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GPS' PAYMENT CONTRACTS AND THEIR REFERRAL POLICY

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GPs' Payment Contracts and their Referral Policy*

by

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Abstract

The aim of this paper is to compare the role of general practitioners in determining access to specialised and hospitalised health care in two different types of health care systems: Systems where a GP referral is compulsory for specialist/hospitalised attention and systems where this referral is only facultative. We model the dependence between the GPs' diagnosis effort and referral practice, and concentrate on the optimal contracts that induce the best behaviour from the public insurers' point of view with asymmetric information on both GP's diagnosis effort and diagnosis outcome. We show that the compulsory referral system is superior wherever the GP's incentives matter.

keywords: health economics, referral, contracts and moral hazard.

JEL: D82, I18 and L51

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1. Introduction

The aim of this paper is to provide a theoretical framework to analyse the role of general practitioners in determining access to specialised and hospitalised health care in different types of health care systems. We will mainly compare systems where patients can receive specialised care only after a general practitioner (GP) refers them to a specialised health provider (compulsory referral) with systems where patients are allowed to freely access specialised care (facultative referral).

Within each of these institutional regimes, we shall consider the provision of incentives with regard to the cost containment/quality achievement objective, which is widely recognised as the main objective for any health system. We will limit our attention to the incentives that are derived from the GPs remuneration scheme since GPs are aimed to act as gatekeepers or filters towards specialised and hospitalised care, which are generally more expensive. To suit the characteristics of real world health systems such as the British or the Spanish ones, no competition between GPs is considered and patients are supposed to be fully insured.[1]

The international experience provides us with a variety of payment systems for the GPs, as well as different relations between primary and specialised care. Very specially, in the EU, the comparison of the different existing systems within a unique theoretical framework, will become a very urgent need given the growing interest for integration in health markets.

In France and Germany, GPs are paid according to a fee for service scheme. The patients have an unrestricted access to the specialists, while they need a GP's referral only to go to the hospital. On the other hand, a GP's referral is required for visiting both a specialist or a hospital in the National Health System in the UK (NHS), as well as in the public health system in Spain (Servicio Nacional de Salud-SNS). Around one third of the GPs working for the Spanish SNS are paid according to a

[1] However, we do not pretend, that the incentives faced by GPs through the payment contract are the only determinants of health care costs and quality. Still, as we consider neither competition nor patients'

capitation contract. The remaining two thirds of these GPs receive a fixed salary. In any case, the GPs in the SNS pay no share of the costs associated with their referrals. On the contrary, one of the special characteristics of the NHS in the UK is that the "GP fundholders" receive some budget for paying their patients drugs as well as buying out some hospital services. The share of this budget that is not spent can be reinvested to improve the GP fundholder services. Besides, the GPs in the NHS are paid according to a complex payment scheme, that includes a capitation component. In Spain, there also exist private health insurance companies allowing the patients to freely access specialised health care providers.

It has been argued that the GPs attitude towards their gatekeeper role may depend upon the incentives included in their payment contract. In particular, the GPs in the Spanish SNS who are paid according to a capitation scheme may have an incentive to refer their patients even when it is not necessary, in order to satisfy their clients. On the contrary, in the GP fundholders in the NHS, there is an incentive to restrict the referrals.[2]

It is the special feature of the health services as experts' services that allows the GPs to adjust their referral strategy to the incentives they face. In particular, it is hardly verifiable whether a referral decision by a GP is adequate or not. Therefore, when designing the GPs' payment scheme, it is important to consider its influence on the GP's referral practice. However, some perverse effects might arise if the GPs contract design is aimed only at inducing the desired referral practice, since referring patients is not the only activity of a GP. In particular, prior to any referral decision, or more generally, prior to any treatment decision, the GP should diagnose the patient. This activity requires some effort from the GP. Therefore, moral hazard arises because the GP's effort is hardly observable by outside parties while it is costly to the GP. Whether a GP has an incentive to shirk her diagnosis effort or not, also depends on her payment contract.

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co-payment to discipline the GPs' gatekeeper attitude, the payment scheme is here an important determinant of the GP's incentives.

[2] See NERA for the previous argument.

We formalise these ideas in a one GP-one patient-one specialist model with third party payment. This is, the patient does not directly bear the costs of the services he requires but rather this cost is borne by a third party- a public health system or an insurer- who also designs the GP's payment contract.

In the model, the patient will need either specialised care, to be provided by the specialist, or non specialised care, to be provided either by the GP or by the specialist. Treatment provided by the specialist is assumed more expensive than treatment provided by the GP.

When analysing the optimal GPs payment contract, the dual role of the GP as performing a diagnosis and making referral decisions is recognised since we not only consider the moral hazard in the diagnosis activity[3] but, also, how it relates to the GP's referral practice. Indeed, the GP payment contract can only be based on observable elements of the GP's activity. These are: whether the GP performed diagnosis, treated and/or referred the patient. Therefore, the contract can consist of three components: a capitation payment, a bonus for not referring the patient elsewhere, and a cost sharing parameter for treatment.

We show that the bonus for not referring matters as it acts as an incentive for diagnosis effort since it is earned only when the GP rightly diagnoses that the patient does not need specialised care. The cost sharing parameter (equivalent to a bonus for not treating) is shown to act as a disincentive for effort since it is earned whenever the GP decides not to treat the patient (so to refer him), whatever the diagnosis outcome is. Still, this cost sharing parameter matters to avoid any systematic attitude such as first treating the patient for whatever diagnosis outcome.

The former argument holds for both the compulsory and the facultative referral systems. However, the contracts differ among both systems because in the GP's sample of patients, the proportion of patients needing primary care only is reasonably higher when a GP referral is facultative. Therefore, the temptation for systematically

[3] Central to our analysis is the assumption that the accuracy of the diagnosis is increasing on the effort exerted by the GP.

not referring the patient is higher when the referral is facultative since the GP knows that her patients are more likely to need primary care only. To avoid this higher temptation, we then need a higher cost sharing parameter. As this higher cost sharing parameter disincentive the diagnosis effort, we also need a higher bonus for not referring to compensate the effect on effort. The expected GP's per patient payment is then higher when the referral is facultative. This partially explains why we conclude by stating the superiority of the compulsory referral system whenever the GP's incentives matter.

A related paper (Garcia Mariñoso, 1998), also sets an insurance contract for a patient in order to optimally regulate the access to expensive specialised care. The patient's behaviour and beliefs are explicitly formalised, while the GP's opportunistic behaviour is reduced to a single binary decision on the level of diagnosis activity. It describes how by changing the insurance contract, the insurer can alter the pool of patients that access each type of provider. It is shown that if consumers are not too risk averse and provider costs are not too different, the insurer allows some patients to visit the specialist directly.

