

Abstract

In this paper we discuss the interest of applying differential co-payment rates across alternative medical treatments. Two treatment strategies are considered : a “long term strategy” in which patients apply preventive measures before knowing if they have the disease and an “emergency strategy” where patients are treated on contraction of the disease. We show that the second approach should be more generously subsidized by the regulator.

In countries which rely mainly upon public funds to finance health care, identical co-payment rates are often applied to a variety of medical activities to restrain public spending. For instance, the co-payment rate for visits to specialists (in ophtalmology, cardiology, internal medicine and so on) may be uniformly raised from e.g. 20 to 30 per-cent in the hope of containing the increase in health expenditures for the social security system.

While obvious administrative reasons may justify uniform co-payment rates (or uniform increases in them), the purpose of this paper is to show that there are also good economic reasons for differentiating co-payment rates according to the nature of the medical activity (as is the case in other fields of government interventions).

To illustrate our point of view we consider a group of patients who face the risk of suffering from a single disease during a given period. The idiosyncratic probability that each patient will get the disease is known, at least to him while the distribution of these probabilities in the population is public knowledge. To fight the disease two mutually exclusive¹ medical strategies are available :

- either patients are regularly treated from the very beginning of the period. We refer to this strategy as “long term treatment” (L.T.T.) ;
- or nothing is done pro-actively and patients are treated “in emergency” when a medical accident reveals during the period that they have the disease. This is the “emergency strategy” (E.S.).

Our objective in this paper is to show that in accordance with well known results in public finance (see e.g. Atkinson A.B. and J. Stiglitz (1980)), it is appropriate to differentiate the co-payment rate of the treatments (i.e. one minus the public subsidy rate granted according to the medical strategy). We show besides that the emergency treatment should be more generously subsidized than the L.T.T.

To reach this objective, the paper is organized as follows. In section 1 we present the model and its notation. Section 2 is devoted to individual choices that are influenced both by the medical conditions and the co-payment rates applied to each medical strategy as well as the level of taxes needed to finance the subsidies.

In section 3 we compare the first best solution of the problem to a “laissez-faire” one. Section 4 is devoted to a “second-best” approach. It is in this section that we prove our main result about the optimal co-payment rates. We end up with a short conclusion and perspectives for future research.

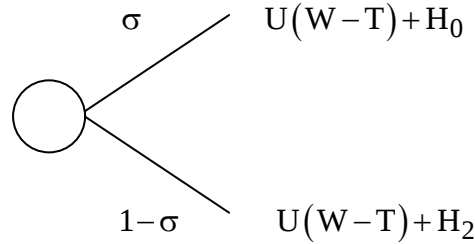
¹ They are mutually exclusive for each patient. However globally one strategy may be applied to a group of patients and the other strategy to another group.

SECTION 1 : THE MODEL

We consider a population of patients with identical additive utility functions $U(W) + H$ where $U(W)$ is an increasing and concave function in final wealth and H is the final health state. These patients are also endowed with the same initial wealth. The only difference between them is the probability (σ) of developing a given disease during the period.

At the beginning of the period, nobody knows who will become sick : only the probability that each patient becomes sick during the period is known, at least to him. The distribution of the probabilities of disease is public knowledge and it is represented by a density function $f(\sigma)$ with cumulative distribution $F(\sigma)$.

If someone becomes sick without receiving treatment his health state is denoted H_0 while full health (absence of disease and of treatment) implies of course a higher level of H , denoted H_2 with $H_2 > H_0$. In summary the lottery faced by a patient who does not get any treatment is represented by :



where $W - T$ is initial wealth (W) net of taxes (T).

If at the beginning of the period the patient chooses the long term treatment (L.T.T.) he modifies the lottery he faces. While σ is unchanged by this strategy, the net financial and medical outcomes are modified. The net cost of the strategy for the patient is $(1-s)C$ where C is the cost of L.T.T. and where $(1-s)$ is the co-payment rate (so that s is the subsidy rate determined by the regulator). As far as its medical efficiency is concerned the long term treatment improves the health state of sick people by b (with $H_0 + b < H_2$) and it does not deteriorate the health state of patients who do not become sick.

