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**SUPPLIER INDUCED DEMAND AND
COMPETITIVE CONSTRAINTS
IN A FIXED-PRICE ENVIRONMENT**

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Supplier induced demand and competitive constraints in a fixed-price environment*

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Abstract

The "physician induced demand" (PID) model states that in the face of negative income shocks, physicians may exploit their agency relationship with patients by providing excessive care. PID models in the literature are basically monopoly models. Despite of its intrinsic relevance no formal analysis has been proposed of demand induction within a competitive environment. In this paper we aim at filling this gap providing a model of monopolistic competition between physicians that are able to induce demand.

We work in a fixed price environment. Demand is price insensitive and increasing in the level of induction. Patients choose between alternative providers according to a discrete choice model, driven by providers' level of quality and induction. Once patients have chosen their provider, they consume an amount of treatments which is an increasing function of the induction effort "produced" by their physician. This structure picks up some of the empirical facts on health service demand where we observe patients choosing freely their providers but then consuming in a way that is dependent on physician's advice. Moreover we assume that physician can increase the efficiency of inducement by investing in quality. Marginal costs of treatments are constants and quality is a fixed cost. Physicians compete in quality and induction levels in order to maximize profits. We assume that quality is determined first and induction level then and solve the model backward. We derive conditions leading to a solution with positive level of induction and the comparative statics effects due to the key parameters of our model. We close the paper by discussing the policy implications emerging out of our analysis.

1 INTRODUCTION

Significant information asymmetry may provide suppliers the opportunity to induce demand. The more complicated the product or service, the greater is the potential for such nefarious behavior. Accident victims may be induced to purchase the services of lawyers and chiropractors, automobile mechanics may make unnecessary repairs, personal financial planners may advise investments in their own interest. Supplier-induced demand (SID) is a particularly contentious issue in medical economics [see Newhouse (1970), Evans (1974), Fuchs (1978), Reinhardt (1985), Stano (1987), De Jaegher and Jegers (2000)]. In this context physician induced demand (PID) is assumed to exist “when the physician influences a patient’s demand for care against the physician’s interpretation of the best interest of the patient” [McGuire (2000)]. As in the legal profession or the service trades, the existence of PID is not the issue: “Everyone knows that physicians exert a strong influence over the quantity and pattern of medical care demanded in a developed economy” [Evans (1974)].

A great deal of empirical and theoretical work has been devoted to the issue of PID in Health Economics. The reason is that PID threatens the basic market paradigm and severely undermines economic recommendations about market policy. Market demand can be interpreted in terms of the interests of the consumer and in terms of market efficiency whenever consumers have stable preferences. A well-behaved market demand underlines any proposal for co-insurance policies and for a reduced national health insurance coverage [see Rice (1998) for an extended discussion and critics of these proposals]. However, with PID at work, the policy implications drawn from the theory of consumer demand are at risk. As a result there is a strong policy motive to study the issue. “The issue of PID obviously goes straight to the heart of probably the major controversy in contemporary health policy, namely the question whether adequate control over resource allocation to and within healthcare is best achieved through the demand side or through regulatory controls on the supply side” [Reinhardt (1989), p. 339].

Clearly, some physicians induce demand, just as some automobile mechanics make unnecessary repairs. The important question for public policy is whether the representative physician engages in SID. The PID model states that in the face of negative income shocks, physicians may exploit their agency relationship with patients by providing excessive care. Income shocks may typically arise from three different sources. The inducement model has been tested by assessing how these three alternative types of income shocks affect the utilization or the fees of medical procedures. Therefore these are tests for the “marginal” PID and not for the “absolute” PID. A first source is variations in the physician/population density across areas: increased density

lowers the income of existing stock of physicians, and it will lead to increased utilisation of medical procedures in an inducement-type model [see Fuchs (1978), Cromwell and Mitchell (1986), Birch (1988), Grytten, Carlsen and Sørensen (1995)]. Income shocks may emerge as the consequence of an exogenous change in demand due to epidemiological shifts, evolution of needs, variation in tastes [see Gruber and Owings (1996)]. However the most common is variation in fees paid to physicians, generally by government payers [see Rice (1983 and 1984), Yip (1998)].