Jelovac (1998) models an incentive scheme for a physician who behaves opportunistically both at the diagnosis stage and when recommending a medical treatment. The physician is assumed to provide all types of treatment. The optimal physician's payment is shown to include a cost sharing component. This payment scheme induces the physician to do her best to diagnose the patients health status, and to provide the most adequate treatment in order to minimise the likelihood of a second patients' visit and its corresponding costs.

It is not clear whether the latter payment scheme would discipline a GP when we consider that there is specialisation in types of treatment (primary and specialised care). A GP could as well refer the patient to the specialist in order to minimise the number of patients' visits. In this sense the paper of Ma (1994) sheds some light on what should be the optimal reimbursement system for a health care provider that refuses expensive patients. He concludes that the implementation of a first best requires a piecewise linear reimbursement rule that can be interpreted as a mixture of pure prospective payment and pure cost reimbursement. However, in Ma there is no explicit formulation of the health care provider's dual role as performing a diagnosis and recommending treatment.

This paper is organised as follows. The model is presented in section 2. Section 3 and section 4 present the GP's problem and the insurer's problem, respectively. Section 5 compares a system with compulsory GP's referral with a system with facultative GP's referral. Section 6 concludes. Proofs are in the appendix.

2. The Model

We model the relationship between a public insurer, a general practitioner (or GP), a specialised health care provider (or specialist), and a patient (or group of patients) as a game with the following timing. In stage 1, the public insurer sets the GP's payment contract. In stage 2, the GP either accepts or rejects the contract (in this latter case, the game ends). In stage 3, "Nature" determines the type of illness of the patient who then chooses (exogenously in this model) which provider to visit. If the patient chooses to visit the specialist, the game ends. Otherwise, in stage 4, the GP exerts some level of effort while doing the diagnosis. In stage 5, Nature draws the GP's signal about the patient's illness type. In stage 6, the GP decides either to provide non specialised treatment or to refer the patient to the specialist. If the patient recovers his health, the game ends. Otherwise, the patient is referred to the specialist in stage 7.

Let now detail the decision variables and parameters that are relevant in the model, following the sequence of the game.

In stage 1, the public insurer designs the GP's payment contract so as to maximise some measure of the patient health, net of the insurer's costs. Within this model, the health measure is reflected in the expected insurer's valuation of some health loss, denoted l, suffered by the patient when he is not cured[4] after receiving a medical treatment. It corresponds to the disturbance caused by one unnecessary

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[4] By cured we mean that the condition of the patient has improved to the point the state of arts in medicine allows to. This might not necessarily mean that the illness is cured. However, we make the assumption that it always pays for the public insurer and the patient to get the patient into this improved condition.

treatment, or to any loss related to delays in receiving adequate treatment. The public insurer's objective is therefore equivalent to minimising the sum of the patient's expected health loss and his own expected costs.

The insurer's costs first consist of the GP's payment. The payment contract, denoted by (D, B, S), consists of three non-negative components. First, the GP receives a payment, D, for performing a diagnosis. Second, she receives a bonus, B, when she does not refer the patient to the hospital. Third, the GP receives another bonus, S, when she does not provide non specialised care to the patient[5]. Furthermore, the public insurer fully reimburses the specialist for its cost h[6]. This latter cost of specialised treatment includes the so called hotel costs of a hospital and the costs of the many diagnosis tests which are generally run in a hospital for whatever type of illness[7]. The cost of specialised or hospital treatment is generally higher than the cost of treatment by a general practitioner which we normalise to zero.

In stage 2, the GP decides either to accept or to reject the contract, comparing her expected utility from accepting the contract with the utility of receiving some reservation wage, denoted w[8]. We assume that the GP is risk-neutral with respect to money and that her utility is separable in money and effort. We say that the GP has negotiation power when she can impose the contract to give her at least the same utility as from w, not only in expected terms but also in any contingency.

In stage 3, "Nature" determines the type of illness of the patient. Patients suffer from two types of condition m: common ($m= \underline{m}$), and special ($m= \overline{m}$). While the common condition can be cured by all types of providers, the special illnesses can only be cured with probability one by the specialist. In order to keep the model

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[5] Note that D can be interpreted as a capitation payment and S as the savings the GP makes on any cost sharing scheme.

[6] Since we do not consider any agency problem on the specialist's side, there is no need for a more sophisticated payment scheme.

[7] The idea here is that the fix cost component of hospital costs is large enough so as to have that per patient costs do not depend on the type of illness.

[8] This reservation wage can be viewed as the average wage of a GP before an hypothetical reform takes place, the reform consisting in offering to the GP the possibility to choose between the former reservation wage, w, and the alternative contract (D, B, S).

realistic, we assume that the patient suffers from a common illness with probability $p \geq 2/3$ [9] and that this is common knowledge.

The patient then chooses which provider to visit. We assume in this model that this choice, denoted K, is only determined by whether patients need a GP referral or not to go to the specialist[10], and that the probability that the patient first chooses to visit the GP, denoted λ, is common knowledge[11]. If we denote α the probability to visit the GP given that the illness is of a common type, and β the probability to visit the GP given that the illness is of a special type, then $\lambda = \alpha p + \beta(1 - p)$. We can then define the probability q of a common type illness given that the GP is visited first as $q = \alpha p / \lambda$[12]. These probabilities depend crucially on whether the GP's referral is compulsory or not for visiting a specialist. If it is compulsory, then $\alpha = \beta = 1$, and so $\lambda = 1$ and $q = p$. If the GP's referral is only facultative, then assuming reasonably that $\beta \leq \alpha$, we have $\beta \leq \alpha \leq 1$, $\lambda \leq 1$ and $p \leq q$.

If the patient's choice is to visit the specialist (K=SP), the game ends because we assume that the specialist is enabled to treat any kind of illness and that the patient is then cured with probability one.

If the patient's choice is to visit the GP (K=GP), then in stage 4, the GP exerts some level of effort, $e \in [1/2, 1]$, while performing the diagnosis. This effort yields a signal about the illness type to the GP: $m_d \in \{\underline{m}_d, \overline{m}_d\}$, which coincides with the true illness type m with some increasing probability on effort. For simplicity, we assume

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[9] Horn, Sharkley and Gassaway (1996) report from the Managed Care Outcomes Project, that among 12.997 patients with at least one of the five most common illnesses, about 77% suffered from a condition classified as either light, normal, or needing some diagnostic test, and about 22% from a condition classified as either heavy and needing study, or catastrophic and requiring hospitalisation.

