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Health insurance, treatment plan, and delegation to altruistic physician

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ABSTRACT

We study delegating a consumer's treatment plan decisions to an altruistic physician. The physician's degree of altruism is his private information. The consumer's illness severity will be learned by the physician, and also will become his private information. Treatments are discrete choices, and can be combined to form treatment plans. We distinguish between two commitment regimes. In the first, the physician can commit to treatment decisions at the time a payment contract is accepted. In the second, the physician cannot commit to treatment decisions at that time, and will wait until he learns about the patient's illness to do so. In the commitment game, the first best is implemented by a single payment contract to all types of altruistic physician. In the noncommitment game, the first best is not achieved. All but the most altruistic physician earn positive profits, and treatment decisions are distorted from the first best.

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1. Introduction

Physicians have different practice styles. Patients with similar medical conditions often get treated differently. Practice-style variations are present across specialties such as obstetrics (Epstein and Nicholson (2009)), cardiology (Molitor (2012)), and primary care (Grytten and Sørensen (2003)). Practice variations can be very costly if physicians deviate from using cost-effective treatments. In fact, Phelps and Parente (1990) estimated an annual welfare loss valued at US $33 billions due to hospitalization rate variations.

Current theory explains practice variation by information diffusion and physician learning (Phelps (1992), Phelps and Mooney (1993)). Under this hypothesis, practice variation should be smaller within markets than between markets, and should diminish over time. However, Epstein and Nicholson (2009) find the opposite: for risk-adjusted cesarean-section rates, within-market variation is twice that of between-market variation; almost 30% of the variation is due to time-invariant, physician-specific factors other than experience, gender, race, and where a physician received residency training. This time-invariant, physician-specific factor likely reflects physicians' intrinsic preferences about the appropriate treatments for their patients.

In this paper, we model practice styles by physicians' heterogenous preferences towards their patients. Physicians are partially altruistic, their utilities being weighted sums of profits and patients' utilities. Physicians have multiple treatment options, and patients' illness severities differ. Physicians' tasks are to match patients with different severities to

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different treatment plans. However, physicians possess private information about patient's illness severity, and their treatment decisions are noncontractible.

We study the following questions. What is the efficient treatment plan when there are multiple treatment options? Under what conditions can payment contracts implement the efficient treatment plan? If the efficient treatment plan is not implemented, what are the distortions? Finally, how are insurance premiums affected?

Since Arrow (1963) observed the importance of altruistic physicians in the health market, the altruistic-physician assumption has been widely adopted.[2] While most papers in the literature have assumed that the degree of altruism is given and known, we go beyond the fixed-altruism assumption and allow the physician to be of many different types, this being his private information.[3]

An altruistic physician may trade off his own profit against the consumer's utility. This formal construct does permit an ultra altruistic physician to run a financial loss to subsidize treatments. This, however, is unrealistic. Being an economic agent, a physician must face some financial constraints, so we assume that a physician must on average earn a minimum profit. We do allow a physician to sustain some financial loss sometimes, but he must expect to earn a minimum profit on average. We normalize this minimum expected profit to zero.[4]

The physician practice-style issue rests on an environment in which many treatment options for an illness are available. We model multiple treatment options in the simplest way. A less costly treatment succeeds in eliminating a patient's illness disutility with a lower probability. A second treatment is more costly, but succeeds with a higher probability. In contrast to papers in the literature, we let physicians combine treatments. For example, a high-cost treatment may be used after a low-cost treatment fails to eradicate the illness. The physician decides on sequences of treatments, which we call treatment plans or protocols.

Our main findings are the following. First, the first-best treatment plan prescribes a conservative approach under a cost-convexity assumption, which says that the higher the success probability, the higher is the cost per unit success probability. If the severity is low, then no treatment is used; if it is of medium value, a low-cost treatment will be used; if it is high, then the low-cost treatment will be used, followed by the high-cost treatment if necessary. In other words, the consumer should never take the high-cost treatment before trying the low-cost treatment.

Second, the first best can be implemented by a *single* contract when the physician can commit to treatment plans before learning about patients' severities. This result is surprising both because in principal-agent models, information asymmetry often generates information rent and distortions, and because the first best is implemented without the use of any contract menu. Third, the first best is infeasible when the physician cannot commit to treatment plans; the physician earns excess profits, and treatment decisions are distorted from the first best.

To explain our results, we should first describe the extensive-form game. In Stage 1, an insurer offers an insurance contract to the consumer, and a payment contract to the physician, which consists of a capitation payment and the physician's share of treatment cost. In Stage 2, nature determines the physician's degree of altruism, which is privately known to the physician. In Stage 3, the physician and the consumer decide whether to accept the contract. The physician also decides on a practice style which is a rule for prescribing a treatment plan for any illness severity. In Stage 4, nature determines the patient's illness severity. The physician learns the illness severity and follows the treatment plan decided in Stage 3.

The commitment power manifests in Stage 3. At that time, the physician has not learned the patient's illness information (he already has the private information about the degree of altruism), but he does anticipate learning that in Stage 4. What he does in Stage 3 is to formulate a rule for how the patient is to be treated: if the severity turns out to be such and such in Stage 4, then this or that treatment will be used. Stage 3 is also the contract acceptance stage, and the physician must simultaneously assess whether the capitation payment and cost share can generate a minimum expected profit.

The first best can be implemented by a contract designed as if the physician were the least altruistic type. Suppose the least altruistic physician puts a 10% weight on consumer's utility. The insurer should offer a contract with a 10% cost share and a transfer equal to 10% of the expected first-best cost. The 10% altruistic physician will fully internalize the social costs and benefits when bearing 10% of the cost. A lump-sum transfer equal to 10% of the expected cost in the first best allows the least altruistic physician to break even.

Why can this contract still implement the first best when the physician puts, say, a 50% weight on the consumer's utility? If the physician accepts the contract and implements the first best, he also breaks even. The doctor would have liked to offer more generous treatments because he was more altruistic. But if he had done so, he would not break even. The transfer is so low—only 10% of the expected first-best cost—that more generous treatment plans would put the 50% physician in the red. The nonnegative expected profit constraint is so binding that the 50% physician must follow the strategy of the least altruistic physician. It follows that the 50% altruistic physician implements the first best.

[2] A sample of papers using the altruism assumption in the health literature includes Chalkley and Malcomson (1998), Choné and Ma (2011), Dranove and Spier (2003), Dusheiko et al. (2006), Ellis and McGuire (1986, 1990), Jack (2005), Ma (1998), Ma and Riordan (2002), Makris and Siciliani (2011), Newhouse (1970), Rochaix (1989), and Rogerson (1994).

[3] All the papers in footnote 2 use the known altruism assumption except Choné and Ma (2011) and Jack (2005).

[4] Our results remain the same if the minimum profit is strictly positive. The level of the premium will be adjusted accordingly, since any profits will be passed onto consumers.