Coming to the theoretical developments in the PID literature we see that a major concern has been to identify reasonable explanations for the constrained ability to induce demand by the doctor. In other words to develop a good theory of limited absolute PID. Actually, if there is no limit to the physician's ability to induce demand we end with the absurd result that as long as the price of the health services exceed marginal cost, physicians will continue to induce demand until the patients' full income is extracted. Moreover a good theory of PID has to account for the empirical evidence on marginal PID, i.e. medical services utilisation should be predicted to increase in response to an income shock, like for instance an increase in the competitive pressure.

Limits or costs to inducement have been introduced within four different frameworks. Stano (1987) takes one direction, making the natural analogy between inducement and advertising. He assumes that inducement has a real resource cost (like advertising) and is limited by the profit calculation of doctors in the presence of diminishing returns. Following proposal from Newhouse (1970) and Evans (1974), McGuire and Pauly (1991) model professional ethics. They model inducement as inherently unpleasant, and limited by the psychic costs the physician bears when she gives advice to the patient slanted toward her own self interest. De Jaegher and Jegers (2000) question that these two models are definitely the same: both the advertising and the professional ethic model assume that firms shift demand, but are constrained by some cost involved by demand-shifting. As far as demand shift coincide with a decrease in price we could end up with an improved patients' welfare in presence of a marginal PID and positive moral costs. Therefore they argue that "treating inducement as a variant of advertising leads to an unintuitive model of PID" and that "to reflect moral costs of shifting demand, one may therefore include price as an argument in the physician's utility from professional ethics. This brings De Jaegher and Jegers (2000) to model professional ethic as utility interdependence, following a proposal made by Farley (1986). In these three traditions, patients are assumed to have no information. Since the 1980s, however, several authors [Pauly (1980), Dranove (1988), Rochaix (1989)] have developed models, in which physicians induce demand but are constrained in doing so by the patient's information. These models assume that patients are Bayesians. Physicians are

then constrained in inducing demand, in that in response to certain diagnosis, patients may refuse treatment, or look for a second opinion [Rochaix (1989)]. Additionally, if patients have imperfect information of their true health status, they may reject the diagnosis if it contradicts their information [Dranove (1988)].

In this paper we wish to contribute to the theoretical literature on PID by developing a model that tackles with some unaddressed issues. None of the models in the literature deal with competition explicitly. Income shocks have been analysed looking at "representative providers" ignoring explicit demand interdependencies between each providers. In a sense PID models in the literature are monopolistic behaviour models. In this framework competition enters indirectly through the effects increased demand elasticity exerts on monopolist inducement and pricing rules. Despite of its intrinsic relevance no formal analysis of PID has been proposed within a truly competitive environment. We aim at filling this gap providing a model of monopolistic competition between physicians that are able to induce demand. In this context limits to "absolute" PID are set by competitive pressure alone, i.e. we can abstain from including any ethical or financial cost for inducement.

Our model share some features with a model of hospital nonprice competition developed by Pope (1989). Like in that paper, which is not concerned with demand induction, we allow for quality competition among the providers and we consider a fixed price environment, i.e. we assume that providers are reimbursed fee-for-service by a third payer.

Quality competition has been a rather neglected topic in the PID literature. Feldman and Sloan (1988) discuss the issue in a monopoly setting suggesting that the marginal PID effect can be reverted. They argue that "the main objection to government price setting is not that physicians will get around the controls by inducing demand, but that price controls result in a quantity and quality of physicians' services that is not ideal and may be inferior to those given in an unregulated monopoly". Bradford and Martin (1995) provide empirical evidence about the relevance of quality competition in PID. They argue that physicians may respond to increased competitive pressure by product differentiation based on quality. Thus, if patients value quality in medical services, the representative physician's demand curve may rise as increasing competition leads to higher quality. If quality changes are not modeled explicitly, this gives the appearance of SID. A simple regression of fees against physician density in their data set reveals a positive and significant correlation. Controlled for quality, however, fees decline as competition increases. Moreover, quality increases as competition increases.

We specify the demand side of our model sharing some features of the demand modelling adopted in the altruism and patient's information approaches. In particular we adopt a two stage demand structure, like in

Farley (1986) and De Jaegher and Jegers (2000), which is consistent with the theory of "increasing monopoly" suggested by Pauly and Satterthwaite (1981).