[10] This choice may depend on many other things such as the incentives faced by the patients through their insurance contract (See Garcia Mariñoso), their symptom, or their individual preference for either type of provider. In order to focus on the GP's gatekeeper role, we decided to take all these things as given so as to consider the patient's choice as exogenous.

[11] If we consider a group of patients instead of one patient, the parameter λ can be interpreted as the (observable) proportion of patients going first to the GP.

[12] The parameter q could as well be interpreted as the proportion of patients suffering from a common illness among the patients visiting the GP.

that $\Pr(\underline{m}_d | \underline{m} \cap GP) = \Pr(\overline{m}_d | \overline{m} \cap GP) = e$. The GP bears the cost of effort, designated $v(e) = (e - 1/2)^2 / 2$.

Moreover, the GP also knows by experience what is the likelihood q that the patient she is seeing has a minor condition (or the share of $\underline{m}$ types in his practice). The GP combines this piece of information with the diagnosis outcome to decide in stage 6 whether to treat the patient or alternatively, to refer him to a specialist. If the patient recovers his health, that is, if he receives an adequate treatment, the game ends. Otherwise[13], the patient suffers the health loss valued l by the insurer, and is referred to the specialist in stage 7.

We solve the game by backwards induction. For notational clarity, we will use the following notation:

$X=qB-(2q-1)S$, $z=(1-q)l+qh$, and $m(y)=Min\{y; 1/2\}$.

3. The GP's Problem

3.1. Referral Decision

The GP faces a sample of patients composed of q patients of type $\underline{m}$ and 1-q patients of type $\overline{m}$. She combines the information on the likelihood of the patient being an $\underline{m}$- or $\overline{m}$-type with her diagnosis outcome to update her belief on the true state of nature m. If the GP uses a bayesian updating rule, she correctly diagnoses a common illness with probability:

$$\Pr(\underline{m} | \underline{m}_d \cap GP) = \frac{q.e}{q.e + (1-q).(1-e)} \qquad \text{(and } \Pr(\overline{m} | \underline{m}_d \cap GP) = 1 - \Pr(\underline{m} | \underline{m}_d \cap GP)\text{)},$$

and she correctly diagnoses a special illness with probability:

[13] That is, if the patient actually suffers from an illness of the special type and has been treated by the GP.

$\Pr(\overline{m}|\overline{m}_d \cap GP) = \dfrac{(1-q).e}{q.(1-e)+(1-q).e}$ (and $\Pr(\underline{m}|\overline{m}_d \cap GP) = 1 - \Pr(\overline{m}|\overline{m}_d \cap GP)$),

(See Appendix 1).

We now detail the different decisions the GP can adopt, once effort has been exerted and the diagnosis outcome has been disclosed. Referring the patient to the specialist will result in a payment for the GP of *D*+*S*, while keeping the patient for treatment will pay the GP the capitation component *D* and with some probability the bonus *B*. The GP earns this latter bonus only if the patient will not need ultimately to be referred to the specialist, that is, if the true illness condition of the patient is common. Therefore, the probability to earn *B* is $\Pr(\underline{m}|\underline{m}_d \cap GP)$ if the GP's signal is $\underline{m}_d$, and $\Pr(\underline{m}|\overline{m}_d \cap GP)$ if the signal is $\overline{m}_d$.

Comparing this payment with the payment achieved when the patient is immediately referred, we obtain that:

If $m_d = \underline{m}_d$, then the GP prefers to refer whenever $S \geq \dfrac{q.e}{q.e+(1-q).(1-e)} B$.

If $m_d = \overline{m}_d$, then the GP prefers to refer whenever $S \geq \dfrac{(1-q).e}{q.(1-e)+(1-q).e} B$.

Using the fact that $1/2 \leq e \leq 1$, we conclude that:

Lemma 1. *Referral choice (summary).*

* *If $S \geq B$, the GP refers the patient, whatever her signal and level of effort are.*

* *If $B \geq S \geq qB$ and $e \leq (1-q)S/X$, the GP refers the patient whatever her signal is, but if $e \geq (1-q)S/X$, she refers the patient only when her signal is $\overline{m}_d$.*

* *If $qB \geq S$ and $e \leq q(B-S)/X$, the GP does not refer the patient whatever her signal is, but if $e \geq q(B-S)/X$, she refers the patient only when her signal is $\overline{m}_d$.*

Note first that, for all cases, if the effort exerted by the GP is low (or below a certain threshold), then the decision to treat or refer does not depend on the outcome of the diagnosis she has performed. This is, the GP will refer or treat the patient, regardless of diagnosis and only considering the values of B and S.

The bonus B is a gain for the GP when she rightly does not refer (this is, when she makes the right guess of a common illness which happens with probability q). S is a gain for the GP whenever she refers a patient immediately (whatever her guess and the patient's true condition are). In consequence, B and S drive the GP behaviour in different directions: while S/B increases, referring the patient becomes more profitable than treating him. Indeed, S/B determines the preference between keeping or referring patients and results in the three regimes which are made manifest in Lemma 1.

This behaviour implies that before effort is exerted, the GP anticipates that she might follow two strategies with respect to the information acquired during diagnosis. These are: (1) To condition the referral decision to the information gained during diagnosis: a "most adequate" referral strategy, (2) not to condition the decision on the information gained during diagnosis: a blind strategy. In this latter case, the GP can either systematically provide treatment, whatever the diagnosis outcome indicates: a "keep all" strategy or systematically refer the patient to the hospital, whatever the diagnosis indicates: a "send all" strategy[14]. These referral practices determine the effort the GP chooses, and ultimately the patient's expected health loss, *EL*, the public insurer's expected costs, *EC*, and the GP's expected utility, *EU* (see Appendix 2 for the derivation of *EL, EC* and *EU* under each of the above mentioned strategies).

3.2. Diagnosis

We begin this section by mentioning a special feature of the blind referral strategies. If the GP adopts either of these, neither the GP's expected payment, nor the patient's expected health loss, nor the public insurer's expected costs depend on the GP's diagnosis effort, since the GP's referral decision is independent on the information she acquires during diagnosis. Therefore, it is always optimal for the GP

[14] Subscripts a, k and s will refer to each of these strategies.

to exert the lowest effort, be it contractible or not. This is why we describe these strategies as “blind treatment strategies”. Hence the following lemma:

Lemma 2. *GP's effort under a blind strategy.*

Under blind referral strategies, the optimal diagnosis effort is minimal: $e_s = e_k = 1/2$.

