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AN EXPERIMENTAL ANALYSIS OF PATIENT DUMPING UNDER DIFFERENT PAYMENT SYSTEMS

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JEL Classification: C93; D91; I12; K13.
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An experimental analysis of patient dumping under different payment systems

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Abstract

Physicians behave differently depending on the payment systems, giving rise to several problems such as patient dumping, when patients are refused because of economic or liability reasons. While different studies have focused on the impact of remuneration scheme on the quantity of medical services provided, little research has been dedicated to patient dumping. This paper aims to test whether and to which extent the adoption of fee-for-service (FFS) or salary system can induce physicians to practice patient dumping. For, we will use an artefactual field experiment where physicians facing the possibility of being sued for medical malpractice, decide whether or not to provide medical services for patients with different state of health. Also, we check whether the introduction of the risk of being sued for a physician for having practiced dumping can have effect on his behaviour. Results show that dumping is more often observed under Salary than under FFS. However, physicians seem to be insensitive to the introduction of dumping liability under the same incentive mechanism, though it seems to trigger a higher amount of services provided. Policy strategies concerning the incentive scheme may vary on the hospital purposes.

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1. Introduction

It is commonly acknowledged that financial incentives from payment systems have a crucial impact on the behaviour of healthcare providers (Clemens and Gottlieb, 2014). Not only physicians choose the quality and the quantity of medical services to provide but, even more fundamentally, they could decide whether to treat patients depending on the remuneration scheme (Treiger, 1986; Barnett and Mayer, 1992). To support governments in their attempt to optimize healthcare delivery, a considerable theoretical literature analyses pros and cons of the alternative remuneration schemes (see e.g., Simoens and Giuffrida, 2004). In his review, Robinson (2001) argues that, albeit most used, fee for service (FFS) and capitation (CAP) present many drawbacks. For instance, a remuneration which gives physicians a fixed fee for each service provided (FFS), incentivizes the provision of inappropriate services, inflating healthcare costs without any effect on health itself (Donaldson and Gerard, 1989). Even worse, a lump-sum payment for a treated patient (CAP)[1], which does not take account of the quantity and the costs of services, could lead some practitioners to curtail consultation time, harming patients' health (Maynard *et al.* 1986). On the one hand, under such scheme physicians have an incentive to cream-skim patients, selecting only consumers who are in a good health status, given their reduced treatment costs (Matsaganis and Glennerster, 1994). On the other hand, this system rewards the dumping of the chronically ill patients owing to treatments expensiveness compared to physician's reimbursement (Preston et al., 1997). Similarly, an alternate prospective payment such as diagnosis related group (DRGs) promotes low risk patients' treatment at the expense of high-risk patients (Takahara, 2016). Under DRGs, indeed, hospitals receive a lump-sum payment for each patient treated, given a certain diagnosis (Siciliani, 2006). Consequently, hospitals which decide to treat expensive patients incur losses whenever costs are greater than the corresponding DRG payments. In a nutshell, prospective payment systems

[1] Notice that salary, largely used by hospitals, produces outcomes largely in line with CAP (Blomqvist and Busby, 2012).

induce hospitals to aim for efficiency and profit maximization and most importantly to refuse treatment on patients, a phenomenon known as *patient dumping* (Eze and Wolfe, 1992).

Despite initially limited to USA, the concept of patient dumping progressively spread on multiple continents, including Europe, given the introduction of case payment mechanisms (Busse et al., 2006). DRG systems were originally thought to provide a financial incentive to reduce health care expenditures. To this end, the patient was classified into one of the 468 diagnostic indices and the hospital was reimbursed according to a formula derived from the average costs of treating patients with that diagnosis (Preston et al., 1997). As a result, hospitals were induced to save costs and to seek increased efficiency (Horwitz, 1988). If the cost for treating the patient was lower than the fixed sum, the hospital could realise profits, otherwise the hospital absorbed the additional cost (Dranove, 1987). Therefore, hospitals were likely to dump charity patients who could not pay for the needed care (Mullner et al., 1986). Based on the above, one of the possible reasons for the observed dumping is that hospitals pursuing profit maximation strategies try to reduce the number of their high-cost admissions (Eze and Wolfe, 1992). Under such assumption, many theorists explored alternative payment structures such us a risk adjustment prospective system to prevent cream skimming and, mainly, patient dumping (see e.g., Sappington *et al.,* 1999; Barros, 2003). Similarly, hospitals could be insured for some fraction of the additional costs incurred to treat expensive patients (Chalkley and Khalil, 2005). Nevertheless, the reason behind dumping could be not so straightforward. Specifically, patient dumping, and medical malpractice liability are strictly related. Since physicians constantly face the risk of being sued for malpractice, they could turn away a priori patients to protect themselves if they are unable to provide patients with the best care in fearing to be sued (Zibulewsky, 2001). However, regardless the underlying reason, it is undeniable that patient dumping carries significant social costs. First, patients can face fatal treatment delays (Busse et al., 2006). Further to this, dumping makes patients converge to specific hospitals, especially public hospitals, triggering further treatment delays (Newhouse, 1983). Contrarily, another strand of literature supports dumping policy said to be welfare-improving to some extent. As outlined by Busse et al. (2006), information asymmetry (i.e., between patient and hospital) concerning patient type is mitigated, given the endogenous change in the distribution of patients

across the hospitals following dumping. For this reason, reduction in information rent allows hospitals to save costs for treating high-severity patients.

Since there is little consensus on the causes and the effects of patient dumping, the phenomenon requires further investigation. The assessment of the hospital's perspective is beyond the scope of this paper; however, we can reasonably assume that physicians' choices, being all employed at public hospitals, reflect employers' directives. Therefore, our focus is to investigate the occurrence of patient dumping under two different payment schemes, FFS and salary[2], building on a framed field experiment. Although experimental evidence on the impact of payment systems on the quantity of medical services provided is fast growing (see e.g., Green, 2014; Brosig et al., 2016; Lagarde and Blaauwn, 2017), the same cannot be said about patient dumping. This paper can be seen as a first attempt to fill this gap in the literature, assessing how the introduction of medical liability and the risk of being sued for dumping may affect physicians' practice of patient dumping under different payment systems. In this experiment, each participant playing the role of a physician decides whether to take charge of the patient and then, to what extent to treat him, given a certain payment structure. Under both the payment schemes, participants always face the possibility of being sued for malpractice and eventually an additional risk of being sued for practicing dumping. While the design closely mirrors Hennig-Schmidt et al. (2011) and Finocchiaro Castro et al. (2019), the novelty lies in the interplay of three issues heavily affecting medical care decisions: patient dumping, medical liability and the probability of being sued for dumping. Results show that dumping is more often observed under Salary than under Ffs. However, physicians seem to be insensitive to the introduction of dumping liability under the same incentive mechanism, though it seems to trigger a higher amount of services provided. Older physicians are more likely to take charge of the patient than their younger colleagues. Policy strategies concerning the incentive scheme may vary on the hospital purposes.

2. An overview on patient dumping

[2] Choosing salary as payment method is plausible being the most common compensation scheme employed by hospitals. Moreover, similarly to CAP and DRG, it does not provide physician with any financial incentive to work harder than the minimum (Hewak and Kovacs-Litman, 2015).

Before the Consolidated Omnibus Reconciliation Act legislation (COBRA) was enacted in USA by Congress in 1985, hospitals could refuse treatment to any patient. Cost containment efforts by both government and private sector and the increase in the number of uninsured were the main reasons for patient dumping (Treiger, 1986). Most of the uninsured delayed seeking healthcare until their illness had become serious, due to their economic status. For this reason, as the severity of their medical conditions increased, the cost of providing treatment for these patients increased in the same way, giving hospitals an economic incentive to dump them (Rice *et al.,* 1988). This was partly due to the prospective payment system introduced in the USA by the Medicare Program[3], the afore-mentioned DRG (Siciliani, 2006).

As patient dumping was becoming more and more frequent, in 1985 the U.S. Congress decided to enact COBRA to prohibit it. According to this law, hospitals, who received Medicare funds, were required to screen, and stabilise all patients in need of emergency care and women in active labour before transferring them, if necessary, regardless of their economic status (Saks, 2004). A hospital could transfer a patient in an emergency condition if and only if the patient requested a transfer or the physician certified that another facility could provide better treatment[4]. All transfer decisions needed the appraisal of a qualified staff member and the receiving hospital had to be informed of the pending transfer and had to consent to it. Moreover, appropriate transportation and medical services during the transfer had to be guaranteed to the patient.