The paper is organized as follows. Section 2 presents the model. Section 3 provides and discusses the comparative statics results concerning the key parameters in our model. Section 4 contains a simple simulation exercise. Section 5 concludes.

2 THE MODEL

2.1 Demand side

Out of a population P a given number N of individuals have to receive, once in a given time interval, a certain medical treatment¹. Individuals do not pay *out-of-pocket* for the treatment they receive (for ex. hospital admissions) as far as treatments are reimbursed to the providers, according to a prospective tariff, p , by a third payer. This could be both a public or a private insurer. We do not deal here explicitly with the insurance side of our story.

We consider a two stage representation of the demand for health care². The first stage is initiated by the patient who chooses the provider according to utility maximization; the second stage is dominated by the provider who indirectly determines the amount of treatment. In our framework we assume that patients are unable to assess the value of the received treatment. Therefore the utility of the treatment is invariant in the exact amount they receive: "they are not good epidemiologists" [De Jaegher and Jegers (2000)]. Once they have chosen a doctor j , patients passively accomplish to her advice and consume the treatment according to the following consumption function:

$$d_j = 1 + f(1 + q_j)i_j \tag{1}$$

which implies that individuals consume at least one unit of service. Individual consumption increases with the inducement effort produced by the chosen provider, i_j . Moreover the marginal productivity of inducement increases with quality, q_j , by a factor f . Quality does not increase individual consumption per se, i.e. if induction effort is absent quality does not affect consumption. Actually we want to treat quality and inducement separately. Quality does not induce demand.

Once they have received their treatment patients observe the values of q_j and i_j and are able to engage in word-by-mouth advertisement [see

¹ N/P is given in our model. We might reasonably assume that it is an epidemiologic constant, which is independent of market structure and behaviour.

² We adopt, in this respect, a framework suggested by Farley (1986).

Satterthwaite (1979)]. This last is a typical feature of markets for a "reputation" good, like health care. In these markets consumers' search among providers is conducted primarily by asking relatives, friends and associates for recommendations. Our assumption is related, as will be made clear later, to a fundamental premise in Pauly and Satterthwaite (1981) theory of "increasing monopoly" in reputation good markets.

Coming to the first stage we consider that individuals choose among different providers according to the two relevant characteristics: the level of quality, and the inducement effort, produced by the providers. Individuals choose the provider, in order to maximize a random utility function of the following type:

$$U_{nj} = -\mathbf{b}i_j + \mathbf{g}j + \mathbf{e}_{nj} \quad (2)$$

where $-\mathbf{b}$ and \mathbf{g} reflect the marginal disutility of inducement³ and the marginal utility of quality, respectively, and \mathbf{e} is the random component representing unobservable factors affecting individual choice. Inducement effort enters negatively in the utility function: patients dislike to be manipulated, even if, once they have chosen their "manipulating" physician, they accomplish passively to her advice.

In order to derive the choice probability of provider j we have to make assumptions on the \mathbf{e} 's. If, and only if [see Anderson, De Palma and Thisse (1992)], the \mathbf{e} 's are independently and identically distributed according to the Weibull⁴ distribution, the choice probabilities of provider j , coming out of the utility maximization process, have the form of the logistic distribution function:

³ \mathbf{b} could be the product of the true marginal disutility of inducement $\underline{\mathbf{b}}$ and the individual perceived inducement. Insofar, policies increasing the level of individual awareness of inducement can be analyzed by looking at the effects of an increase in \mathbf{b} .

⁴ Assuming normality of \mathbf{e} we would result in a probit specification. See comments on Werden, Froeb and Tardiff (1996). From the econometric viewpoint probit and logit models are negligibly different in large samples. In the context of an economic model the logit specification is more tractable with no loss of generality.

$$\begin{aligned}
prob(j) &= \frac{\exp[-\mathbf{b}i_j + \mathbf{g}q_j]}{\exp[-\mathbf{b}i_j + \mathbf{g}q_j] + \sum_{s=1}^{J-1} \exp[-\mathbf{b}i_s + \mathbf{g}q_s]} = \\
&= \frac{\exp[-\mathbf{b}(i_j - i_J) + \mathbf{g}(q_j - q_J)]}{1 + \sum_{s=1}^{J-1} \exp[-\mathbf{b}(i_s - i_J) + \mathbf{g}(q_s - q_J)]} \tag{3}
\end{aligned}$$

where q_j e i_j are the quality and inducement level of the reference provider⁵. Therefore the inducement effort reduces the share of patients accruing to the j -th provider, while quality increases it.