This lowest level of effort maximises the GP's expected utility, given the constraints that make either of the blind strategies optimal in the next stage (see Lemma 1). In particular, if $S \geq B$, $e_s = e_k = 1/2$ is the solution to $_{\{e\}} Max\left\{EU_s\right\}$. If $B \geq S \geq qB$, it is the solution to $_{\{e\}} Max\left\{EU_s\right\}$ *s.t.* $e \leq (1-q)S / X$. If $qB \geq S$, it is the solution to $_{\{e\}} Max\left\{EU_k\right\}$ *s.t.* $e \leq q(B-S) / X$. The GP's expected utility evaluated at this lowest level of effort is then $EU_s = \lambda\,(D+S)$, with the "send all" strategy, and $EU_k = \lambda\,(D+qB)$, with the "keep all" strategy.

On the other hand, when $B \geq S$ and $e \geq (X + |S - qB|) / 2X$, the GP adopts the most adequate referral strategy (i.e. referring only if her signal is $\overline{m}_d$, see Lemma 1). In that case, she exerts a level of effort e_a which is the solution to $_{\{e\}} Max\left\{EU_a\right\}$ *s.t.* $e \geq (X + |S - qB|) / 2X$:

$$e_a = \begin{cases} (X + |S - qB|) / 2X & if \quad 2X^2 \leq |S - qB| \\ m(X) + 1/2 & if \quad 2X^2 \geq |S - qB| \end{cases}$$

The GP's expected utility evaluated at this level of effort is:

$$EU_a = \begin{cases} \dfrac{\lambda}{2}\left\{2D + S + qB + |S - qB| - \left((S - qB)/2X\right)^2\right\} & if \quad 2X^2 \leq |S - qB| \\ \lambda\left\{D + qS + X\left(m(X) + 1/2\right) - \left(m(X)\right)^2 / 2\right\} & if \quad 2X^2 \geq |S - qB| \end{cases}$$

In order to know under which condition the GP exerts an effort e_a, e_k, or e_s, we compare her expected utility under each referral strategy and evaluated at the corresponding optimal effort. We then conclude with the following lemma:

Lemma 3. *GP's problem (summary).*

(i) *If* $m(X).(1-\ m(X)) \geq\ 2q(B\text{-}S)$, *the GP refers the patient, whatever her signal is, exerting the lowest level of effort and her expected utility is* $EU_s = \lambda\ (D+S)$.

(ii) *If* $m(X).(1-\ m(X)) \leq\ 2\ Min\{\ q(B\text{-}S);\ (1\text{-}q)S\ \}$ *and* $B \geq\ S$, *the GP refers the patient only when her signal is* $\overline{m}_d$, *exerting a level of effort* $e_a = X+1/2$, *and her expected utility is* $EU_a = \lambda\left\{D + qS + X\left(m(X)+1/2\right) - \left(m(X)\right)^2/2\right\}$

(iii) *If* $m(X).(1-\ m(X)) \geq\ 2(1\text{-}q)S$, *the GP does not refer the patient, whatever her signal is, exerting the lowest level of effort and her expected utility is* $EU_k = \lambda(D+qB)$.

When the GP adopts the most adequate referral strategy, her optimal effort is increasing in B and decreasing in S (see Lemma 3, (ii)). The rationale behind this dependence is that the likelihood of right diagnosis is increasing in effort (see appendix 1). Since B is a gain for the GP whenever she rightly diagnoses a common illness, it is earned more frequently as effort increases from illnesses of the common type, a proportion q of the GP's sample. The bonus S is earned whenever the GP diagnoses a special illness, be it rightly or wrongly. As effort increases, it is earned more frequently from illnesses of the special type and less frequently from illnesses of the common type. Therefore, S acts an incentive for effort for the special type illnesses, a proportion $1\text{-}q$ of the GP's sample. It also acts as a disincentive for effort for the common type illnesses. If the GP's sample were balanced the two effects would cancel and effort would be independent on S. However, as $q>1\text{-}q$ (since $q \geq p \geq 2/3$), the second effect dominates and the overall effect of S on effort is negative.

However, the incentive power of B is limited because of the following. If B is too high relatively to S, then not referring the patient is more profitable to the GP than referring him, to the point that the GP would systematically first treat the patient by herself, whatever the diagnosis outcome is. This is reflected in the case (iii) of Lemma

3, with the effort being at its lowest level as we have now a blind strategy. The case (i) in Lemma 3 refers to another incentive problem of the bonus S (apart from disincentivating effort): if S is too high with respect to B, the GP would systematically refer the patient, whatever her signal about the illness type is. Her effort would therefore be at its lowest level.

4. The Insurer's Problem

4.1. Contract Design

We first characterise the optimal GP's contract in a first best situation, that is, with no asymmetric information between the public insurer and the GP about the GP's effort and the diagnosis outcome. This first best contract minimises the insurer's expected costs and valuation of the patient's health loss. The only constraint it must satisfy is the participation constraint, ensuring that the GP accepts the contract in stage 2: $EU \geq w$. Since no other constraint matter, the participation constraint binds at the optimum since both the insurer's expected costs and the GP's expected utility are increasing in the expected GP's payment. Hence the following lemma:

Lemma 4. *First Best contract design.*

When the insurer wants the GP

* *to refer the patient whatever her signal is, any contract* (D, B, S) *such that* $D+S= w/\lambda$ *is an optimal contract, with* $e= 1/2$. *The insurer's objective function is* $(EC+EL)_s= h+w$.

* *to refer the patient only when her signal is* $\overline{m}_d$, *any contract* (D, B, S) *such that* $D+qS+ m(X).e - v(e)= w/\lambda$ *is an optimal contract, with* $e= 1/2+ m(z)$. *The insurer's objective function is* $(EC+EL)_a= h+w+\lambda\, m(z).(1- m(z)) / 2 - \lambda\, qh$.

* *not to refer the patient whatever her signal is, any contract* (D, B, S) *such that* $D+qB= w/\lambda$ *is an optimal contract, with* $e= 1/2$. *The insurer's objective function is* $(EC+EL)_k= h+w+\lambda\,\{(1-q)l - qh\}$.

This first best solution not only serves as a benchmark. It also shows what can be attained with asymmetric information on effort and diagnosis outcome, if the GP has little negotiation power in the sense that she cannot impose any wealth constraint. This would be a case of moral hazard with a risk neutral agent (the GP) and no wealth (or limited liability) constraint. It can be shown that there exist some contracts inducing the same level of effort as in the first best case, and hence the same expected insurer's costs, patient's health loss and GP's utility.