The other available medical strategy corresponds to emergency medicine (E.T.). When it is adopted no treatment is initiated at the beginning of the period but if the disease occurs during the period, an emergency treatment is used. Its net cost to the patient is $(1-\tilde{s})\tilde{C}$ where $(1-\tilde{s})$ is the co-payment rate applied to this treatment and $\tilde{C}$ is the cost of E.T.. As is natural we assume that $\tilde{C} \geq C$ and that the emergency treatment is medically less efficient than the

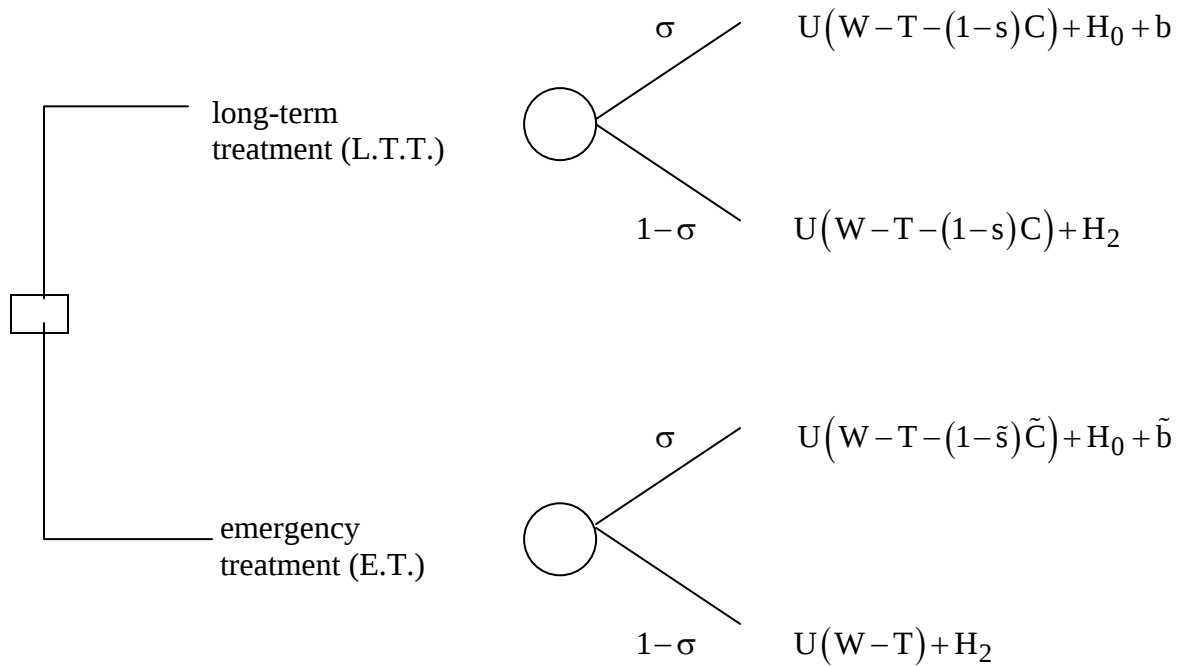
long term one. Indeed a sick patient who receives the emergency treatment (E.T.) benefits from a health state $H_0 + \tilde{b} \leq H_0 + b$ where $\tilde{b}$ is the medical benefit of E.T. for a sick patient.

Of course if we want that sick patients (who are not under L.T.T.) adopt the emergency treatment, we need :

$$U(W - T - (1 - \tilde{s})\tilde{C}) + H_0 + \tilde{b} > U(W - T) + H_0 \quad (1.1)$$

We assume that this condition is always satisfied even when $\tilde{s} = 0$, i.e. under “laissez-faire”.

The choice between the two treatments may now be represented by a decision-tree :



Before looking at individual choices it is worth pointing out that the E.T. strategy is not dominated by the L.T.T. one despite the fact that it is medically less efficient ($\tilde{b} < b$) and more costly ($\tilde{C} > C$). Indeed the emergency treatment has an “informational” advantage : since it is applied ex-post when the true state of the world is revealed it is given only to sick people. On the contrary, the long-term treatment is used as well for sick people as for healthy ones. As a result its lower cost per patient ($C \leq \tilde{C}$) and its better performance ($b > \tilde{b}$) is compensated for by the fact that it is applied to a larger population.