As far as the elasticity of choice probabilities decreases, in absolute value, with an increase in J , this representation of patient behaviour is coherent with Pauly and Satterthwaite (1981) theory of “increasing monopoly”. This theory states that, as far as the the number of physicians within a community increases, then consumer information about each physician decreases. If this number "is small - three for example - then each physician has a detailed reputation throughtout the community. Each consumer is likely to have friends who go the the three and can remember what friends have reported about each. If, however, the number of physicians in the community is larger - thirty, for example - then each one's reputation is less defined" [Pauly and Satterthwaite (1981), 490]. Thus, increasing the number of physicians makes search more difficult and therefore consumers become less sensitive to choice attributes⁶.

We are now able to define the demand served by a given provider j as $x_j = B_j d_j$, where $B_j = N * prob(j)$.

2.2 Providers

There are J providers competing both in quality and inducement. Inducement is a costless effort the providers can produce in order to increase individual demand. On the other hand, producing quality is costly, since it imposes fixed costs in a proportion k .⁷ The overall cost function is given by:

⁵ In order to model the "outside" good we should keep the characteristics of the reference provider as fixed. However this brings in too much analytical complexity. So that in our model of internal competition the reference provider is one of the J providers belonging to the inside market.

⁶ Pauly and Satterthwaite (1981) provides supporting empirical evidence to this theory.

⁷ It is typical in the principle-agent literature on reimbursement schemes [see Hodgkin and McGuire (1994)] to consider the variable costs as an increasing function of quality. This would bring in too much analytical complexity.

$$C_j = cx_j + kq_j. \quad (4)$$

Therefore quality increases individual consumption and the share of N patronizing a given firm j . however it imposes fixed costs in proportion to k ; inducement increases individual consumption, it is costless, but reduces the share of clients patronizing the firm.

Indicating the reimbursement premium over variable costs as $D=p-c$ we are now able to define the profit function for a firm j as:

$$\Pi_j = B_j [1 + f(1 + q_j)i_j] \Delta - kq_j. \quad (5)$$

2.3 Equilibrium

In order to determine the equilibrium levels of q and i we assume that quality is determined first and induction then, and solve the model backward assuming Cournotian conjectures by the firms.

Solving the second stage for i , given the level of q , we obtain:

$$-bN \frac{\exp[.] \left(1 - \exp[.] + \sum_{s=1}^{J-1} \exp[.] \right)}{\left(1 + \sum_{s=1}^{J-1} \exp[.] \right)^2} [1 + f(1 + q_j)i_j] \Delta + N \frac{\exp[.]}{1 + \sum_{s=1}^{J-1} \exp[.]} f(1 + q_j) \Delta = 0$$

Imposing the simmetry of the solution, i.e. $i_j=i_J$ and $q_j=q_J$ for any j , we obtain, after some algebra:

$$i^*_j = \frac{J}{b(J-1)} - \frac{1}{f(1 + q^*_j)} \quad (6)$$

which implies that in equilibrium, the level of inducement is increasing in the level of quality.

Substituting i^* in the profit function and solving the first stage we obtain:

$$\left(\mathbf{g} - \frac{\mathbf{b}}{\mathbf{f}(1+q_j^2)} \right) N \frac{\exp[.] \left(1 - \exp[.] + \sum_{s=1}^{J-1} \exp[.] \right)}{\left(1 + \sum_{s=1}^{J-1} \exp[.] \right)^2} \frac{J}{\mathbf{b}(J-1)} \mathbf{f}(1+q_j)\Delta +$$

$$+ N \frac{\exp[.]}{1 + \sum_{s=1}^{J-1} \exp[.]} \frac{J}{\mathbf{b}(J-1)} \mathbf{f}\Delta - k = 0$$

Again imposing the symmetry of the solution and solving for q_j we obtain:

$$1 + q_j^* = \frac{-J[N\Delta\mathbf{f} - (J-1)\mathbf{b}k] + \sqrt{J^2[N\Delta\mathbf{f} - (J-1)\mathbf{b}k]^2 + 4N^2\Delta^2(J-1)^2\mathbf{g}\mathbf{f}}}{2N\Delta(J-1)\mathbf{f}\mathbf{g}} \quad (7)$$