As an example, suppose that the insurer wants the GP to refer the patient only when her signal is $\overline{m}_d$. Then the optimal contract must satisfy the GP's incentive compatibility constraint[15]. Take for example the contract (D, B, S) with $D = (w/\lambda) - (3-q) / 8(1-q)$, $B = 1 / 4q(1-q)$ and $S = 1 / 4(1-q)$. This contract satisfies the incentive compatibility constraints in Lemma 3(ii). From Lemma 3(ii), we find the optimal effort for the GP: $e_a = 1$, and the resulting GP's expected utility: $EU=w$. The insurer's objective function is then $(EC+EL)_a = h+w - \lambda\,(qh - 1/8)$. This contract is first best since it gives the GP exactly her reservation utility and it induces the first best level of effort (see Lemma 4). As it is typical with a risk neutral agent, we reach the first best solution because there is no problem of risk provision, and any kind of incentive can then be provided. In particular, for the contract to be first best, we need a very low payment in the worst contingency: $\lambda D < w$.

A first best contract cannot be a solution anymore when the GP has negotiation power and can impose the contract to give her at least the same utility as from w in any contingency, and in particular in the worst contingency: $\lambda D \geq w$. As is it clear from Lemma 3, the capitation payment D has no incentive power at all while it is a cost for the insurer. Therefore, in a second best contract, this payment D will always be set at its lowest level, as stated in the next lemma.

[15] That is, the constraints ensuring that the GP refers the patient only when her signal is $\overline{m}_d$ (see (ii) in Lemma 3).

Lemma 5. *Second Best contract design (Capitation Payment).*

The Second Best capitation payment is such that the wealth constraint binds: $D= w/\lambda$.

Considering the blind treatment strategies, we know from Lemma 1 that the GP's referral decisions are always independent on the diagnosis outcome, and hence her effort is the lowest one no matter the bonuses in the contract (Lemma 2). Therefore, if the public insurer wants the GP to adopt one blind strategy, it is better for him to economise on the GP's bonuses, provided that the GP has an incentive to adopt any of these blind strategy (see Lemma 3). The following lemma gives the optimal bonuses for any of the blind strategies.

Lemma 6. *Second Best contract design* (*Blind strategies*).

When the insurer wants the GP either to refer the patient whatever her signal is, or not to refer the patient whatever her signal is, the optimal contract is characterised by $B=S=0$. *The GP exerts the lowest level of effort:* $e= 1/2$, *and the insurer's objective function is* $(EC+EL)_s= h+w$ *or* $(EC+EL)_k= h+w+ \lambda\{(1-q)l - qh\}$, *respectively.*

Considering the most adequate strategy, the bonuses now matter both for determining the level of effort and for providing the GP with incentives to adopt this strategy, following the incentive compatibility constraints in Lemma 3(ii). The following proposition provides us with the optimal incentive provision through bonuses in that case.

Proposition 1. *Second Best contract design* (*Incentive provision*).

When the insurer wants the GP to refer the patient only when her signal is $\overline{m}_d$, *the optimal contract is characterised by:*

* $B= S= 0$ *if* $z \leq (4-3q) / 4(1-q)$. *The GP exerts the lowest level of effort:* $e= 1/2$, *and the insurer's objective function is* $(EC+EL)_a= h+w+\lambda \{(1-q)l - qh\} / 2$.

* $B= (4-3q) / 8q(1-q)$ *and* $S= 1 / 8(1-q)$ *if* $z \geq (4-3q) / 4(1-q)$. *The GP exerts the highest level of effort:* $e= 1$, *and the insurer's objective function is* $(EC+EL)_a= h+w+\lambda (4-3q) / 8(1-q) - \lambda qh$.

Proof. See Appendix 3.

Notice that the optimal contract is characterised by positive bonuses only when the specialist costs as well as the patient's expected loss (both summarised in z) are high enough. This happens because providing the GP with incentives through bonuses is costly for the insurer. Indeed, with these positive bonuses and because of the wealth constraint, the GP's expected utility is strictly higher than her reservation utility: $EU_a = w + \lambda(3 - 2q) / 8(1 - q) > w$, meaning that the GP earns an informational rent. This is costly for the insurer, and it is worthwhile only when the specialist costs as well as the patient's expected loss are high enough.

In that case where it is worth giving incentives to the GP, the optimal incentive provision requires a positive bonus S, even though this bonus acts as a disincentive for effort. Still, any lower bonus S would make the GP go for a treat all blind strategy. Therefore, the incentive constraint in Lemma 3(iii) that matters (and binds, see appendix 3) is the one ensuring that the GP has no incentive to adopt the treat all blind strategy.

4.2. Contract Choice

The former subsection provides us, for both the first best and the second best situation, three optimal contracts, depending on whether the insurer prefers one or another referral strategy. To complete the analysis, the following lemma presents the conditions under which the insurer prefers either of the referral strategies (and hence offers the corresponding optimal contract and induces the corresponding level of effort).

Lemma 7. *Insurer's Choice.*

The insurer prefers the GP to adopt

* *the send all strategy, when* $m(z).(1- m(z)) \geq 2\, qh$, *in the first best, and when* $qh \leq Min\{ (1-q)l; (4-3q) / 8(1-q) \}$, *in the second best.*

* *the most adequate strategy, when* $m(z)(1- m(z)) \leq 2Min\{qh; (1-q)l \}$, *in the first best, and when* $(4-3q) / 8(1-q) \leq Min\{ (1-q)l; qh \}$, *in the second best.*

* *the keep all strategy, when* $m(z)(1-m(z)) \geq 2(1-q)l$, *in the first best, and when* $(1-q)l \leq Min\{ qh; (4-3q) / 8(1-q) \}$, *in the second best.*

Proof. Straightforward from Lemmas 4 and 6 and from Proposition 1.

The conditions presented in the former lemma are very intuitive (see Figure 1 for a graphical representation of these conditions in the second best case). To summarise, they state that it is worth incentivating the GP to adopt the most adequate treatment strategy, when both the specialist costs and the patient's health loss are high. If instead the specialist costs are low, then the insurer is better off with a blind send all strategy since it economises on the GP's expected costs (the GP does not need to be compensated for any effort and she does not earn any informational rent). It also economises on the patient's expected loss, since the patient is always cured with probability one when he receives specialised care, while the specialist costs do not heavily increase the insurer's costs. On the contrary, when the patient's health loss is low, then the insurer is better off with a blind treat all strategy. Again it economises on the GP's payment. It also allows to limit the specialist costs to the very necessary cases, while the patient does not suffer much from delaying a specialised treatment if necessary.