Hospitals and physicians who knowingly violated COBRA statute were subject to monetary fines and risked losing participation in Medicare. Furthermore, patients and the receiving hospitals could sue a referring hospital which had transgressed the provisions of COBRA, obtaining damages for personal harm or financial loss (Kusserow, 1988). In addition to COBRA, many states had enacted statutes to guarantee access to emergency care to uninsured and indigent (see e.g., Dallek and Waxman, 1985; Treiger, 1986; Volp and Siegel, 1993)[5].

[3] Medicare cares for those who are 65 years of age and older by guaranteeing access to hospital care and physician services, whereas Medicaid addresses to the problems of the poor and near poor (Rice *et al.*, 1988).
[4] The physician had to demonstrate and certify that the benefits of the transfer outweighed the risks because the transferring hospital could provide highly specialized technical teams and needed equipment (COBRA, 1985).
[5] Texas and Alameda regulations required that each hospital had its written transfer policy establishing that the patient had to be transported with qualified personnel and medical equipment (Dallek and Waxman, 1985). Wisconsin's law prohibited delay in treatment due to financial reasons (Treiger, 1986). New Jersey established the Uncompensated Care Trust Fund, an 'indigent-pool' which reimbursed hospitals for all their bad debt and charity care to eliminate financial incentive to practice patient dumping (Volpp and Siegel, 1993).

However, it is undisputed that COBRA legislation and the following statutes fail to fully prevent dumping (Kellermann and Hackman, 1990). To confirm this, Struik (2015) makes several examples of patient dumping episodes in Los Angeles, Las Vegas, Chicago, Denver and New York which prove that this practice persists. The United States Commission on Civil Rights (September 2014) stated that the Centers for Medicare and Medicaid Services (CMS) received approximately an average of 500 EMTALA[6] complaints annually in the period between 2006 and 2012. More recent episodes have been reported by the Office of Inspector General (U.S. Department of Health and Human Service, 2019[7]). To these is added the story of a 17-year-old boy from California suffering from COVID-19 who was denied medical treatment since he lacked insurance and died during the transportation from the dumping hospital to a public hospital (Parris, 2020[8]).

There may be several reasons explaining why this problem still exists. First, since hospitals act like businessmen, they try to cut their losses. Treating the poor who cannot afford any medical insurance is the main reason for their losses (New York Times, 1989). These losses could result in their closing, thus jeopardizing the availability of medical services for everyone. Second, it may be an issue of enforcing[9], or rewriting the law to avoid ambiguity (e.g., on what we mean for 'emergency') (New York Times, 1991). Notably, monetary fines do not seem enough to prevent physicians and hospitals from practicing patient dumping.

As far as our context is concerned, since the nineties most European countries have begun to reimburse their hospitals according to a DRG system, which is supposed to cover all costs, based on U.S.A. Medicare program (Busse et al., 2011). In Italy, in particular, health care is publicly financed[10] and DRG tariffs are set equal at a national level, though regions have the opportunity to modulate charges according to various criteria such as organizational features (e.g., presence of emergency room), or activities performed (e.g., research activities) (Cavalieri et al., 2013). Additionally, Italian healthcare system (*Sistema Sanitario Nazionale*) governance was recently reorganized, transferring partial financial responsibility to the Regions in order to

[6] Emergency Medical treatment and active Labor Act (EMTALA) is an act belonging to COBRA legislation.
[7] https://oig.hhs.gov/fraud/enforcement/cmp/cmp-ae.asp
[8] News taken from the speech of the Lancaster major for COVID-19 Daily Update, available at https://www.youtube.com/watch?time_continue=165&v=NkhnAF7E5xw&feature=emb_title
[9] For instance, the Statute should define appropriate circumstances for the revocation of Medicare contract, thus a hospital's contract with Medicare should be suspended for repeated violations.
[10] According to the Italian Constitution, the central government distributes tax revenues for publicly financing health care. Regions oversee the organization and the delivery of health services through local health units (Donatini,2015).

contain increasing health expenditure (France, 2006). Thus, since health protection is a competence shared between the State and the Regions, healthcare services in terms of both quantity and quality are not uniformly distributed throughout the national territory (Gabriele, 2019). However, despite such inequalities, the Italian National Health service has ensured access to free or low-cost healthcare, such as treatment at public hospitals, to all citizens and residents since its establishment (Cantù et al., 2011). Consequently, the emergency department or emergency room[11] cannot refuse emergency patients who need to be diagnosed and stabilized (*Cass. sentenza* n. 40753/16 del 29.09.16). Then, if and only if there is another medical facility equipped with specialists who can provide a better treatment according to the medical diagnosis, the patient can be transferred (*Agenzia di Sanità pubblica*, 2002). Nevertheless, the initial medical facility should always find a place for the patient in its structure or in other ones, and in the latter case it should act as a bridge between the patient and the new structure (D'Athis et al., 1992).

Although patient dumping is very mitigated in Italy and should not need for a particular regulation, there has been a recent judgement by the court of Cassation (i.e., the court of last resort in Italy[12]) in this regard. According to the ruling n. 45844 (5 November 2014), the doctor on call who refuses to treat an emergency patient is criminally responsible for dereliction of duty[13] (art. 328 Code of Criminal Procedure). Such conduct constitutes a crime if the admission is urgent and cannot be delayed without harming the patient's health. The intervention by the court of Cassation followed an episode of patient dumping occurred in 2011, where a E.R. doctor[14] refused to admit a patient in serious conditions as a result of an accident (Asprone, 2015). Generally, similar events are not as frequent in Italy as in U.S.A., because of the public nature of Italian healthcare provision. However, the recent need to reduce healthcare spending, among others, reducing beds, could trigger treatments rationing (Gabriele, 2019) which in the worst scenario results in dumping. In such a scenario, it becomes necessary to investigate the

[11] By Emergency department we refer to the department of a hospital responsible for the provision of medical and surgical care to patients arriving at the hospital in need of immediate care. The emergency department is also called the emergency room or ER (www.medicinenet.com).
[12] The Supreme Court of Cassation is the Italian highest court, whose decisions cannot be subject to further review by any other court (Traina, 2009).
[13] It happens in response to a request or an order but also when there is a substantial emergency for which an action is needed. In this way, public official's inertia constitutes a guilty refusal of the act.
[14] See footnote 58.

reasons behind patient dumping which does not always have a financial nature and may be very insightful in a policy perspective. An emblematic episode has been recently recorded in Abruzi where a 70-year-old man died in front of the hospital waiting to be admitted, after a previous rejection by another medical facility[15].

3. Literature Review

This paper contributes to different streams of literature. First, it deals with the role of medical liability in affecting medical decisions, adding to previous works by Nashed et al. (2012) and Kessler and McClellan (2002). Typically, insurance covers physicians from the financial risks of malpractice litigation, however there are several non-insurable costs, such as psychological and reputational costs (Currie and Macleod, 2008). This means, albeit being insured, physicians are still concerned about legal liability[16]. Nonetheless, not all physicians suffer from the same liability risks since medical specialists are more exposed to litigations compared to their peers (Jena et al., 2011). As a result, surgeons prefer performing elective procedures which do not really affect the quality of care provided to patients, in the attempt to evade litigation[17] (Agarwal, 2018). Alternatively, in response to liability, physicians can choose to treat only less risky patients (i.e., cream skimming) to decrease the probability of negative outcomes. Both practices known as defensive medicine have been further reviewed by Danzon, (2000), Kessler (2011) and Bertoli and Grembi (2018).

The second contribution of the paper relates to the growing experimental literature devoted to finding how different payment structures affect medical service provision. The initial studies carried out in this field can be attributed to Henning Schmidt *et al.* (2011) who test how medical students respond to fee-for-service and capitation. They observe that patients are over-treated under FFS and under-treated under CAP and that healthier patients are better off under CAP,

[15] https://www.fanpage.it/attualita/avezzano-enzo-muore-in-auto-in-attesa-del-ricovero-tra-le-urla-della-moglie-fateci-e-entrare/

[16] In Italy, we record the highest number in Europe of physicians sued for medical malpractice. For this reason, the national health system is obliged to pay high insurance premiums when it succeeds in finding an insurance company ready to bear risk of monetary claims due to medical malpractice. (Fusciani, 2004). A brief overview of the Italian regulation of medical malpractice can be found in the Appendix.