SECTION 2 : INDIVIDUAL CHOICES

At the beginning of the period a patient who is informed only about the probability (σ) that he will develop the disease must decide to adopt or not the long-term treatment. Of course the higher σ the more attractive to him the long-term treatment. In fact there exists a probability threshold $\hat{\sigma}$ such that the patient is indifferent between the two alternatives described in the decision tree. Formally $\hat{\sigma}$ is solution of :

$$U(W - T - (1-s)C) + \hat{\sigma}(H_0 + b) = \hat{\sigma} U(W - T - (1-\tilde{s})\tilde{C}) + (1-\hat{\sigma})U(W - T) + \hat{\sigma}(H_0 + \tilde{b}) \quad (2.1)$$

Patients for whom σ exceed $\hat{\sigma}$ turn to the long term treatment while others “wait” and use the emergency treatment later on in case of need.

It is easy to determine how $\hat{\sigma}$ is influenced by the decisions of the regulator about the variables he controls (s , $\tilde{s}$ and T). Implicit differentiation of (2.1) yields :

$$\frac{d\hat{\sigma}}{ds} = \frac{-CU'(B)}{-D} < 0 \quad (2.2)$$

$$\frac{d\hat{\sigma}}{d\tilde{s}} = \frac{\hat{\sigma}\tilde{C}U'(\tilde{B})}{-D} > 0 \quad (2.3)$$

$$\frac{d\hat{\sigma}}{dT} = \frac{U'(B) - \hat{\sigma}U'(\tilde{B}) - (1-\hat{\sigma})U'(A)}{-D} \underset{<}{=} 0 \quad (2.4)$$

where

$$A \equiv W - T$$

$$B \equiv W - T - (1-s)C$$

$$\tilde{B} \equiv W - T - (1-\tilde{s})\tilde{C}$$

$$D \equiv U(B) - U(A) - (H_0 + b) + (H_0 + \tilde{b}) < 0$$

$$\equiv U(B) - U(A) + \tilde{b} - b < 0$$

In accordance with intuition (2.2) and (2.3) indicate that if a treatment is more generously subsidized it will be more often adopted by patients. For instance if emergency medicine is better subsidized, $\hat{\sigma}$ increases so that more patients decide not to use the long-term treatment. Among these patients some of them will become sick and will need the emergency treatment.

The impact of T on $\hat{\sigma}$ is sign ambiguous essentially because the wealth effect is itself sign-ambiguous.

SECTION 3 : THE “FIRST-BEST” AND “LAISSEZ-FAIRE” SOLUTIONS

Before turning to the optimal selection of s , $\tilde{s}$ and T by the regulator in the next section, we first compare a “first-best” solution to a “laissez-faire” one.

If the regulator adopts a “laissez-faire” (L.F.) approach, he implicitly chooses $s = \tilde{s} = T = 0$ and simply observes individual choices. In contrast, in a first-best solution (F.B.) the regulator observes σ and thus can determine some threshold for σ above which patients are forced to take – free of charge – the long-term treatment. Below the threshold patients are denied L.T.T. and are referred to the emergency treatment – again free of charge – in case of need². The program is financed by a uniform lump-sum tax T levied on all patients at the beginning of the period.

These two programs are analyzed in turn and are then compared for a specific case.

3.a. The “laissez-faire” solution (L.F.)

In this case, the choice of individual patients is determined as in eq.(2.1) with $T = s = \tilde{s} = 0$. Hence the threshold probability at which patients are indifferent between each possible decision ($\hat{\sigma}_{LF}$) is solution of :

$$\hat{\sigma}_{LF}U(W - \tilde{C}) + (1 - \hat{\sigma}_{LF})U(W) - U(W - C) = \hat{\sigma}_{LF}[b - \tilde{b}] \quad (3.1)$$

The left hand side (L.H.S.) of (3.1) represents the expected utility of final wealth gained by adopting the E.T. rather than the L.T.T. strategy. The right hand side (R.H.S.) of (3.1) is the expected loss of health state if E.T. is used instead of L.T.T. Of course at the threshold probability the expected gain is equal to the expected loss.