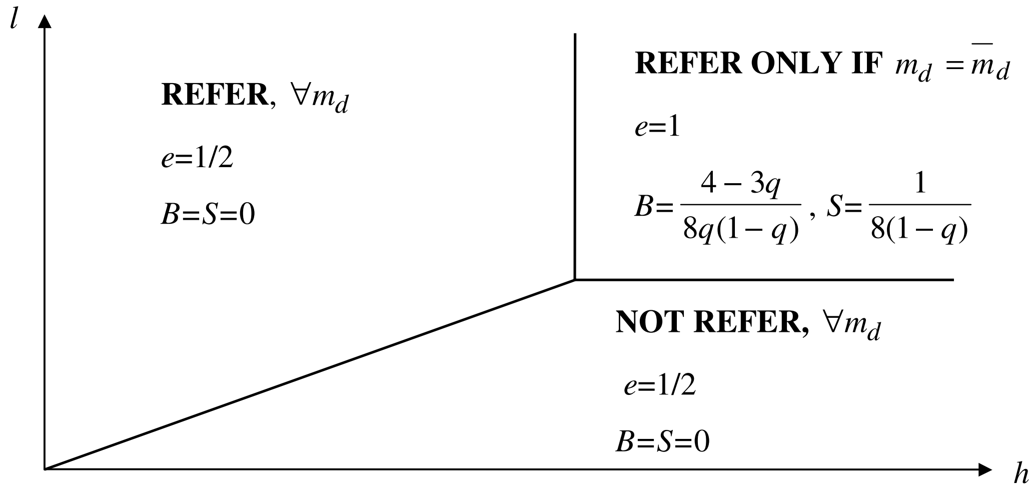

Figure 1

5. Compulsory or Facultative Referral?

In this section, we focus on the comparison between the facultative and the compulsory referral systems, in the cases where the GP's incentives matter, that is, when the insurer wants the GP to adopt the most adequate strategy. For a more complete comparison in the second best case, see Figure 2.

Crucial for this comparison is the fact that the proportion of GP's patients actually needing primary care only, q, is higher when the referral is facultative ($q \geq p$), than when it is compulsory ($q=p$). Also important is the fact that the GP's sample of patients, λ, is lower when the referral is facultative ($\lambda \leq 1$) than when it is compulsory ($\lambda=1$).

For the insurer, what matter are the patient's expected health loss and the expected costs consisting in specialists costs and GP's payment. The later can be discomposed in reservation wage (w), effort compensation ($\lambda.v(e)$), and informational rent ($IR_a = EU_a - w$). Suppose for the argument simplicity that $z \geq 1/2$ so as to have as first best effort the same as the second best one (e_a=1). Therefore, the expected health loss is zero (EL_a=0), the expected specialist costs are $(1-\lambda q).h$, and the effort compensation is $\lambda.v(e_a)=\lambda / 8$.

In a first best situation, the GP earns no informational rent as her participation constraint always binds. Therefore, the comparison between having a compulsory or a facultative referral only relies upon the expected specialist costs and the GP's effort compensation. The expected specialist costs are higher if the referral is facultative since a proportion of patients directly visit the specialist without needing it. The GP's effort compensation is higher if the referral is compulsory as the GP must exert effort for diagnosing more patients. Therefore, if the specialist costs are low enough ($h < \underline{h} = (1-\lambda) / 8(p-\lambda q)$), the insurer will prefer the referral to be facultative as the unnecessary visits to the specialist are not too costly. For higher levels of specialist costs, the insurer rather prefers the referral to be compulsory.[16]

In the second best case, the GP earns a positive informational rent: $IR_a = \lambda\,(3-2q) / 8(1-q)$. Whether this informational rent is higher when the referral is compulsory or facultative is not determined. Two opposite effects are at work here. First, it is increasing in the proportion (or probability) of patients visiting the GP, λ. As the GP sees more patients when the referral is compulsory, she earns the bonuses more often.

Second, the informational rent per patient is higher when the referral is facultative because both bonuses are higher. Indeed, the probability of earning the bonus B while exerting the lowest effort ($\Pr(\underline{m} | \underline{m}_d \cap GP) = q$ when e=1/2) is higher when the referral is facultative because a higher proportion of patients actually need primary care only. Therefore, the temptation to systematically not refer the patient is higher. To avoid this systematic behaviour, we need a bonus S higher than when the referral is compulsory. To understand why, recall that the incentive constraint that matters (and binds) is precisely the one ensuring no keep all strategy (see Lemma 3(ii)): $m(x).(1-m(x)) = 2.(1-q)S$. For a given bonus B, S must be higher when the referral is facultative as the proportion q is higher. Indeed, at this incentive constraint, we have:

$$\frac{\partial S}{\partial q} = \begin{cases} \dfrac{(1-2X)B + 4XS}{1-2(2q-1)X} & when \quad X \leq 1/2 \\ \dfrac{1}{8(1-q)^2} & when \quad X \geq 1/2 \end{cases} \qquad \geq 0.$$

That explains why the optimal bonus for the most adequate strategy $S = 1 / 8(1-q)^2$ (in Proposition 1) is increasing in q.

We also know that the bonus S acts as a disincentive for effort, and even more when the referral is facultative as the proportion q is higher: $\delta e_a / \delta S = -(2q-1) < 0$

[16] Having $m(z).(1-m(z)) = 1/4 \leq 2.Min\{qh, (1-q)l\}$ for the most adequate strategy to be optimal in the first best, allows for the specialist cost h to be above or below $\underline{h}$.

(see Lemma 3(ii)). Therefore, to compensate this negative effect on effort, we need a higher bonus B too: B = (4-3q) / 8q(1-q) (see Proposition 1), increasing in q.

Overall, the GP's informational rent is an additional cost for the insurer, whenever the referral is compulsory or facultative. From Lemma 7, we know that the insurer is worth paying this cost only if the specialist costs are high enough: $h \geq (4\text{-}3q) / 8q(1\text{-}q)$. For such high levels of specialist costs, the insurer always prefers the referral to be compulsory since the unnecessary visits to the specialist are too costly.

The following lemma summarises this comparison between compulsory and facultative referral:

Proposition 2. *Compulsory or facultative referral?*

When the most adequate strategy is optimal:

In the first best situation, the insurer prefers the referral to be either compulsory or facultative, depending on the parameters configuration.

In the second best situation, the insurer always prefers the referral to be compulsory.

Proof. Straightforward from Proposition 1, and Lemmas 1, 4, 7 and 8.