[17] Notice that this practice (i.e., excessively using treatments and diagnostic tools) does nothing but increasing healthcare expenditures (Traina, 2009).

while sickest patients benefit otherwise. These results, whose replicability has been successfully tested in Wang et al. (2020), echo those of the artefactual field experiment by Brosig *et al.* (2015), who show that students are more influenced in their decisions by financial incentives compared to physicians who are more patient-regarding (similarly to Schmidt et al., 2014[18]). Building on the same experimental design, Brosig *et al.* (2016) analyse the possibility of introducing mixed payment systems as an alternative to pure FFS and CAP. They find that such schemes mitigate both over-provision and under-provision, thus benefitting patients' health. Moreover, in line with the findings of the aforementioned experiments, participants show a certain degree of altruism towards patients' health. In a similar setting, but allowing for uncertainty of the patient health outcome, Martinsson and Persson (2019) show that physicians' willingness to altruism varies across patients with different medical needs and that between all the possible principles for provision of medical care (i.e., severity of illness; capacity to benefit; ex post health equality), severity of illness drives such variation. Drawing from Brosig et al. (2015), in their laboratory experiment Finocchiaro Castro et al. (2019) introduce the risk for physicians of being sued for malpractice under FFS and CAP, and test how it impacts on medical service provision. Results show that physicians provide a higher number of medical services when malpractice liability pressure comes into play. However, while introducing the probability of being sued for malpractice reduces physicians' tendency to under-treat patients under CAP, it exacerbates overprovision under FFS.

Other studies in the field employing similar experiments assess physicians' behaviour under alternative payment systems, such as performance pay, (Brosig et al., 2019), report cards (Green, 2014), and salary (Lagarde and Blaauw, 2017), showing that quality of care improves under prospective payment systems. Godager et al. (2016) depart from the abovementioned evidence and test whether disclosing physicians' performance information to their peers can have an impact on their medical decisions under FFS. When performance information is displayed, subjects choose more frequently to maximise patient benefit only, or the sum of their profit and patient's benefit. Finally, gender differences in service provision are investigated in Godager et al. (2021), showing no statically different behaviour between men and women among Chinese physicians and medical students.

[18] Notice that they compared medical students and nonmedical students' behaviour.

Although building on the above-mentioned works, the present paper does not assume that physicians always choose to treat patients, thus allowing for the possibility of patient dumping, which previous studies fail to consider.

4. Theoretical Model

To derive the theoretical equilibrium as level of medical care provided by physicians under different payment systems, we employ a simple model theorised by Ellis and Mcguire (1986) and then readjusted by Finocchiaro Castro M. et al. (2019) to include medical malpractice liability. However, since this model is aimed to test whether the risk of being sued for both medical malpractice and dumping could affect physicians' behavior, we are taking an important step forward for our experimental purposes. Starting from the previous models, we add another variable which could capture the potential punishment for practicing dumping.

First of all, we imagine considering a physician who cares for both his profit and the benefits to patients. Physician's profit can be represented as follows

$$\Pi(q) = R(q) - C(q) \tag{1}$$

where $R(q)$ is physician's revenue which does vary according to the payment system. Specifically, under FFS physicians receive a fee, based on a national fee schedule[19], for each unit of medical services provided; thus, the revenue function is: $R_{FFS} = pq$. On the contrary, according to salary, subjects are paid a monthly sum, which does not vary with the services provided; thus, the revenue function is: $R_{Salary} = L$. Going back to equation 1, $C(q)$ is the total cost for providing medical care. We can state that $R'(q) \geq 0$ and $R''(q) = 0$ in coherence with the standard payment systems. In the same way the total cost is set increasing and convex, $c'(q)$

[19] The fee schedule assigns a fixed relative value to each health care service, recognising that goods and services can have different production costs. Following Schmidt *et al.* (2011), we refer to the German scale of charges and fees for physician services. In Germany, physicians working in outpatient care are enrolled in their respective regional Association of the Statutory Health Insurance Physicians which pays them according to the "Uniform Evaluation Scale". This payment system is based on the mix of services provided, the number of patients served and finally a fixed budget distribution scheme (An IGES Group company Assessment in Medicine, Reimbursement of Medical Devices in Germany, 2018).

> 0 and c'' (q) >0. As mentioned before, the physician is also interested in the patient's benefit, thus his utility function includes *B(q)* which is the patient's expected health benefit sent increasing and concave, that is $\mathrm{B}'(\mathrm{q}) > 0, \mathrm{B}''(\mathrm{q}) < 0$). Patient's benefit resulting from medical treatment depends on $B(q) + \varepsilon$ where ε refers to a random component depending on the unavoidable uncertainty surrounding the provision of medical care, which is independent from the quantity of treatment given, that is $E[\varepsilon|q] = E[\varepsilon] = 0$. The total benefit function is assumed to increase to a point, that is a certain quantity of treatment, after which point it starts to fall (Ellis and Mcguire, 1986).

Therefore, physician i's expected utility function when he does not face the risk of being sued can be represented as follows:

$$E[U(q)] = R(q) - C(q) + \alpha B(q) \tag{2}$$

where $0 \leq \alpha \leq 1$ is defined as the rate at which the physician is willing to give up one euro of profit for one euro of patient benefit (Ellis and Mcguire, 1986).

A rational physician *i* wants to maximize his utility function. The first order condition for the optimal quantity of medical service, q^*, can be written as:

$$R'(q^*) + \alpha B'(q^*) = C'(q^*) \tag{3}$$

If we consider the risk for a physician *i* to be sued, we need to add another term to the previous condition to include the expected disutility caused by a complaint, $p(q)$ (Finocchiaro Castro *et al.,* 2019). This term is assumed to decrease in the quantity of medical services provided to the patient, $p'(q)<0$, consistently with the idea of defensive medicine. Although it may be difficult for patients to judge whether medical provision is appropriate (Kershbamer and Sutter, 2017), physicians use overtreatment to persuade that the patient's poor health is not due to malpractice but rather to the uncertainty surrounding the provision of medical care (Finocchiaro Castro et al., 2019). In fact, according to Studdern et al. (2005), physicians are willing to practice positive defensive medicine, that means providing additional unnecessary care, so as to discourage patients from suing them or, even worse to document diligence and prudence (Kessler and McClellan, 2002) persuading the legal system that the patient has been treated according to the standard care. However, for the purposes of our study, we need to include another variable in the model so far described to account for a punishing mechanism for dumping physicians. We refer to this variable as *d(j),* which represents the possibility for a physician of being sued for

dumping, where *j* is the degree of patient's illness. It is reasonable to assume that this probability increases with the severity of the patient's disease ($d'(j) > 0$) and that it is independent from the quantity of medical services provided, $E[d|q] = 0$. In fact, reports for patient dumping are likely to come from patients with serious health conditions, since mainly in these cases the refuse to treat them could cause irreparable damage to their health, leading patients themselves or their relatives to instigate a prosecution (Rice et al., 1988). Moreover, it is implausible that a physician who provides at least a minimum treatment to patients could be sued for dumping and this explains the independence between the quantity of services and the probability of being sued for dumping. For the same reason, if a physician is sued for dumping, he cannot be sued for malpractice, and vice-versa (i.e., one event precludes the other), that is $E[d|p] = 0$. In fact, malpractice can only arise if the physician takes care of the patient. On the contrary, when the physician decides to reject the patient a priori, he can only be accused of dumping.

Based on the above, the physician's expected utility which includes both medical liability and dumping becomes as follows is the following:

$$E[U(q)] = R(q) - C(q) + \alpha B(q) - p(q)H - d(j)D \tag{4}$$

Where H is the disutility coming from any potential complaint including all the monetary and nonmonetary costs incurred to undertake a legal defensive action (Finocchiaro Castro et al., 2019); similarly, D is the disutility coming from complaint for patient dumping[20].

Here, the first order condition to obtain the optimal quantity of medical services to be provided is defined as follows:

$$R'(q^*) + \alpha B'(q^*) - p'(q^*)H = C'(q^*) \tag{5}$$

The first order condition, used to find the optimal quantity of medical services provided does not depend on d(j), since it does not vary according to q. However, physician's profits are inversely proportional to $d(j)$:

[20] Notice that although according to the COBRA legislation mentioned in the previous sections, only hospitals can be directly sued for EMTALA violations, physicians responsible for such repeated violations could face disciplinary actions and could be subject to civil monetary penalties (Fabrikant et al., 2006 and Zibulewsky, 2001).

$$\frac{d\Pi}{\partial d(j)} < 0 \quad (6)$$

which could significantly affect his choice. As a result, the introduction of the risk of a complaint for dumping could discourage physicians from practicing it.

5. Hypotheses and Design

5.1. Hypotheses

Our first hypothesis deals with the impact that the two payment systems have on the practice of patient dumping. According to the Cook Count Study[21] conducted in 1986 and referred to the period 1980-1983 eighty-seven percent of the hospitals which decided to reject or transfer patients to other medical faculties cited the lack of insurance as the sole reason for such a conduct. Moreover, Harvard Medical school's study[22] indicated that when there was no medical reason to transfer the patient, some patients were transferred due to financial interests of hospitals and physicians (Treiger, 1986).

