higher than in a CAP group. Most studies of Health Maintenance Organizations in the USA find that managed care reduces the length of hospital stays, the number of specialist consultations and the number of hospital operations (e.g., Miller and Luft, 1994). A main objection to these studies is, however, that they are unable to disentangle payment incentives and tighter administrative controls under managed care (Grytten et al., 2009).

Croxson et al. (2001) show evidence for the financial incentives of the UK fundholding system to have a strong impact on physicians' behaviour. Before enrolling, physicians intensified their hospital-based activity in order to increase their budget for the duration of the fundholding scheme. After becoming a fundholder, they decreased activities to retain the surplus of the fund.

<sup>1</sup> In a medical decision-making context, the early study by Fan et al. (1998) explores alternative methods for controlling the cost of physician services under global budgeting, Ahlert et al. (2008) and Hennig-Schmidt and Wiesen (2010) explore behavioural differences between medical students and other subject pools. The experimental studies by Lévy-Garboua et al. (2008) and Schram and Sonnemans (2008) analyse issues dealing with health care funding and health insurance choice.

<sup>2</sup> In a similar vein, Frank (2007) suggests the application of behavioural economics that help to answer relevant issues in health economics.

<sup>3</sup> The applicability of Ellis and McGuire's model to a primary care setting is discussed by Newhouse (2002).

<sup>4</sup> Arrow (1963) already emphasised the importance of professional ethics and, thus, departs from a pure profit-maximizing motive when describing the behaviour of physicians.

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