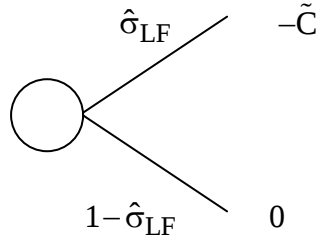
Once $\hat{\sigma}_{LF}$ is obtained the proportion of patients who use the L.T.T. is simply equal to $1 - F(\hat{\sigma}_{LF})$ while $\int_0^{\hat{\sigma}_{LF}} \sigma dF(\sigma)$ patients will need the E.T. later on.

Using the concept of risk premium, (3.1) can also be written as :

$$U(W - \hat{\sigma}_{LF}\tilde{C} - \pi) - U(W - C) = \hat{\sigma}_{LF}(b - \tilde{b}) \quad (3.1')$$

where π is the risk premium associated with the following lottery :

² Of course we exclude by assumption the case where no treatment at all would be efficient.



Because the R.H.S. (right hand side) of (3.1') is necessarily non negative one has:

$$\hat{\sigma}_{LF}\tilde{C} + \pi \leq C$$

so that
$$\hat{\sigma}_{LF} \leq \frac{C - \pi}{\tilde{C}} < \frac{C}{\tilde{C}} \quad (3.2)$$

a result that will be used later on.

3.b. The first-best solution

In this environment the regulator is assumed to be utilitarian and to know the value of σ for each individual so that he can determine who receives L.T.T. which is offered free of charge. Patients who do not have the L.T.T. and who become sick get the E.T. also free of charge. The program is financed by a lump-sum tax T on each individual in order to cover the treatment costs. Formally one has :

$$\text{Max}_{\hat{\sigma}} U(W - T) + (H_0 + \tilde{b}) \int_0^{\hat{\sigma}} \sigma dF(\sigma) + (H_0 + b) \int_{\hat{\sigma}}^1 \sigma dF(\sigma) + (1 - \bar{\sigma})(H_2) \quad (3.3)$$

$$\text{s.t.} \quad T = \tilde{C} \int_0^{\hat{\sigma}} \sigma f(\sigma) d\sigma + C[1 - F(\hat{\sigma})]$$

where $\bar{\sigma}$ is the average value of σ .

The first-order condition (F.O.C.) associated with this program is :

$$(C - \hat{\sigma}_{FB}\tilde{C})U'(W - T) = \hat{\sigma}_{FB}(b - \tilde{b}) \quad (3.4)$$

where $\hat{\sigma}_{FB}$ is the treatment threshold for the first-best solution. Because it avails upon perfect information, the regulator can directly use this threshold to allocate patients across the two treatments. This condition means that the net welfare cost of a further patient allocated to L.T.T. is at the optimum equal to his expected improvement in health state.

The second order condition for a maximum is easily checked and notice again that because the R.H.S. of (3.4) is non negative, one also has a natural upper-bound for $\hat{\sigma}_{FB}$ which is :

$$\hat{\sigma}_{FB} \leq \frac{C}{\tilde{C}}$$

While (3.1') and (3.4) have rather similar structures it is pretty obvious that in general $\hat{\sigma}_{LF}$ and $\hat{\sigma}_{FB}$ cannot be compared, essentially because they are influenced by different and independent parameters. The threshold under L.F. ($\hat{\sigma}_{LF}$) depends upon patients' risk aversion through π and is not at all dependent upon the distribution of σ in the population. On the contrary, under the first-best solution, $\hat{\sigma}_{FB}$ critically depends upon that distribution because T is linked to it through the budget constraint.

Although $\hat{\sigma}_{LF}$ and $\hat{\sigma}_{FB}$ cannot be compared in general, we now turn to a specific situation where the comparison can be made.

