

# Does insurance make us blind?

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## Abstract

How the variation of insurance coverage and the insurance regime can affect the consumer's search behavior of the healthcare price ? Here, the effort is defined by the consumer's search behavior. Without insurance, the effort is optimal and we show that the presence of insurance market deteriorates this level of effort that corresponds to the moral hazard phenomenon. In France, 64 % of individuals declare they do not know the price of the use of healthcare. The overall expenditure is affected by the moral hazard and the adverse selection depending on organization forms of the health insurance market. With a voluntary insurance market, the *high-risk* can be the only type to have access to the healthcare depending on the trade-off between the volume (quantity of demand) and the price decided by the supplier. Therefore, we show that the moral hazard and adverse selection phenomena lead to an increase of the overall expenditure under a compulsory insurance system and may lead to a decrease under a voluntary one.

## 1 Introduction

To be insured against a damage allows for smoothing the expenditure related to this damage. The more individuals have an insurance coverage, the smaller is the possibility that the disaster implies a shock on their wealth (or the income). The extreme case being the full coverage where the overall expenditure related to the disaster is completely refunded. The presence of insurance market may modifies the consumer's behavior. When his behavior modified the occurrence of the damage, we talk about *ex ante* moral hazard (Arrow, 1963 ; Grossman and Hart, 1983) but the agent's behavior can also be modified after the realisation of the damage, that correspond to the *ex post* moral hazard.

In this paper, we are concerned by the effect of insurance on the search behavior of a consumer in a healthcare market where the costs of the healthcare is covered by insurance and consequences on health expenditures. Without insurance, the search behavior of a consumer is optimal. The presence of insurance modifies this search behavior that corresponds to the concept of *ex post* moral hazard. The pioneer paper is the Stigler's model (1961). In our paper as Hall, Lippman and McCall (1979) or Dionne (1984), the searcher maximizes the expected utility of wealth instead of minimizing the expected price net of search costs. However, as Fombaron and Milcent (2005), we distinguish the costs of the damage and the monetary evaluation of the discomfort due to the damage. Moreover, we consider no cost of search. The agent has just to ask the provider to know

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the price. Without presence of insurance or for a medication not reimbursed, the price is always known by the agent because the agent has to pay for the healthcare. With a full insurance coverage, agents being fully reimbursed whatever the damage cost, they do not undergo the financial shock related to the disaster. Therefore, they have no incentive to provide any effort of search. Agents could have no idea of the healthcare price. In France, 64 % of individuals declare they do not ask the price of the use of healthcare (visit to the doctor, price of medication and so on).<sup>1</sup>

We propose to study this problem considering four types of insurance system: a voluntary versus compulsory system and a monopolistic without discrimination system versus a competitive with discrimination one. For sake of simplicity, the former is named a public insurance system and the latter one, a private insurance system.

For sake of simplicity, we assume that the probability of damage is exogeneous. To illustrate our model, we propose to consider the context of health insurance. However, our results go way beyond the field of health economic. This model could be applied to a large number of economic fields as automobile insurance, housing insurance, life insurance or even unemployment insurance on labour market and so on.

In this context, the cost of the damage is the healthcare price noted  $P$ . The monetary evaluation of the discomfort due to the illness is  $D$ . The probability of illness is exogeneous while the probability of consuming is endogeneous. The individual decision to consume depends on his insurance contract. So, the insurance contract plays on the probability of consuming. Moreover, insurers do not observe this probability when the contract is offered.

We consider two types of agent. High risks denoted  $H$  have a higher probability to have the illness than the low risks denoted  $L$ . The probability of illness of the  $i$  - *type* is  $p_i$ .

Therefore, our approach may be interpreted as a model of adverse selection and moral hazard.

In the second section, we present the approach and notations. In the third section, we assess the monetary evaluation of the moral hazard depending on insurance system. Then, in the section 4, we conclude.

## 2 Approach and notations

Here, the effort is defined by the consumer's search behavior of the "real"<sup>2</sup> price.

*Definition of the agent's perception:*

The perception of price noted  $Pe_i(P, e)$  with  $e \in [0; 1]$ , depends on the participation of the  $i$  - *type* and the level of effort  $e$ .<sup>3</sup> For sake of simplicity, we define the perceived healthcare price for a null level of effort  $Pe_i(P, 0)$  noted  $Pe_i$ .