Evidence shows that patient dumping is still practiced 30 years after EMTALA and most of the time it is due to financial reasons (see Zaubi et al., 2016). Indeed, when physicians are paid through a prospective system, such as salary, they are induced to control for the costs of patient care[23] (Ellis and Mcguire, 1986). With this in mind, suppliers could decide to screen patients, to separate those who are in a good health status (more profitable patients) from those who have an undiagnosed disease or defect (less profitable patients), thus dumping high-risk patients (Matsaganis and Glennerster, 1994). Therefore, under such a payment scheme, we reasonably expect physicians to refuse to treat patients whose needs are costly to fulfil (Sappington et al., 1999). On the contrary, a retrospective payment system, such as FFS, gives physicians an incentive to provide as many healthcare services as possible (Donaldson and Gerard, 1989). In other words, providers have no reason to hold down their costs, because the amount paid is determined by the actual realised costs, computed only after that services had been rendered to beneficiaries. If we assume that dumping is only due to financial reason, FFS physicians should

[21] A Prospective Study of 467 Patients, 314 New Eng. J. Med. 552-556 (1986)
[22] It was conducted at Highland Hospital in Oakland (Treiger, 1986).
[23] Physicians act as agents of the hospital where they are employed.

be less willing to dump patients because they are covered for treatment expenditures. In particular, based on our model, when the risk of being sued for dumping does not come into play, physicians should be more eager to dump patients when they are paid according to salary than when they are paid according to FFS.

Hypothesis 1: *The level of patient dumping achieved under salary is higher than the one reached under FFS, when physicians do not face the risk of being sued for dumping.*

Our second hypothesis builds on both Green (2014) and Finocchiaro Castro et al. (2019)'s experimental results. Generally, collected data show that physicians paid by retrospective payment systems (e.g., FFS) provided more total services when compared with prospective payment systems (e.g. salary). In fact, according to Faloon (2012), under salary physicians are willing to minimise their level of effort because extra services are not properly remunerated. However, such difference could be partly mitigated by the constant presence of medical malpractice liability. As confirmed by Finocchiaro Castro et al. (2019), when the probability of being sued for medical malpractice is introduced, the quantity of medical services provided increases under both CAP and FFS, despite such payment systems should provide physicians with conflicting interests (i.e., in the absence of medical liability).

Hypothesis 2: *When physicians do not dump patients, the level of medical services provided is higher under the FFS than under Salary.*

Then, we check whether the introduction of the possibility for a physician of being sued for dumping affects physicians' attitude towards the patient. According to equation 4, physician's expected utility decreases in $d(j)$. However, when the physician does not refuse to treat the patient, he does not face the risk of a report for dumping. As a result, we expect this variable to be a deterrent against the practice of dumping.

Hypothesis 3*: When physicians do face a risk of being sued for patient dumping, the level of dumping decreases, regardless of the payment systems.*

Finally, we investigate on whether the introduction of the possibility of being sued for dumping affects physician's choices on the quantity of services provided. The first-order condition does

not change when we introduce $d(j)$, because it does not figurate in it, since $d(j)$ does not depend on the quantity of services provided (equation 5).

Hypothesis 4: W*hen physicians do not practice dumping, given a certain payment structure, they provide the same quantity of services, in the presence or in the absence of the risk of being sued for dumping.*

5.2. Design

In this experiment, each participant plays the role of a physician and decides whether to take charge of and eventually to what extent to treat the patient (e.g., the amount of medical services to provide), given a certain payment structure. In fact, at the beginning of the experiment, participants are randomly assigned to different payment conditions, either salary or FFS. Under both the payment schemes, participants always face the possibility of being sued for malpractice. Then, participants face an additional risk of being sued for practicing dumping, regardless of the payment structure. This potential sanction is the only deterrent we can use against the incentive to practice patient dumping[24]. In fact, the lack of effective means to prove violations jeopardises the capacity of monitoring the problem and then, punishing infringements through appropriate fines (Kusserow, 1988). Thus, hospitals can often find a way to subvert the legislation, because there is no entity checking discharge plans which are often falsified due to the lack of any monitoring system (Struik, 2015). To make an example of what we mean by subversion, medical facilities could cite the inability to properly treat the patient as the sole reason for refusing him, when this is not the case. Alternatively, physicians could give the patient a minimum level of treatment persuading him he is receiving appropriate care, but really dumping him (Treiger, 1986). Based on the above, the only risk for a physician or a hospital practicing dumping is being sued by the damaged patient. Subjects who have suffered dumping should refer matters for civil and criminal prosecution to the relevant authorities,

[24] A parallel may be drawn here with the traditional dumping theory, in the form of price-discrimination between national markets (Salvatore, 1989). In this model, the foreign exporter who wants to maximize his profits from foreign sales must consider a variable cost of exporting coming from the likelihood of antidumping action. This cost is increasing with additional quantities exported, due to a higher probability of getting sued for dumping behaviour. In fact, in case domestic firms file an antidumping petition, the foreign exporter must undertake a defensive action which has a cost.

putting out the investigation. The physician and the hospital held responsible for the fact will incur reputation damage together with all the legal consequences referred to in the previous sections (Meoli et al., 2018). For all these reasons, we believe that introducing potential liability in our model can be appropriate to reproduce the above-mentioned systems of incentives in the lab.

Table 1 reports the 2x2 design which allows for both a within-subject and a between-subject analysis, like Brosig et al. (2000). At a within level, participants under the same payment structure act both in the absence and in the presence of the possibility of being sued for dumping[25]. Additionally, the comparison between the two different payment conditions allows for between-groups tests.

[25] Notice that the order of the treatments varies across subjects to avoid carry-over bias (Charness et al., 2012).

Table 1: Experimental design

	DUMPING		
PAYMENT SCHEME		YES	NO
	FFS	T1	T2
	SALARY	T3	T4

In all treatments, each physician *i* faces 9 different patients, pooled into three different groups according to the degree of their illness (*j*=1,2,3). For each patient, physicians observe the generic diagnosis[26] referred to a common disease and, hence, easy understandable to any physician regardless of his medical specialty. Patients are presented in a random order, which varies across treatments, to avoid carryover effects (Charness et al., 2012). The three types of patients belong to an heterogenous population. Patient types reflect the patients' different states of health: good(j=1), intermediate(j=2) and bad(j=3).

Diagnoses are provided in table 2.

Table 2: Diagnoses

Pathologies	**Severity of illness**
hypertension	1
measles	1
fever and a cough	1
cholecystitis	2
femur Fracture	2
respiratory distress	2
hepatic coma	3
intestinal obstruction	3
stroke	3

Once the participant has observed their diagnosis[27], he must decide if he wants to take charge of the patient or not. Then, if he has previously decided to treat the patient, he chooses the

[26] Diagnoses have been provided by a general practitioner and then classified according to the severity of illness.

[27] Notice that we do not report patients' sensitive data to protect privacy

quantity of medical services q to give ($0 \leq q \leq 10$), knowing that, under the FFS system, both his profit Π and the patient's health benefit *B(q)* are affected by that choice.

When it comes to another remuneration scheme such as salary, our model is simplified because subjects receive regular time-based payments, which means a fixed euro amount per specific time period. In contrast to FFS, physician *i'* profit is independent from the quantity of medical services provided but varies with the actual costs. Physician's revenue can be represented as follows:

$$\Pi(q) = \begin{cases} pq - cq^2 \ under \ FFS \\ L - cq^2 \ under \ salary \end{cases}$$

We set p=2 which is the fee for unit of service provided, c=0.1 which represents the marginal cost for the provision of medical services (Finocchiaro Castro *et al.,* 2019) and L=10 which refers to a fixed hourly amount received, similar to Lagarde and Blaauwn (2017). When participants are sued for malpractice, their total profit is reset to zero (i.e. for that period, which means for that patient) (Finocchiaro Castro *et al.,* 2019).

As far as patients are concerned, their expected benefit used which is the same as in Ellis and Mcguire model (1986) can be derived as follows:

$$B^j(q) = \begin{cases} B_0^j + q \ \ if q \leq q^* \\ B_1^j - q \ if \ q \geq q^* \end{cases}$$

With $B_0^{j=1} = 7$, $B_0^{j=2}$=5, $B_0^{j=3}$=3 and B_1^j=B_0^s+$2q^*$ ∀ j.