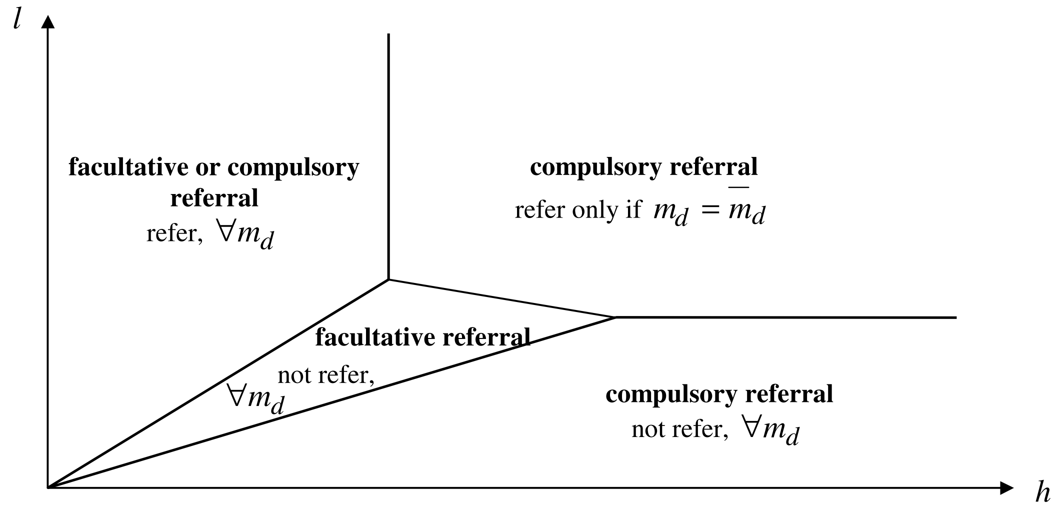

Figure 2

6. Conclusion

The first aim of this paper has been to derive an optimal payment contract for a GP, taking account for her incentives with regard to her role of filter towards specialised care. We show that at least two tools are needed to give the right incentives to the GP. First, the GP must be rewarded when she does not refer the patient to the specialist. This gives her an incentive to do her best while diagnosing the patient because she gets this reward only when she correctly diagnoses an illness that does not need specialised care. Second, the GP must be rewarded too when she immediately refers the patient to the specialist. This second reward does not help in having a better diagnosis since it is earned whenever her diagnosis is correct or not. The function of this reward is rather to prevent the GP to systematically not refer the patient, taking advantage of the probability to have the first reward.

The second aim of the paper is to use this optimal contract to compare a system where a GP's referral is compulsory for the patient to access to specialised health care, with another where it is only facultative. We show that the GP's per patient payment is higher when the referral is facultative because it is more difficult to give her incentives. Indeed, when the referral is facultative, the patients partially self-select themselves so that the proportion of GP's patients needing primary care only is higher. The GP's temptation to systematically not refer is then higher and we must offer her a higher reward for immediately referring to prevent this temptation.

Furthermore, the main trade-off underlying the comparison between compulsory and facultative referral is the following. A system with compulsory referral allows to save on specialist costs and on the GP's per patient payment. A system with facultative referral allows to pay the GP less often as a smaller proportion of patients visit her. Thus, when the specialist costs are high, a system with compulsory referral results in lower overall insurer costs. However, when the specialist costs are lower, it is not even worthwhile to give incentives to the GP to do her best, because the incentive provision is costly for the insurer. Therefore, whenever the incentive provision matter, the insurer prefers the GP's referral to be compulsory.

Our conclusion about the superiority of the compulsory referral system raises one question about the Spanish health system, among others. We observe the coexistence of both compulsory referral in the public health sector and facultative referral in the private health sector. Is the private sector doing bad in Spain? Or does the facultative referral simply act as a tool for attracting potential patients in a rather competitive insurance market? Further research is needed to answer this question, with a model where insurance companies are competing for potential patients.

Another useful research would consist of adapting our analysis to a case where the GPs themselves are competing for patients, to account for the French and German situations.

References

1.- Demsky, J.S. and Sappington, D.E.M., 1987, "Delegated Expertise", *Journal of Accounting Research*, 25, 1, pp.68-89.

2.- Garcia Mariñoso, B., 1998, "Optimal Access to Hospitalised Attention from Primary Health Care", mimeo.

3.- Gaynor, M., 1994, "Issues in the Industrial Organisation of the market for Physician Services", *Journal of Economic Management and Strategy*, 3, pp.211-255.

4.- Horn S.D., Sharkey P.D., and Gassaway J., 1996, "Managed Care Outcomes Project: Study design, baseline patient characteristics, and outcome measures", *Am J Man Care* 1996, 2, pp.237-247.

5.- Jelovac, I., 1998, "Physicians' Payment Contracts, Treatment Decisions and Diagnosis Accuracy", mimeo Universitat Autonoma de Barcelona.

6.- Ma, C.t.A., 1994, "Health Care Payment Systems: Cost and Quality Incentives", *Journal of Economics Management and Strategy*, 3, pp.93-112.

7.- NERA, "El Sistema Sanitario Español: Alternativas para su Reforma", Madrid, 1997.

8.- Pita Barros, P., 1995, "Technology Levels and Efficiency in Health Care", Working Paper n. 264, Universidade Nova de Lisboa.

9.- Wolinsky, A., 1993, "Competition in a Market for Informed Experts Services", *Rand Journal of Economics*, 24, pp.380-398.

Appendix 1

In general:

$$\Pr(m \cap GP) = \Pr(GP).\Pr(m|GP) = \lambda \Pr(m|GP).$$

$$\Pr(m \cap m_d \cap GP) = \Pr(m \cap GP).\Pr(m_d|m \cap GP) = \lambda \Pr(m|GP).\Pr(m_d|m \cap GP).$$

$$\begin{aligned}\Pr(m_d \cap GP) &= \Pr(\underline{m} \cap m \cap GP) + \Pr(\overline{m} \cap m \cap GP) \\ &= \lambda \Pr(\underline{m}|GP).\Pr(m_d|\underline{m} \cap GP) + \lambda \Pr(\overline{m}|GP).\Pr(m_d|\overline{m} \cap GP).\end{aligned}$$

$$\Pr(m|m_d \cap GP) = \frac{\Pr(m \cap m_d \cap GP)}{\Pr(m_d \cap GP)} = \frac{\Pr(m|GP).\Pr(m_d|m \cap GP)}{q.\Pr(m_d|\underline{m} \cap GP) + (1-q).\Pr(m_d|\overline{m} \cap GP)}.$$