2.4 Admissible solutions

As we said before we were unable to model an outside option. Therefore we cannot coherently prevent our internal market competition model to have solutions leading to non positive values of patients' provider utility, i.e. $-\mathbf{b}i_j + \mathbf{g}_j < 0$. We exclude this situation by considering parameters structures leading to solutions with positive values of individual utility. Moreover we exclude also solutions containing negative values for the inducement effort. Therefore we impose as admissible the following situations:

1. $q^* > 0$ and $i^* = 0$

2. $q^* > 0$ and $i^* > 0$

Looking for positive solutions we have:

$$q_j^* > 0 \Leftrightarrow \mathbf{g} < \frac{(J-1)(N\Delta + Jk)\mathbf{b} - JN\Delta\mathbf{f}}{N\Delta\mathbf{f}(J-1)} = \mathbf{g}_l \quad (8)$$

i.e. quality is positive provided that patients' marginal utility of quality is sufficiently small. Moreover it's easy to show that, after substituting q^* in i^* that:

$$i_j^* \geq 0 \Leftrightarrow \mathbf{g} \leq \frac{J^2k}{N\Delta(J-1)} = \mathbf{g} \quad (9)$$

This is equivalent to say that:

$$N\mathbf{g} \frac{J-1}{J^2} \Delta - k \leq 0, \text{ i.e.: } \frac{dB(q, \bar{i})}{dq} \Delta - \frac{dC}{dq} \leq 0 \quad (9bis)$$

i.e. in equilibrium inducement is absent (strictly positive) provided that the marginal cost of quality is equal to (larger than) the marginal revenue due to what we call a "pure practice effect", i.e. to the increase in the number of patients (not treatments) stimulated by an increase in quality.

Looking for model structures leading to positive levels of quality when inducement is zero (our situation 1.) we have to assume that $\mathbf{g}_i > \mathbf{g}$. This amounts to say that:

$$\mathbf{f} < \mathbf{b}(J-1)/J \quad (10)$$

in words, marginal productivity of inducement has to be sufficiently smaller than marginal disutility of inducement. Therefore our situation 1. emerges as far as (10) holds and (9bis) holds with equality. Since (10) has to hold in order to prevent situations leading to solutions with non positive levels of individual utility, situation 2. emerges as far as additionally (9bis) holds as a strict inequality. We can conclude by saying that meaningful solutions emerge provided that the marginal cost of quality is equal or larger than the marginal revenue due to a "pure practice effect", in the presence of a marginal productivity of inducement lower than the marginal disutility of inducement.

3 COMPARATIVE STATICS

It is straightforward to show that the following comparative static results hold:

Table 1: Comparative static results

		$\frac{\partial q^*}{\partial v}$	$\frac{\partial i^*}{\partial v}$
Reimbursement premium	\mathbf{D}	-	-
Inducement productivity	\mathbf{f}	-	-
Quality fixed cost	\mathbf{K}	+	+
Marginal disutility of inducement	\mathbf{b}	+	-
Marginal utility of quality	\mathbf{g}	-	-
Number of individuals	\mathbf{N}	-	-
Number of providers	\mathbf{J}	+	+

The more (less) generous is the reimbursement premium the lower (higher) is the incentive to induce demand and to provide quality. The lower is the productivity of inducement the higher are inducement and quality.

As the fixed cost for quality provision increases the producers tend to counteract the income shock by increasing both inducement and quality. We might see in perspective the relevance of this result by considering the possibility of a reimbursement scheme covering, at least partially, the fixed costs for quality. According to our analysis reimbursing providers for their fixed costs for quality reduces the incentives to overproduce and reduces quality as well.

Concerning the utility parameters we see that as far as the marginal utility of quality is concerned, its increase tends to reduce both inducement and quality. On the contrary we observe that an increase in the marginal disutility of inducement leads to an increase in quality and to a decrease in inducement. This suggests that improving individuals awareness of inducement behaviour might lead to a net improvement in individuals welfare.

The typical test of demand induction relies on variation in provider density across geographical areas. According to our analysis income shocks due to an increase in the degree of competition brings in both an increase in inducement and an increase in the level of quality.