Based on the above, Finocchiaro Castro et al. (2019) have derived the optimal quantity to provide for patients, in both the payment structures, which depends on the degree of their illness: $q_1^* = 3(\text{patient with a good health status}), q_2^* = 5(\text{patient with an intermediate health status}), q_3^* = 7$ (patient with a bad health status).

Moreover, they fixed the value of *p(q)*, so as that $p^{j=1}(q) < p^{j=2}(q) < p^{j=3}(q)$ since it increases with the severity of illness and decreases with the quantity of services provided. In particular, they set:

$p^j\,(q) = \lambda^j \left(1 - \frac{q}{10}\right)$ where $\lambda^{j=1} = 0.3, \lambda^{j=2} = 0.4$ and $\lambda^{j=3} = 0.5$.

Finally, we set the variable which we add to this model *d(j),* which increases with the degree of illness, but does not vary with the quantity of services provided. We impose: *d(1)=0.1, d(2)=0.15 and d(3)=0.2*. Such low probabilities are supported by the arguments presented at the beginning of this section. In summary, since hospitals and then physicians can always subvert the antidumping law, their probability of facing a complaint for dumping is conceivably low.

Patient are assumed to be passive, accepting each level of medical services provided by physicians.

Having completed these decision tasks for all the treatments (i.e., two for each participant), participants answer a questionnaire about their social-economic status and the motivations which have driven their choices.

Although real patients are not actually present in our experiment, participants are conscious that their choices affect real patients outside the lab, because *B(q)* is converted into money which will be given to the 'Per Mano ONLUS', a local voluntary association which monitors and assists people affected by Duchenne Muscular Dystrophy (like Henning Schmidt et al., 2011; Finocchiaro Castro et al., 2019).

5.3. Procedure

The experiment was conducted at the main hospital of Reggio Calabria, thanks to an agreement signed by the same hospital and the Mediterranean University. Local physicians who chose to contribute to this research took part in the experiment during their coffee-breaks. For this reason, the experiment was conducted in different tranches, and with pool of different sizes[28]. 35 physicians[29] joined the experimental sessions: 18 of them were assigned to the ffs treatment, while the remaining 17 were incentivized through salary. 49% of the subjects were emergency room doctors, to preserve the external validity of the experiment. In fact, ER physicians are

[28] Notice that since the design provided for no participants' interaction, we did not require a specific amount of people in the room to start the experiment.
[29] We are aware of our sample being too small. However, we are currently running additional sessions to increase the sample size.

those who more frequently decide to take charge of the patient, and then hospitalize him, or screen the patient and leave him go home (Iannello et al., 2015). The rest of physicians were cardiologists or oncologists.

Upon arrival, subjects were randomly allocated to the given seats, where they completed their task in full anonymity, using Z-tree (Fischbacher, 2007). Before starting the experiment, we measured physicians' attitude towards risks, since physicians make their choices facing liability, either for malpractice or dumping. Notably, liability condition can change physicians' attitude towards risks, therefore it is appropriate to assess it ex ante. To do this, we handed participants a questionnaire first proposed by Holt and Laury (2002), but with hypothetical rewards (see e.g., Galizzi et al., 2016). Such questionnaire included 10 hypothetical choices between a safer lottery and a riskier lottery, respectively A and B. Payoff and probabilities distributions allowed to estimate a subject' attitude towards risk by the number of times he had chosen lottery A. Typically, as the probability associated to the high payoff outcome increases, subjects ought to shift from option A to option B, as outlined by Holt and Laury (2002). Results show that 46% of the subjects opted for lottery A for the first three or four choices and then definitely moved to lottery B. 13% of the subjects preferred option B for all the strings. Finally, three subjects can be classified as very risk averse, choosing lottery A for all but the last option, while three subject showed irrational preferences, randomly moving from A to B.

Instructions were read aloud, and all the participants' doubts were clarified before the starting session. At the end of the experiment, one of the periods was randomly selected and physicians were paid with voucher meals whose value corresponded to their profit in that period[30]. We chose to use meal tickets to preserve the salience of the incentive mechanism (i.e., they can soon spend them at their cafeteria, during their lunch break), though being very low compared to physicians' opportunity cost. In fact, physicians should have intrinsic motivation on their own, knowing that they are contributing to research, and paying them something corresponding to their opportunity cost could reduce the quality of information they provide during the

[30] According to McKeganey (2001), food voucher could replace cash payment for research participation, being appropriate to the category of the participant group.

experiment (Gneezy and Rustichini, 2000)[31]. The whole experiment lasted approximately half an hour and the average reward was 9.03€ per participant.

6. Results

In this section we will provide the preliminary results of this experiment. The main variables of interest are respectively physicians' choice concerning whether to take charge of the patient and then the level of services provided. Regression analysis will be preceded by the descriptive analysis and nonparametric tests, given the small sample.

6.1. Descriptive analysis and nonparametric tests

Before starting with the descriptive analysis, it is important to specify what variable 'choice' stands for. '*Choice*' refers to the first decision which a physician must make in this experiment, choosing whether to take charge of the patient, in that case the variable is equal to 1, or leave him and moving to the next patient, in that case the variable is equal to 0. If and only if the physician decides to treat the patient, he moves to the next stage and decides on the level of services to provide.

Table 3 and Table 4 report the summary statics for the four different treatments.

As it was predicted in the hypotheses, the average frequency for choosing to treat the patient is higher under ffs (0.86) than under salary (0.65), and differences are significant at the 1% level according to the Wilcoxon ranksum, the median test and the chi-squared test (p-value<0.001). However, physicians seem to be insensitive to the introduction of dumping liability under the same incentive mechanism (p-value=0.571).

Table 3: Summary statistics Salary

	Salary	Salary with dumping

[31] The above-mentioned incentive is reasonably salient for two reasons. First, cafeteria is the only hospital internal alternative available to physicians. Although there are some external cafés, walking distance from the hospital, their opportunity cost may be high (physicians would have to push out and walk for 15 minutes). Additionally, according to the regulation, the internal cafeteria must charge discounted rates (20% less) to the hospital's employees.

VARIABLES	mean	sd	obs	mean	Sd	obs
Choice	.65	.48	153	.69	.46	153
Quantity of services provided	4.2	2.02	100	4.65	1.95	100

Table 4: Summary statistics Fee for service

	Fee for service			Fee for services with dumping		
VARIABLES	mean	sd	obs	mean	Sd	obs
Choice	.86	.35	162	.86	.3501	162
Quantity of services provided	4.76	2.17	139	5.05	2.161	139

As far as the quantity of services provided is concerned, moving from salary to ffs raises the quantity of services provided, as shown in literature (e.g., Brosig et al., 2015 and Finocchiaro Castro et al., 2019), and such increase is significant according to both the ranksum and median test at the 1% level. However, as in the previous case, physicians seem to be indifferent to dumping liability regardless of the payment structure (p-value>0.1). Table 5 provided below summarizes all the nonparametric tests conducted to compare different treatments.

Table 5: Nonparametric tests (p-value)

VARIABLES	**CHOICE**	**QUANTITY OF SERVICES PROVIDED**	
	Ranksum	Ranksum	Median
FFS vs SALARY	0.000	0.0008	0.000
FFS without d. vs SALARY without d.	0.000	0.0088	0.001
FFS with d. vs SALARY with d.	0.0004	0.02	0.000

FFS without d. vs FFS with d.	1.000	0.19	0.140
SALARY without d. vs SALARY with d.	0.46	0.04	0.246

Caption: d.=dumping liability

Based on the above, under malpractice liability the introduction of an additional liability for dumping does not affect physicians' decisions concerning both the choice of treating the patient and the amount of services to provide. Nevertheless, what is relevant for doctors' decisions is the payment structure. In fact, the frequency of dumping is higher under Salary than under FFS. More specifically, dumping frequency mean distinguished by incentive scheme and broken down by patient's severity of illness is shown in Table 6.

Table 6: Choice frequency mean by treatment and severity

VARIABLES	FFS	FFS w.d.l.	SALARY	SALARY w.d.l.
Severity of illness=1	0.67	0.63	0.1	0.16
Severity of illness=2	0.96	0.96	0.88	0.96
Severity of illness=3	0.94	0.98	0.98	0.96

Caption: w.d.l= with dumping liability

The greatest difference can be seen for the patients with the lowest level of illness, where the choice frequency is 0.1 under Salary and 0.67 under FFS. This result indicates that if physicians must choose between different patients, they prioritize seriously ill patients.

Going to the quantity of services provided, showed in table 7, as mentioned before, the largest difference is observed for the patient whose degree of illness is low. Moreover, dumping liability introduction results in a slightly larger amount of services provided regardless of the severity of illness.