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<sup>1</sup>Enquête santé, INSEE 2002-2003.

<sup>2</sup>"Real" healthcare price by opposition to "perception" of the healthcare price.

<sup>3</sup>Note that in Fombaron and Milcent (2005), the perception of healthcare price is defined for  $e = 0$ .

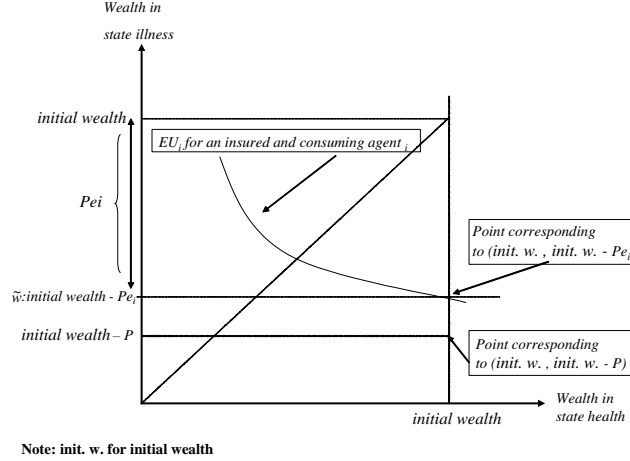


Figure 1

Interpretation of *Figure 1*: The insured and consuming expected utility of an agent  $i$  is defined such as to a wealth in state of health is associated the corresponding level of wealth in state of illness. When the wealth in state of health is equal to the initial wealth, the perceived healthcare price is defined by the difference between the initial wealth and the corresponding level of this wealth in state of illness called  $\tilde{w}$ .

Algebraically,

$$\begin{aligned}
 p_i U(\tilde{w}) + (1 - p_i) U(\text{initial wealth}) &= EU_i \text{ of an insured and consuming agent } i \Leftrightarrow \\
 p_i U(\text{initial wealth} - Pe_i) + (1 - p_i) U(\text{initial wealth}) &= EU_i \text{ of an insured and consuming agent } i \\
 \text{with, initial wealth} &= \begin{cases} w_0 & \text{in voluntary scheme} \\ w_0 - \alpha_i & \text{in compulsory scheme} \end{cases} \quad \forall i = H, L
 \end{aligned}$$

By assumption, the lowest level of perceived healthcare price is for  $e = 0$  and it increases with  $e$  to correspond to the "real" price for  $e = 1$ . For a maximal level of effort  $e = 1$ , the individual perception of the price always corresponds to the "real" price whatever the participation of the agent and the insurance system,

$$Pe_i(P, 1) = P \quad (1)$$

#### *Willingness-to-pay*

The willingness to pay  $P^{c_i}$  of the consumer  $i$  is the maximal price that a consumer accepts to spend for the healthcare *i.e.* the price beyond which the consumer refuses to consume. We assume that the consumer accepts to consume until his perception of the price is equal to his monetary evaluation of her discomfort. Therefore, the willingness to pay  $P^{c_i}$  is defined by

$$Pe_i(P^{c_i}, e) = D, \quad \forall i \in \{H, L\} \quad (2)$$

The consumption of medication is depending on the form of insurance market, the type of the agent and the level of information (Fombaron and Milcent, 2005). Here, the full information does not allow for moral hazard because this information is then a public information, known by all agents. Then, we focus on asymmetric information situation.

Trivially, the consumption of medication of an uninsured agent  $i$  (*i.e.* for  $e = 1$ ) is defined for  $P \leq D$ . Indeed, from equations (1) and (2), we have  $P^{c_i} = D$ . Therefore, for  $P \leq D$ , there is a demand of healthcare for any value of  $P$  that does not depend on the insurance market. On the

contrary, when  $P > D$  the consumption of the medication depends on the insurance system. Only insured agents can have access to the healthcare. The presence of an insurance market creates an imperfection on the healthcare market by allowing for a healthcare sold to a price higher than  $D$ . This imperfection has an effect on the overall healthcare expenditure.