Therefore:

$$\Pr(\underline{m}|\underline{m}_d \cap GP) = \frac{q.e}{q.e + (1-q).(1-e)}; \qquad \Pr(\overline{m}|\underline{m}_d \cap GP) = \frac{(1-q).(1-e)}{q.e + (1-q).(1-e)};$$

$$\Pr(\underline{m}|\overline{m}_d \cap GP) = \frac{q.(1-e)}{q.(1-e) + (1-q).e}; \qquad \Pr(\overline{m}|\overline{m}_d \cap GP) = \frac{(1-q).e}{q.(1-e) + (1-q).e}.$$

Appendix 2.

$$EL_a = \Pr(\underline{m}_d \cap GP).\Pr(\overline{m}|\underline{m}_d \cap GP).l = \lambda(1-q).(1-e).l;$$

$$\begin{aligned}EC_a &= \Pr(GP).D + \Pr(\underline{m}_d \cap GP).\Pr(\underline{m}|\underline{m}_d \cap GP).B + \Pr(\overline{m}_d \cap GP).S \\ &\quad + \left\{\Pr(SP) + \Pr(\overline{m}_d \cap GP) + \Pr(\underline{m}_d \cap GP).\Pr(\overline{m}|\underline{m}_d \cap GP)\right\}h \\ &= h + \lambda\left\{D + qS + (X - qh)e\right\};\end{aligned}$$

$$\begin{aligned}EU_a &= \Pr(GP).(D - v(e)) + \Pr(\underline{m}_d \cap GP).\Pr(\underline{m}|\underline{m}_d \cap GP).B + \Pr(\overline{m}_d \cap GP).S \\ &= \lambda\left\{D + qS + Xe - (e - 1/2)^2/2\right\};\end{aligned}$$

$$\begin{aligned}EL_k &= \left\{\Pr(\overline{m}_d \cap GP).\Pr(\overline{m}|\overline{m}_d \cap GP) + \Pr(\underline{m}_d \cap GP).\Pr(\overline{m}|\underline{m}_d \cap GP)\right\}.l \\ &= \lambda(1-q).l;\end{aligned}$$

$$EC_k = \Pr(GP).D + \left\{\Pr(\overline{m}_d \cap GP)\Pr(\underline{m}|\overline{m}_d \cap GP) + \Pr(\underline{m}_d \cap GP).\Pr(\underline{m}|\underline{m}_d \cap GP)\right\}.B$$
$$+ \left\{\Pr(SP) + \Pr(\overline{m}_d \cap GP).\Pr(\overline{m}|\overline{m}_d \cap GP) + \Pr(\underline{m}_d \cap GP).\Pr(\overline{m}|\underline{m}_d \cap GP)\right\}h$$
$$= h + \lambda\left\{D + qB - qh\right\};$$

$$EU_k = \Pr(GP).(D - v(e))$$
$$+ \left\{\Pr(\overline{m}_d \cap GP)\Pr(\underline{m}|\overline{m}_d \cap GP) + \Pr(\underline{m}_d \cap GP).\Pr(\underline{m}|\underline{m}_d \cap GP)\right\}.B$$
$$= \lambda\left\{D + qB - (e - 1/2)^2/2\right\};$$

$$EL_s = 0;$$

$$EC_s = \Pr(GP).(D + S) + h = h + \lambda\{D + S\};$$

$$EU_s = \Pr(GP).(D + S - v(e)) = \lambda\left\{D + S - (e - 1/2)^2/2\right\}.$$

Appendix 3. Proof of Proposition 1.

When the contract design is submitted to the GP's wealth constraint and we consider the GP referring the patient only if her signal is $\overline{m}_d$, then the optimal GP's payment contract is the solution to:

$$\underset{\{B,S\}}{Min}\left\{h + w + \lambda\left[qS + (1-q)l + (X - z)(m(X) + 1/2)\right]\right\}$$
$$s.t. \quad \begin{cases} B \geq S \geq 0 \\ m(X).(1 - m(X)) \leq 2.\,Min\left\{q(B - S); (1-q)S\right\} \\ X = qB - (2q - 1)S. \end{cases}$$

Consider first the case where $X \geq 1/2$. Then, $m(X)= 1/2$, and the insurer's program can be rewritten as:

$$\underset{\{X,S\}}{Min}\left\{h + w + \lambda\left[qS + (1-q)l + X - z\right]\right\} \quad s.t. \quad \begin{cases} X \geq 0 \\ X - 1/8 \geq (1-q)S \geq 1/8. \end{cases}$$

The objective function is increasing in both X and S. Therefore, the optimal X and S are the lowest one such that the constraints hold: $X= 1/2$ and $S= 1/8(1-q)$. The insurer's objective function is then:

$$(EC+EL)_1 = h + w + \lambda\left(\frac{4-3q}{8(1-q)} - qh\right).$$

Consider now the case where $X \leq 1/2$. Then, $m(X) = X$, and the insurer's program can be rewritten as:

$$\underset{\{X,S\}}{Min}\left\{h + w + \frac{\lambda}{2}\left[(1-q)l - qh\right] + \lambda\left[qS + X^2 - zX + X/2)\right]\right\}$$

$$s.t.\quad \begin{cases} 1/2 \geq X \geq (1-q)S \geq 0 \\ X(1-X) \leq 2(1-q)S \leq X(1+X). \end{cases}$$

The objective function is increasing in S. Therefore, the optimal S is the lowest one such that the constraints hold: either $S = 0$, or $S = X.(1+X) / 2(1-q)$.

If $S = 0$, then $X = 0$, otherwise the constraints could not hold together. The insurer's objective function would then be: $(EC+EL)_0 = h+w+\lambda\ \{(1-q)l - qh\} / 2$.

If $S = X.(1+X) / 2(1-q)$, then the constraint $X.(1-X) \leq 2(1-q)S$ is always satisfied since $X.(1+X) \geq X.(1-X),\ \forall X$; the other constraints reduce to $0 \leq X \leq 1/2$, and the program can be rewritten as:

$$\underset{\{X\}}{Min}\left\{h + w + \frac{\lambda}{2}\left[(1-q)l - qh\right] + \lambda\left[\frac{X}{2(1-q)} - \frac{3q-2}{2(1-q)}X^2 - zX\right]\right\}$$

$$s.t.\quad 0 \leq X \leq 1/2.$$

The insurer's objective function is then concave in X: $\dfrac{\partial^2 EC_m}{\partial X^2} = -\lambda\dfrac{3q-2}{1-q} < 0.$

Therefore, it reaches its minimum either at $X = 0$ or at $X = 1/2$. Both candidates have already been considered above.

Comparing $(EC+EL)_0$ with $(EC+EL)_1$, and solving for B and e as functions of X and S, we find the optimum described in Proposition 1.

QED

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