Table 7: Quantity of services mean by treatment and severity

VARIABLES	FFS	FFS w.d.l.	SALARY	SALARY w.d.l.
Severity of illness=1	3.17	3.41	2.2	2.86
Severity of illness=2	4.71	5.07	4.04	4.59
Severity of illness=3	5.94	6.07	4.54	4.95

Caption: w.d.l= with dumping liability

6.2. Regression analysis

Table 8 briefly describes all the variables being used in the following regressions.

Table 8: Variables list

VARIABLES	mean	sd	min	max	obs
Age	46.27	11.16	24	68	630
Emergency department	0.486	0.500	0	1	630
Male	0.400	0.490	0	1	630
Degree of illness	2	0.817	1	3	630
FFS	0.514	0.500	0	1	630
Dumping	0.500	0.500	0	1	630
Period	5	2.584	1	9	630
Choice	0.768	0.422	0	1	630
Quantity	4.704	2.108	0	10	630
Risk seeking	0.371	0.484	0	1	630
Gender*riskseeking	0.114	0.318	0	1	630
Ffs*dumping	0.257	0.437	0	1	630

'*Emergency department*' is a dummy variable capturing emergency department doctors. '*FFS*' is a dummy variable equal to 1 if physicians are paid according to FFS and 0 otherwise. 'Degree of illness' is a categorical variable which can assume the value 1,2 or 3 depending on the patient's severity of illness. '*Dumping*' is a dummy variable referred to the absence or the presence of dumping liability in the treatment. '*FFS*dumping*' is an interaction variable catching FFS with dumping liability treatment. '*Male*' is the gender variable, '*Risk seeking*' indicates risk loving subjects, while '*Gender*riskseeking*' is the corresponding interaction between the former and the latter.

Since practitioners make 9 different decisions, standard errors are clustered at the subject level (Cameron et al., 2008). However, given the small number of clusters, bootstrap methods, originating pseudo-samples from the initial pool, are used (Roodman et al., 2019).

Prior to estimating the effect of the above-mentioned variables on the quantity of services, we need to account for some censored observations (when q does not take a value). In fact, given the structure of this experiment, the quantity of services takes a value only if physician's choice equals 1 at the very first stage, triggering the so-called selection problem (Sartori, 2003), since the sample only includes observations for not dumped patients. In similar cases, Heckmann and more generally selection models are the alternative solution to the standard OLS, since they not only consider the selection bias but also allow for possible dependence between two decisions, in our case choice and quantity. These models include two separate regressions: the selection equation which, in this case estimates the effect of some variables on the probability of choosing to treat the patient; and the outcome equation which considers the quantity of services provided as a dependent variable. However, the lamda parameter from the Heckman model for this dataset is not significant, which means that although a selection bias might exist, results converge to an OLS. A possible alternative to Heckman model is using a limited dependent variable model[32] such as the Cragg's model (1971) which similarly consists of a two-step estimation: a logit model for the discrete decision of whether the quantity of services takes a nonnegative value (i.e., choice of practicing dumping) and a truncated regression for the continuous decision (i.e., amount of services to provide). Before opting for it, we run the Tobit Test for the Tobit one-step model[33] versus the Cragg's two-step model (Lin and Schmidt, 1984), which rejected the first one in favour of the latter ($\lambda > \chi$ critical value).

As far as the decision on whether to practice dumping is concerned (i.e. discrete decision), table 9 reports the output of the logit where 'choice' is the dependent variable. Numbers reported in the tables correspond to coefficients.

Table 9: Logit for choice

VARIABLES	First model	Second model	Third model

[32] The actual value for the dependent variable, quantity of services to provide, is observed if the latent variable is above the limit (which we put -1 whenever patients are dumped).

[33] Tobit model assumes that the discrete decision (choice>0 and then quantity of services≥0) and the continuous decision $E[q|q \geq o]$ are the same. Here, such assumption is quite implausible (dumping decisions differ from choices concerning the number of services to provide).

2.degreeofillness	3.718***	3.940***	3.975***
	(0.601)	(0.614)	(0.549)
3.degreeofillness	4.298***	4.532***	4.567***
	(0.790)	(0.892)	(0.905)
ffs	1.927***	2.583	2.973
	(0.631)	(3.714)	(3.220)
dumping	0.205	0.222	0.420**
	(0.172)	(0.200)	(0.190)
male		0.797	0.266
		(0.685)	(0.642)
age		-0.0624**	-0.0642**
		(0.0268)	(0.0309)
riskseeking		0.647	0.170
		(0.551)	(0.763)
emergency department		-0.714	-0.896
		(3.928)	(3.024)
genderriskseeking			1.973**
			(0.803)
ffsdumping			-0.420
			(0.466)
Constant	-1.627***	0.678	0.871
	(0.383)	(1.140)	(1.173)
Observations	630	630	630

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The probability that physicians decide to take charge of the patient increases with their severity of illness. In fact, given patient complexity there is not always enough time to meet all the patients' needs (Grant et al., 2013). As a result, physicians compare patients and prioritize the most serious ill (Chan et al., 2018). In this experiment, physicians decide to treat the patient depending on how urgently he requires physician's attention.

FFS payment scheme incentivizes patients' treatment. As it was anticipated in the hypotheses, the more physicians are paid for the services they provide, the less dumping is observed, the more overtreatment is boosted (Green, 2014). On the other hand, receiving a fixed payment such as salary results in physicians' low level of effort (Faloon, 2012). Consequently, if physicians decide to dump patients, they prefer doing it under Salary than under FFS.

Physicians' age decreases the probability of taking charge of the patient. According to Iannello et al. (2015), younger physicians make more decisions than their older colleagues. However, their decisions involve less responsibility than that taken by their older peers. As a result, if we assume that admittance decisions involve greater responsibility and that they are mainly managed by older physicians, we conclude that age contributes to physicians' unwillingness to

take risks which would result in taking charge of the patient. In fact, if they refuse the patient, the probability of being sued for dumping, which is present in 2 over 4 treatments, is very low compared to the probability of malpractice claims which is not at play for dumped patients.

Men are more likely to take charge of the patients. This result is explained by introducing the interaction variable which links risk taking to gender. As it is often found in literature, men are more risk takers than women (Fogel and Nehmad, 2009; Pikkel et al., 2016). This contributes to men's willingness to accept patients, assuming medical malpractice claim risks.

Moving to the continuous decision, concerning the amount of services to provide table 10 provides the truncated regression, where 147 observations were truncated because of dumping.

Table 10: Truncated regression for the quantity of services provided

VARIABLES	First model	Second model
2.degreeofillness	1.845***	1.769***
	(0.337)	(0.280)
3.degreeofillness	2.612***	2.542***
	(0.353)	(0.266)
ffs	1.096*	1.060
	(0.570)	(0.873)
dumping	0.358***	0.531***
	(0.103)	(0.108)
age	0.0261	0.0215
	(0.0344)	(0.0243)
Emergency department	-0.588	-0.276
	(0.617)	(0.794)
male	0.503	1.239*
	(0.719)	(0.649)
riskseeking	-0.335	0.383
	(0.636)	(0.614)
genderriskseeking		-1.888
		(1.395)
ffsdumping		-0.284
		(0.208)
sigma	1.846***	1.794***
	(0.181)	(0.140)
Constant	1.043	0.841
	(1.380)	(1.029)
Observations	483	483

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Older physicians provide greater services than their younger colleagues. Reasonably, younger physicians coming from a recent training are more concerned about services cost-effectiveness than their older colleagues. In fact, in recent years, education programmes addressed to medical students integrates economics to incentivize cost-conscious care[34] (Stammen et al., 2015). As a result, younger physicians are more affected by treatments cost assessment in their decisions and try to reduce the amount of unnecessary treatments whenever possible.

FFS and the presence of dumping liability increases the amount of services to provide. As we mentioned in the introduction, on the one hand, a fixed fee for each unit of service (FFS) encourages the provision of services. On the other hand, a reverse incentive is provided under

[34] https://www.renalandurologynews.com/home/departments/practice-management/integrating-economics-into-medical-training/

a prospective payment system such as salary (Donaldson and Gerard, 1989). As far as liability is concerned, although this it is not actually linked to the quantity of services provided, it affects the extent to which physicians treat patients. Like Finocchiaro Castro et al. (2019), the introduction of liability increases medical services by 0.525.

Men provide more services than women doctors. Many studies did not find any difference in medical expenditures (e.g., drug prescriptions, office visits) between men and women doctors (see e.g., Jerant et al., 2013). However, a stream of literature revealed that women are more likely to follow protocols prescribed by guidelines than men (see e.g., Baumhäkel et al., 2009; Kim et al., 2015). Therefore, if men doctors go beyond practice patterns, they could exceed in the quantity of services provided.