3.c. A specific case

When L.T.T. and E.T. have the same medical benefit ($\tilde{b} = b$) an easy comparison between $\hat{\sigma}_{LF}$ and $\hat{\sigma}_{FB}$ emerges. In this case indeed the right hand side of (3.1') becomes equal to zero so that :

$$\hat{\sigma}_{LF} = \frac{C - \pi}{\tilde{C}} \quad (3.5)$$

while (3.4) yields :

$$\hat{\sigma}_{FB} = \frac{C}{\tilde{C}} \quad (3.5')$$

As a result – and contrarily to a widespread belief – more patients adopt the L.T.T. under the laissez-faire solution than under the first-best one. However the reason for the result is easily understood. When $b = \tilde{b}$ the regulator who adopts the first-best solution is indifferent between the two treatments from a medical point of view and he tries to minimize the T value that permits every sick patient to reach a health level $H_0 + b = H_0 + \tilde{b}$. This minimization of T is obtained when $\hat{\sigma}_{FB} = \frac{C}{\tilde{C}}$ i.e. when the marginal cost of obtaining the benefit $b = \tilde{b}$ for one sick patient is the same under each strategy⁴. In the “laissez-faire” however, risk averse individual patients – at equal medical benefit – have a propensity to favor L.T.T. because it generates a known cost C as opposed to the random one induced by E.T. Hence they use L.T.T. more often than what would be observed in the first-best solution.

³ Notice that if the patient were very risk averse $\hat{\sigma}_{LF}$ might be very close to zero.

⁴ Indeed, to obtain $b = \tilde{b}$ for one sick patient with E.T., the marginal cost is $\tilde{C}$. However to obtain $b = \tilde{b}$ for one sick patient with L.T.T. this strategy has to be applied to $\frac{1}{\hat{\sigma}}$ patients inducing a cost equal to $\frac{C}{\hat{\sigma}}$.

SECTION 4 : THE “SECOND-BEST” APPROACH AND ITS PROPERTIES

In a second best environment, treatment decisions are left to the patient but they are influenced by the regulator through his choice of $\tilde{s}$, s and T ⁵. The regulator selects these control variables in order to maximize the sum of individual utilities under a global budget restraint. Formally, one has :

$$\begin{aligned} \text{Max}_{T, s, \tilde{s}, \lambda} Z = & \int_0^{\hat{\sigma}} \left\{ \sigma \left[U(W - T - (1 - \tilde{s})\tilde{C}) + (H_0 + \tilde{b}) \right] \right. \\ & + (1 - \sigma) \left[U(W - T) + (H_2) \right] \Big\} dF(\sigma) \\ & + \int_{\hat{\sigma}}^1 \left\{ U(W - T - (1 - s)C) + \sigma(H_0 + b) + (1 - \sigma)(H_2) \right\} dF(\sigma) \\ & + \lambda \left(T - \tilde{s} \tilde{C} \int_0^{\hat{\sigma}} \sigma dF(\sigma) - sC(1 - F(\hat{\sigma})) \right) \end{aligned} \quad (4.1)$$

where λ is the Lagrange multiplier associated with the budget constraint and where $\hat{\sigma}$ is defined as in (2.1).

Assuming interior solutions the F.O.C. associated to the program are :

$$\frac{\partial Z}{\partial T} = 0 : E[U'] = \lambda \left[1 - \tilde{s} \tilde{C} \hat{\sigma} f(\hat{\sigma}) \frac{d\hat{\sigma}}{dT} + s C f(\hat{\sigma}) \frac{d\hat{\sigma}}{dT} \right] \quad (4.1')$$

$$\frac{\partial Z}{\partial s} = 0 : CU'(W - T - (1 - s)C)(1 - F(\hat{\sigma})) = \lambda \left[C(1 - F(\hat{\sigma})) + (\tilde{s} \hat{\sigma} \tilde{C} - sC) f(\hat{\sigma}) \frac{d\hat{\sigma}}{ds} \right] \quad (4.1'')$$

$$\frac{\partial Z}{\partial \tilde{s}} = 0 : \tilde{C} U'(W - T - (1 - \tilde{s})\tilde{C}) \int_0^{\hat{\sigma}} \sigma dF(\sigma) = \lambda \left[\tilde{C} \int_0^{\hat{\sigma}} \sigma dF(\hat{\sigma}) + (\tilde{s} \hat{\sigma} \tilde{C} - sC) f(\hat{\sigma}) \frac{d\hat{\sigma}}{d\tilde{s}} \right] \quad (4.1''')$$

$$\frac{\partial Z}{\partial \lambda} = 0 : T = \tilde{s} \tilde{C} \int_0^{\hat{\sigma}} \sigma dF(\sigma) - sC(1 - F(\hat{\sigma})) \quad (4.1^{iv})$$