4 WELFARE ANALYSIS

In order to evaluate the social desirability of the abovementioned results we need to look at the social welfare accruing to the overall economy. We will limit our analysis to the effects of an increase in competition, i.e. in the number of providers, J , and to the effects of an increase in the marginal disutility of inducement, b . The former variation could mimic a change in the authorization policy adopted by a social regulator⁸; the latter could reflect a policy aimed at increasing patients's information on physician behaviour.

Since it is not possible to sign the change in consumers' surplus⁹ and firms' profit due to an increase in both parameters, in order to have some hints into the welfare effects of these changes we have to simulate our model. We consider a baseline set of model parameters satisfying the abovementioned conditions for an admissible solution for q and i . Moreover it is reasonable to assume that individuals are more sensitive to quality than to inducement.

⁸ Consider for example the so called Certificate of Need policy in the USA.

⁹ In our context, since patients do not pay out of pocket, consumer surplus correspond to the overall utility he receives. This is given by the sum of the utility due to the choice of the provider, described by equation (2), plus the constant utility accruing to him because of the treatment.

Therefore we assume that $\underline{\epsilon} > \mathbf{b}$. Since (9) has to hold, this implies that $\mathbf{b} < J^2 k / N \Delta (J - 1)$.

In order to properly assess the welfare effect of a change in parameters like J and \mathbf{b} , we should consider the social cost of money spend in the "insurance policy". For the sake of simplicity we assume that the marginal social cost of these funds is 1.

Table 2: The welfare effect of an increase in J

	baseline				
J	2	3	4	5	6
\mathbf{b}	0.06				
\mathbf{g}	0.19				
\mathbf{D}	0.20				
N	1,000				
k	10				
f	0.025				
$1+q^*$	1.206	1.651	1.958	2.234	2.509
i^*	0.179	0.772	1.798	2.926	4.056
Individual Demand	1.01	1.03	1.09	1.16	1.25
Surplus	28.5	77.4	74.2	58.8	43.3
Profits	197.0	186.8	179.3	171.0	160.3
Welfare	225	264	253	230	204
Individual premium	1.206	1.238	1.306	1.396	1.505
Welfare/insurance costs	0.187	0.213	0.194	0.165	0.135

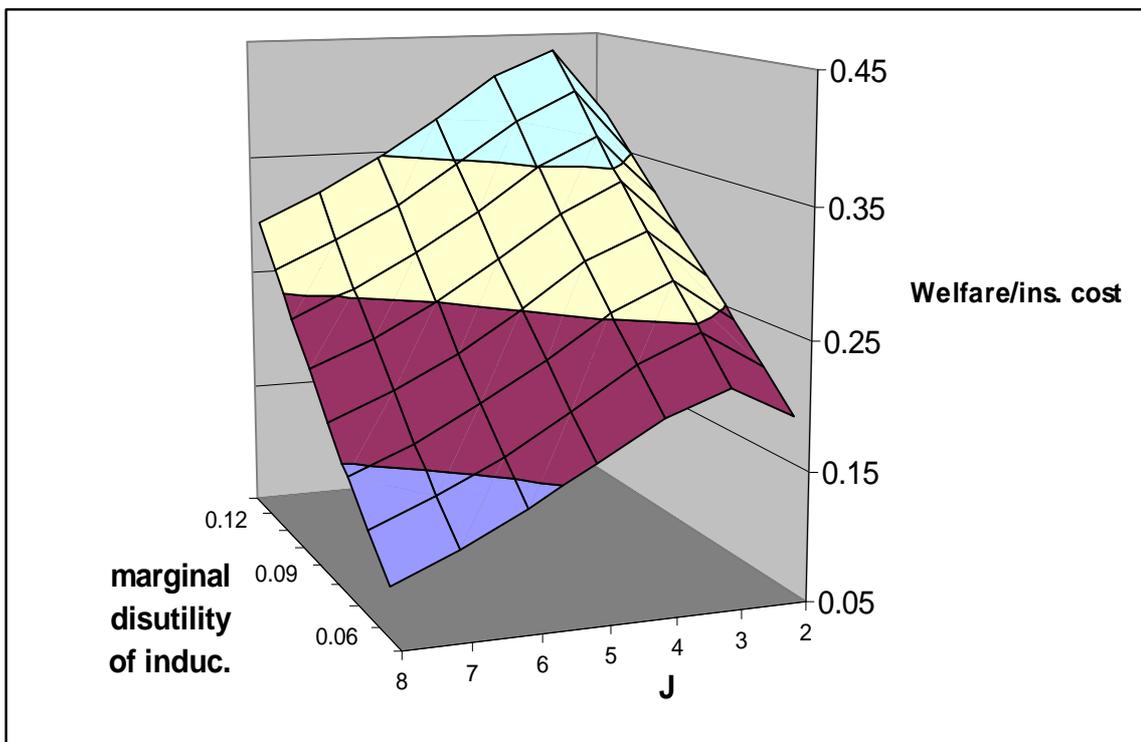
Table 3: The welfare effect of an increase in \mathbf{b}