Finally, severity of illness increases the amount of services provided, as in Finocchiaro Castro et al. (2019), since more serious patients generally require more treatments than others.

7. Conclusions

This artefactual field experiment conducted in the context of the metropolitan hospital of Reggio Calabria saw the participation of 35 physicians, either emergency department doctors, cardiologists and oncologists. Drawing from standard procedures (e.g., Henning Schmidt *et al.,* 2011: Finocchiaro Castro et al., 2019) and adding patients' diagnoses, we tested whether and to which extent the adoption of fee-for-service or salary system can induce physicians to practice patient dumping. Facing the possibility of being sued for medical malpractice, physicians decide whether to take charge of patients. Also, we checked whether the introduction of the risk of being sued for a physician for having practiced dumping can have effect on his behaviour. Results show that dumping is more often observed under Salary than under Ffs. However, physicians seem to be insensitive to the introduction of dumping liability under the same incentive mechanism, though it seems to trigger a higher amount of services provided. Older physicians are less likely to take charge of the patient than their younger colleagues. Finally, men physicians are found to more frequently take charge of the patients, due to their risk-taking behaviour, and to increase the amount of services to provide.

Though more relevant in the American context, this experiment shows that dumping can be viewed with varying perspectives (e.g. hospital physicians believe that patient's pathology falls

under the competence of a family practitioner; physicians tend to prioritize serious ill patient if they have to decide which patient to take charge of, and so on). Since older physicians are found to take charge of patients less than their younger colleagues but to significantly increase the amount of services to provide, introducing economics training among more experienced physicians to incentivize cost-conscious care could be a solution. In fact, according to Cohen et al. (1982) assessing the level of physicians' training, and, we add, their years of experience, is the first step to design effective medical education programmes. As far as dumping is concerned, policy strategies may vary on the hospital purposes. If the hospital wants to avoid unnecessary treatments and hospitalizations, reducing expenditures, salary must be adopted, since it incentivizes physicians to refuse not seriously ill patients. If hospital opts for reducing the rate of refused patients, to avoid further legal complications, FFS is the preferred alternative. On the contrary, introducing liability only affects the amount of services provided.

The above-mentioned measures, should be more specifically addressed to doctors who always decide on patients' admission (e.g. emergency department doctors).

To provide an incentive against patient dumping we introduced a probability of being sued whether physicians decide not to take charge of the patient. Though very low, such probability increases in patient's severity of illness and just depends on it. It does not take into account the circumstances which lead physician to dump the patient, such as the desire to prioritize more serious patients. To overcome this limit, the experimental design could provide physicians with the possibility of choosing between different patients (e.g., cream skim them), making dumping probability vary on such decision. Another possible extension of the experiment could be making the random order of patients' diagnoses depend on physicians' decision of taking charge of patients[35]. This extension could allow to investigate how physicians arrange priority lists. Furthermore, physicians could be given an additional detail about their work shift to check if dumping decision can be attributed to that. For example, Spetz et al. 2001 found that in the Californian context physicians are more likely to perform caesarean sections in the evening hours since they may be affected by leisure incentive. In our context, telling a physician the hour of the day and its match with his work shift could significantly vary his decisions.

[35] For example, if the first patient which physician faces is affected by fewer, and physician refuses to treat him, this could result in a high/low probability of receiving a serious ill patient as next patient (i.e., depending on the severity of illness of the patient refused).

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Appendix D

Italian regulation of medical malpractice

From a legal point of view, for malpractice cases, a physician is both liable to prosecution (in a criminal court) and civil action (in a civil court) in our country (Traina, 2009).

According to decree Balduzzi (law 8 November 2012, n. 189) any physician incurred criminal liability for malice, gross negligence and even slight fault unless he succeeded in demonstrating that he slavishly followed the international guidelines, contained in the same law, or alternatively the good clinical care practices (Cavaliere, 2017).

Data show that healthcare costs are drastically increasing (i.e. partly due to medical malpractice) and that the practice of defensive medicine is becoming even more common than in the past (Traina, 2009). This was due to the previous Italian legislation on medical malpractice which was said to be excessively favourable to injured patients and their attorneys but too disadvantageous to physicians (Monfeli, 2018). For this reason, with the aim of protecting personal and professional dignity of medical professionals, Gelli-Bianco Law (No. 64/2017[36]) replaced the above-mentioned law (Cupelli, 2017). From a criminal point of view, this law has overcome the previous distinction between gross and slight fault and has introduced a cause for exemption from liability: in the event of personal injuries to the patient or manslaughter caused by the physician's unskillfulness[37] , criminality is excluded as long as the physician had followed the international guidelines which are considered appropriate[38] for that case (art. 590-sexies, penal code).

From a civil point of view, the new rules provide for a clear separation between the responsibility of the hospital and that of the physician (Meoli et al., 2018). According to the Court of Cassation "the acceptance of the patient in the hospital for admission or for a clinical

[36] "Provisions on the safety of care and the assisted person, as well as on the professional responsibility of health care professionals".
[37] 'Unskillfulness' consists of a poor attitude in those activities which do need special technical knowledge and implies a deficiency of culture, practice, intuition and capacity of observation (Santovito et al., 2007).
[38] Notice that the specificity of the case could require that the physician deviates from the guidelines (art.5 Gelli-Bianco Law).

control, involves the conclusion of a contract[39]" , and for this reason the medical facility guilty of willfully or voluntary misconduct is contractual liable towards the patient (art. 7 Gelli-Bianco Law). However, the healthcare practitioner is answerable to the non-contractual liability towards the patient. This important demarcation between the hospital and the physician has a direct impact on the burden of proof as well as on the terms of prescription. In fact, when it comes to contractual liability (non-contractual), the burden of proof is on the defendant (the accuser) and the statute of limitation is 10 years (5 years).

In conclusion, the new legislation is trying to minimise the criticisms of the physician's guilt in order not to mortify the professional's actions. Indeed, the new legislation has been enacted so as to restore physician's operating calm and prevent him from practising defensive medicine (Cavaliere, 2017).

[39] 28. Italian Court of Cassation, United Sections, Judgment n.577, 11 January 2008.

Appendix E

Instructions (largely adapted from Finocchiaro Castro et al., 2019)

Welcome to our experiment

You are going to join an experiment on individual decision-making. Instructions are straightforward and, if you pay close attention, you may gain a monetary amount that will be paid to you in corresponding meal tickets at the end of the experiment. The amount of cash you may win depends only on your decisions and will not be affected by other participants' decisions. Your monetary gains, measured in Experimental Crown (EC), will be converted into Euro at the following exchange rate 1 EC = 0.45 Euro. For example, if, at the end of the experiment, you achieve 40 EC, you will receive a 18 Euro meal ticket.

Experimental design

The experiment lasts approximately 30 min and is divided into two stages. You will receive detailed instructions at the beginning of each stage. Please, remind that the decisions taken in one stage of the experiment do not have effects on the decisions that you will have to take in the following stage of the experiment.

Stage I

Please, read carefully the following instructions regarding stage I. If anything in the instructions is not clear please raise your hand and one of the experimenters will approach you. From this moment onward, you cannot communicate with any other participant. If you fail to do so, you will be asked to leave the room

Stage I lasts for nine periods. In each period, you will play in the role of a physician and you will have to decide whether to take charge of an already diagnosed patient. In each period you will face a patient with a different diagnosis. Each diagnosis is associated with a different level

of severity of illness (low, medium, high). If you decide to treat the patient you then have to decide how many medical prescriptions to provide to patients. In other words, you have to decide on the level of medical care (in terms of drugs, diagnostic exams, …) to provide to patients according to their severity of illness. Thus, you will face nine patients. When taking the decision on patient's medical care, you can choose among 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 prescriptions per patient.

If you decide not to treat the patient you will skip to the following period. If you decide otherwise to treat the patient, after the decision on the level of medical prescriptions to provide, the patient could sue you for medical malpractice with probability *Pr*, which depends on the level of medical prescriptions already provided.

The following table show the relationship between patient's severity of illness and your profit, if you decide not to treat the patient.

Severity of illness	Your profit
Low (1)	0
Medium (2)	0
High (3)	0

The other tables we will provide before taking your decision, show the relationship between provided prescriptions and the probability of being sued.

Earnings

In each period of stage I, you will be paid according to the FFS payment system. Your earnings increase together with the number of medical prescriptions that you provide to patients. Moreover, you bear a cost due to the level of effort devoted to visiting each patient that depends on how many medical prescriptions you provide to patients. If you get sued by a patient, you will incur a fixed monetary loss equal to the profits earned in the same period you are sued. Hence, your profit in each period is computed as the payment you receive from the FFS system minus the cost due to the provision of medical services minus, if sued, the monetary loss due to being sued by the patient.