These F.O.C. deserve a careful interpretation. Consider first (4.1''). When s is increased ceteris paribus there is on the L.H.S. the gain in utility for all the patients who use the long term treatment. This number of patients is $1 - F(\hat{\sigma})$ and the per patient gain in utility is

⁵ As correctly observed by Byrne M. and P. Thompson [2001] in a slightly different but quite related context, “the use of subsidies or financial incentives in health is not a new idea, although there are few economic models outside of the insurance literature”. Besides the few exceptions quoted by the authors, let us mention a very stimulating paper by F. Breyer (1982).

measured by $CU'(W - T - (1-s)C)$. The marginal cost of raising s is represented by the R.H.S. of (4.1''). Quite naturally it is made of $C(1-F(\hat{\sigma}))$ which is the direct cost for the regulator of raising s . However the increase in s has another (indirect) effect on the budget restraint which is captured by $(\tilde{s}\hat{\sigma}\tilde{C} - sC)f(\hat{\sigma})\frac{d\hat{\sigma}}{ds}$. When s is increased more patients decide to get the long-term treatment. Their number is given by $f(\hat{\sigma})$ at the margin and they each cost sC to the regulator. Besides note that among these newcomers to the L.T. treatment a fraction $\hat{\sigma}$ would have needed the emergency treatment if s had not been raised. Hence the increase in s generates an indirect saving for the regulator which amounts to $\tilde{s}\hat{\sigma}\tilde{C}f(\hat{\sigma})$.

A similar interpretation applies to (4.1''').

The additional public spending associated with the marginal cost of raising s or $\tilde{s}$ is weighted by λ that stands for the marginal cost of public funds expressed in terms of social welfare. From (4.1') λ can be written as:

$$\lambda = E[U'] \cdot \frac{1}{1 - (\hat{\sigma}\tilde{s}\tilde{C} - sC)f(\hat{\sigma}) \cdot \frac{d\hat{\sigma}}{dT}}$$

If T had no effect on $\hat{\sigma}$ the marginal cost of public funds would simply be equal to $E[U']$, the expected marginal utility of wealth.

Although they do not lend themselves to an easy comparative statics exercise⁶, these F.O.C. already reveal some important features of the optimal co-payment rates. In fact it can be proven that it is never optimal to equate the co-payment rates and that systematically $\tilde{s}^*$ should exceed s^* .

The proof is made in steps.

(1) When $s = \tilde{s}$, $\tilde{s}\hat{\sigma}\tilde{C} - sC$ is negative. This result – which will be very important in step 2 – is easily obtained. Indeed rewrite (2.1) by using the concept of the risk premium, i.e. :

$$U(W - T - (1-\tilde{s})\tilde{C}\hat{\sigma} - \pi) - U(W - T - (1-s)C) = \hat{\sigma}((H_0 + b) - (H_0 + \tilde{b})). \quad (4.2)$$

Because the right hand side of (4.2) is non negative one has : $(1-\tilde{s})\tilde{C}\hat{\sigma} + \pi < (1-s)C$, which becomes : $(1-s)\tilde{C}\hat{\sigma} + \pi < (1-s)C$ when $s = \tilde{s}$.

Dividing by $(1-s)$ on each side and using the fact that π is positive yields the result.

⁶ The S.O.C. for a maximum are not easily checked since they involve the slope of the density function $f(\sigma)$ which can be of any sign.

(2) Consider now the regulator's optimality condition with respect to s and $\tilde{s}$ ((4.1'') and (4.1''')) for any pre-determined T . After obvious manipulations they become :

$$\frac{U'(W - T - (1-s)C)}{U'(W - T - (1-\tilde{s})\tilde{C})} = \frac{1 + \frac{(\tilde{s}\hat{\sigma}\tilde{C} - sC)}{C(1-F(\hat{\sigma}))} f(\hat{\sigma}) \frac{d\hat{\sigma}}{ds}}{1 + \frac{(\tilde{s}\hat{\sigma}\tilde{C} - sC)}{\tilde{C} \int_0^{\hat{\sigma}} \sigma dF(\sigma)} f(\hat{\sigma}) \frac{d\hat{\sigma}}{d\tilde{s}}} \quad (4.3)$$