	Baseline				
\mathbf{b}	0.06	0.07	0.08	0.09	0.10
J	2				
\mathbf{g}	0.19				
\mathbf{D}	0.20				
N	1,000				
k	10				
f	0.025				
$1+q$	1.206	1.409	1.611	1.814	2.017
i	0.179	0.176	0.173	0.171	0.168
Ind demand	1.01	1.01	1.01	1.01	1.01
Surplus	28.5	65.3	102.2	139.3	176.4
Profits	197.0	193.1	189.2	185.3	181.4
Welfare	225	258	291	325	358
Individual premium	1.206	1.207	1.208	1.209	1.210
Welfare/insurance costs	0.187	0.214	0.241	0.268	0.296

According to our simulation [see **Table 2**], an increase in the number of providers exerts a positive effect on quality, but brings in an overprovision of treatments. This cause insurance costs to increase quite quickly. Profits tend to decrease, while consumer's surplus has a non-linear response: it increases first and decreases afterwards. The overall welfare follows the same pattern of consumer surplus. In the end we see that a policy aimed at increasing the number of providers rapidly sort marginal social gains that are more than balanced by insurance costs.

Looking at the effect of an increase in the marginal disutility of inducement [see **Table 3**], produced by policies aimed at increasing patient's information and awareness, we see that it sorts positive effects on quality while limiting overprovision. These policies might sort marginal social gains that are larger than the increase in insurance costs. However these policies reveal to be more effective the less competitive is the market, as **Graph 1** reveals. This result, which is consistent with Pauly and Satterthwaite (1981) theory of "increasing monopoly", provides additional support to the idea that strong competition is of little value in health.

Graph 1: Welfare to insurance cost in response to a simultaneous change in J and b .



5 *CONCLUDING REMARKS*

PID is a particularly contentious issue in medical economics. The reason is that PID threatens the basic market paradigm and severely undermines economic recommendations about market policy. A neglected topic in the theoretical literature concerns the effect of competition when physician may induce demand. This is a relevant topic as far as competition has been repeatedly advocated in health care as a good instrument to improve quality of services. However if demand is manipulated, patients may not be able to constrain providers to the "right" quality. In this paper we contribute to the debate on PID by developing a model that explicitly tackles with the issue of quality competition when inducement is in place.

We work in a fixed price environment. Demand is price insensitive and increasing in the level of induction. Patients choose between alternative providers according to a discrete choice model, driven by providers' level of quality and induction. Once patients have chosen their provider, they consume an amount of treatments which is an increasing function of the induction effort "produced" by their physician. Moreover we assume that physician can increase the efficiency of inducement by investing in quality. Marginal costs of treatments are constants and quality is a fixed cost. Physicians compete in quality and induction levels in order to maximize profits. We assume that quality is determined first and induction level then and solve the model backward.

In terms of policy relevance our analysis provides some interesting hints. Looking at reimbursement policies our results suggest that the less generous is the reimbursement premium the higher is the incentive to induce demand and to provide quality. Moreover a reimbursement scheme covering, at least partially, the fixed costs for quality seems to miss its target. According to our analysis reimbursing providers for their fixed costs for quality actually reduces the incentives to overproduce but reduces quality as well.

Pro-competitive policies, aimed at increasing the number of providers, lead to overprovision of quality and overtreatment, so that they rapidly sort marginal social gains that are more than balanced by insurance costs. On the contrary policies aimed at increasing patient's information and awareness, sort positive net effects that tends to reduce, however the more competitive is the market.

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