Each level of medical prescription provided accrues a certain level of benefit to patient according to her/his severity of illness. Therefore, your choice on the quantity of medical prescriptions to provide determines both your profits and the patients' benefits.

In each period, you will see on the screen (see below) all the information regarding the patient you currently face: his diagnosis, the associated severity of illness, your earning according to the payment system in use, the related costs, the probability of being sued for each possible level of medical prescriptions, the monetary loss due to being sued, your profits and the corresponding patient's benefits.

Stage II

Please, read carefully the following instructions regarding stage I. If anything in the instructions is not clear please raise your hand and one of the experimenters will approach you. From this moment onward, you cannot communicate with any other participant. If you fail to do so, you will be asked to leave the room.

Stage I lasts for nine periods. In each period, you will play in the role of a physician and you will have to decide whether to take charge of an already diagnosed patient. In each period you will face a patient with a different diagnosis. Each diagnosis is associated with a different level of severity of illness (low, medium, high). If you decide to treat the patient you then have to decide how many medical prescriptions to provide to patients. In other words, you have to decide on the level of medical care (in terms of drugs, diagnostic exams, …) to provide to patients according to their severity of illness. Thus, you will face nine patients. When taking the decision on patient's medical care, you can choose among 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 prescriptions per patient.

If you decide not to treat the patient, before skipping to the following period, you may be sued with probability d, which depends on the patient's severity of illness. If you decide otherwise to treat the patient, after the decision on the level of medical prescriptions to provide, the patient could sue you for medical malpractice with probability Pr, which depends on the level of medical prescriptions already provided.

The following table show the relationship between the probability of being sued for not treating the patient, d, and the patient's severity of illness.

Severity of illness	Probability *d*	Your profit
Low (1)	10%	-10
Medium (2)	15%	-10
High (3)	20%	-10

Earnings

In each period of stage II, you will be paid according to the FFS payment system. Your earnings increase together with the number of medical prescriptions that you provide to patients. Moreover, you bear a cost due to the level of effort devoted to visiting each patient that depends on how many medical prescriptions you provide to patients. If you decide not to treat the patient and you get sued for that, you will incur a loss as shown in table and your profit will be simply equal to it. If you decide to treat the patient and you get sued by a patient for malpractice, you will incur a fixed monetary loss equal to the profits earned in the same period you are sued. Hence, if you treat the patient, your profit in each period is computed as the payment you receive from the FFS system minus the cost due to the provision of medical services minus, if sued, the monetary loss due to being sued by the patient.

Each level of medical prescription provided accrues a certain level of benefit to patient according to her/his severity of illness. Therefore, your choice on the quantity of medical prescriptions to provide determines both your profits and the patients' benefits.

In each period, you will see on the screen (see below) all the information regarding the patient you currently face: his diagnosis, the associated severity of illness, your earning according to the payment system in use, the related costs, the probability of being sued for each possible level of medical prescriptions, the monetary loss due to being sued, your profits and the corresponding patient's benefits.

Stage I (for a different pool)

Please, read carefully the following instructions regarding stage I. If anything in the instructions is not clear please raise your hand and one of the experimenters will approach you. From this moment onward, you cannot communicate with any other participant. If you fail to do so, you will be asked to leave the room.

Stage I lasts for nine periods. In each period, you will play in the role of a physician and you will have to decide whether to take charge of an already diagnosed patient. In each period you will face a patient with a different diagnosis. Each diagnosis is associated with a different level of severity of illness (low, medium, high). If you decide to treat the patient you then have to decide how many medical prescriptions to provide to patients. In other words, you have to decide on the level of medical care (in terms of drugs, diagnostic exams, …) to provide to patients according to their severity of illness. Thus, you will face nine patients. When taking the decision on patient's medical care, you can choose among 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 prescriptions per patient.

If you decide not to treat the patient you will skip to the following period. If you decide otherwise to treat the patient, after the decision on the level of medical prescriptions to provide, the patient could sue you for medical malpractice with probability *Pr*, which depends on the level of medical prescriptions already provided.

The following table show the relationship between patient's severity of illness and your profit, if you decide not to treat the patient.

Severity of illness	Your profit
Low (1)	10
Medium (2)	10
High (3)	10

The other tables we will provide before taking your decision, show the relationship between provided prescriptions and the probability of being sued.

Earnings

In each period of Stage I, you will be given a fixed salary. Your remuneration does not vary with the quantity of medical services provided. Your profit in each period is computed as your fixed salary equal to 10, minus the cost due to the provision of medical services if you treat the patient, minus, if sued, the monetary loss due to being sued by the patient.

Each level of medical prescription provided accrues a certain level of benefit to patient according to her/his severity of illness. Therefore, your choice on the quantity of medical prescriptions to provide determines both your profits and the patients' benefits.

In each period, you will see on the screen (see below) all the information regarding the patient you currently face: his diagnosis, the associated severity of illness, your earning according to the payment system in use, the related costs, the probability of being sued for each possible level of medical prescriptions, the monetary loss due to being sued, your profits and the corresponding patient's benefits.

Stage II (for a different pool)

Please, read carefully the following instructions regarding stage I. If anything in the instructions is not clear please raise your hand and one of the experimenters will approach you. From this moment onward, you cannot communicate with any other participant. If you fail to do so, you will be asked to leave the room.

Stage I lasts for nine periods. In each period, you will play in the role of a physician and you will have to decide whether to take charge of an already diagnosed patient. In each period you will face a patient with a different diagnosis. Each diagnosis is associated with a different level of severity of illness (low, medium, high). If you decide to treat the patient you then have to decide how many medical prescriptions to provide to patients. In other words, you have to decide on the level of medical care (in terms of drugs, diagnostic exams, …) to provide to patients according to their severity of illness. Thus, you will face nine patients. When taking the decision on patient's medical care, you can choose among 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 prescriptions per patient.

If you decide not to treat the patient, before skipping to the following period, you may be sued with probability d, which depends on the patient's severity of illness. If you decide otherwise to treat the patient, after the decision on the level of medical prescriptions to provide, the patient

could sue you for medical malpractice with probability Pr, which depends on the level of medical prescriptions already provided.

The following table show the relationship between the probability of being sued for not treating the patient, *d*, and the patient's severity of illness.

Severity of illness	Probability *d*	Profit
Low (1)	10%	0
Medium (2)	15%	0
High (3)	20%	0

The other tables we will provide before taking your decision, show the relationship between provided prescriptions and the probability of being sued.

Earnings

In each period of Stage II, you will be given a fixed salary. Your remuneration does not vary with the quantity of medical services provided. If you decide not to treat the patient and you get sued for that, you will incur a loss as shown in table and your profit will be simply equal to it. Otherwise, your profit in each period is computed as your fixed salary equal to 10, minus the cost due to the provision of medical services if you treat the patient, minus, if sued, the monetary loss due to being sued by the patient.

Each level of medical prescription provided accrues a certain level of benefit to patient according to her/his severity of illness. Therefore, your choice on the quantity of medical prescriptions to provide determines both your profits and the patients' benefits.

In each period, you will see on the screen (see below) all the information regarding the patient you currently face: his diagnosis, the associated severity of illness, your earning according to the payment system in use, the related costs, the probability of being sued for each possible level of medical prescriptions, the monetary loss due to being sued, your profits and the corresponding patient's benefits.

Payment

At the end of the experiment, one of the nine periods of stage I will be randomly drawn. The profit achieved in that period will be paid to you in corresponding meal tickets. While you in this stage have decided in the role of physician on service provision for hypothetical patients, real patients' health outside the lab is affected by your choices. The overall benefits accruing to patients will be converted into Euro and donated to the charity 'Per Mano onlus', https://permanoonlus.wixsite.com/per-mano-onlus. To verify that the monetary amount corresponding to the sum of the patients' benefits in a session is actually transferred, one of the subjects will be randomly chosen to be a monitor. When the experiment is over, the monitor will verify that one of the experimenters will actually transfer the monetary amount through credit card payment on the Per Mano ONLUS website. The money will support the charity assisting people affected by Duchenne Muscular Dystrophy.

Questionnaire

Before starting the experiment, we kindly ask you to answer some simple questions aiming at checking your comprehension of the design of stage I and of the profit generation mechanism.

If you have any question regarding the questionnaire, please raise your hand and one of the experimenters will come to your seat. Stage I will start only when all the participants answer to all questions correctly.