Now if $s = \tilde{s}$ observe that:

- (i) the ratio on the left hand side of (4.3) is surely smaller than unity. Indeed when $s = \tilde{s}$ and given $\tilde{C} > C$:

$$W - T - (1-s)C > W - T - (1-s)\tilde{C}$$

Then because of risk aversion $U'(W - T - (1-s)C)$ is smaller than $U'(W - T - (1-s)\tilde{C})$;

- (ii) the ratio on the right hand side of (4.3) is larger than unity. Indeed at $s = \tilde{s}$ we know that $\tilde{s}\hat{\sigma}\tilde{C} - sC$ is negative. Using the results in (2.2) and (2.3) about the opposite signs of $\frac{d\hat{\sigma}}{ds}$ and $\frac{d\hat{\sigma}}{d\tilde{s}}$, one easily finds that the numerator on the right hand side of (4.3) is larger than unity while the denominator is smaller than unity.

Since the L.H.S. of (4.3) is smaller than unity at $s = \tilde{s}$ while the reverse holds for the R.H.S. obviously $s = \tilde{s}$ cannot be an optimal solution for any predetermined T value.

This result is central for the paper since it clearly shows that the second best optimum cannot be reached when there is no differentiation in the co-payment rates.

(3) To satisfy (4.3) as an equality for any given T , two strategies are possible :

- either increase s and decrease $\tilde{s}$;
- or decrease s and increase $\tilde{s}$.

If the first strategy is chosen it is obvious that an equality cannot be obtained. Indeed the increase in s lowers the numerator on the L.H.S. while the decrease in $\tilde{s}$ increases the denominator. Hence the L.H.S. of (4.3) remains surely smaller than unity. Besides from (2.2) and (2.3) the first strategy reduces $\hat{\sigma}$ so that $\tilde{s}\hat{\sigma}\tilde{C} - sC$ is more negative than before implying that the R.H.S. remains larger than unity.

Notice that the second strategy ($\Delta s < 0$ and $\Delta \tilde{s} > 0$) starting from $s = \tilde{s}$ induces a movement in the right direction to obtain the optimality condition in (4.3). Hence at any level of T , including the optimal one, one necessarily has :

$$s^* < \tilde{s}^*$$

which means that the co-payment rate for the emergency medicine should be smaller than for the long-term one.

This result may look surprising at first glance. Indeed because it is medically more efficient ($b \geq \tilde{b}$) and less costly ($C \leq \tilde{C}$) one might think that L.T.T. should be encouraged by a more generous subsidy rate. This is not so however essentially because the subsidy rates act as a form of insurance for the patients. Since insurance is a very appropriate way to protect against catastrophic risks (small probability and large potential losses, see Eeckhoudt and Gollier (1999)) and because emergency medicine has precisely these features (it is used by patients with low probabilities of sickness who may have to face a large cost (loss) if they do become sick) it is not surprising that an utilitarian regulator will transfer resources towards the patients who need insurance most. This is done here through a more generous subsidy of the emergency medicine.

CONCLUSION

This paper is only a first step in the analysis of the optimal co-payment rate for different medical activities.

Indeed some specific assumptions have been made and they might be changed in further research to check for the robustness of the conclusion. Let us briefly mention a few ones;

- (i) rather than using an additive utility function of wealth and health, one might instead consider interactions between wealth and health in the determination of the utility level ;
- (ii) we have compared in this paper two forms of curative medicine (E.T. versus L.T.T.). One might instead analyze the links between the subsidy to curative medicine and that to either diagnostic or preventive medicine ;
- (iii) we have assumed throughout the paper that the regulator uses the same objective function as each individual. However, in the field of health, the regulator might stress other objectives such as a better equity level between the health status of patients ;
- (iv) the only form of heterogeneity discussed here is related to the probability of disease. Of course in reality disparities in wealth are also important not only because wealth influences the treatment choices but also because it is likely to be correlated with the probability of disease.

Whatever the model adopted however the case seems strong in favor of less uniformity in the co-payment rates.

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