Table 2

Insurance system	Healthcare price when $P > D$	Healthcare demand	
		$H$ - type	$L$ - type
Private Compulsory	$P \leq \frac{D}{1-x_L}$	$p_H N_H$	$p_L N_L$
Private Voluntary	$P \leq P^{C_L}$	$p_H N_H$	$p_L N_L$
	$P^{C_L} < P \leq P^{C_H}$	$p_H N_H$	0
	$P > P^{C_H}$	0	0
Public Compulsory	$P \leq \frac{D}{1-x} \rightarrow \infty$	$p_H N_H$	$p_L N_L$
Public Voluntary	$P \leq P^{C_L}$	$p_H N_H$	$p_L N_L$
	$P^{C_L} < P \leq P^{C_H}$	$p_H N$	0
	$P > P^{C_H}$	0	0

$P^{C_H}$ : WTP defined for a R&S contract

$P^{C_L}$ : WTP defined for a R&S contract

$P^{C_L}_{pooling}$ : WTP defined for a pooling contract

### 3 Extra-cost due to moral hazard

As set up by *Table 2*, the demand of healthcare depends on the insurance market organization for a given healthcare price. This demand is due to the moral hazard allowing to the healthcare price to be higher than the monetary evaluation of the agent discomfort  $D$ . The moral hazard is measured by the difference between the overall cost with insurance market and without one:

- without insurance market, the overall cost of healthcare demand is

$$\mathbb{1}_{P \leq D} \sum_{i=H,L} P p_i N_i \quad \text{with} \quad \mathbb{1}_{P \leq D} = \begin{cases} 1 & \text{if } P \leq D \\ 0 & \text{otherwise} \end{cases}$$

So, the overall cost of healthcare demand is with most equal to  $\sum_{i=H,L} D p_i N_i$

- with insurance market, the overall cost of healthcare demand is for each type  $i$ ,

$$\mathbb{1}_{P \leq P^{C_i}} P p_i N_i \quad \text{with} \quad \mathbb{1}_{P \leq P^{C_i}} = \begin{cases} 1 & \text{if } P \leq P^{C_i} \\ 0 & \text{otherwise} \end{cases}$$

The extra-cost due to the moral hazard is the difference between the overall cost of healthcare demand with insurance market and without one.

1. if  $P \leq D$ , we have  $P \leq P^{C_i}$ . Indeed,  $\forall P^{C_i}, P^{C_i} \geq D$ . So, the extra-cost due to the moral hazard is:

$$\mathbb{1}_{P \leq P^{C_i}} \sum_{i=H,L} P p_i N_i - \mathbb{1}_{P \leq D} \sum_{i=H,L} P p_i N_i = 0$$

The healthcare is not sold to a price higher than the monetary evaluation of the discomfort  $D$  so, the presence of insurance market does not modify the overall healthcare expenditure.

2. if  $P > D$ , the extra-cost due to the moral hazard is:

$$\sum_{i=H,L} \mathbb{1}_{D < P \leq P^{C_i}} P p_i N_i - \sum_{i=H,L} D p_i N_i \quad \text{with} \quad \mathbb{1}_{D < P \leq P^{C_i}} = \begin{cases} 1 & \text{if } P > D \text{ and } P \leq P^{C_i} \\ 0 & \text{otherwise} \end{cases}$$

Different cases appears depending on the insurance regime.

- (a) When the regime is compulsory or  $P \leq P^{C_L}$ , we know that the healthcare price is at most equal to the willingness to pay of the consumer *i.e.*  $P \leq P^{C_i}$ . Therefore,

$$\mathbb{1}_{D < P \leq P^{C_i}} = 1, \forall i$$

So, the effect of the insurance market leads to a global over-cost for both types corresponding to

$$0 < \sum_{i=H,L} P p_i N_i - \sum_{i=H,L} D p_i N_i \leq \sum_{i=H,L} P^{C_L} p_i N_i - \sum_{i=H,L} D p_i N_i$$

- (b) When the regime is voluntary and  $P^{C_L} < P \leq P^{C_H}$ ,

- i. For  $H$  – type agents,

$$\mathbb{1}_{D < P \leq P^{C_H}} P p_H N_H - D p_H N_H$$

with,

$$\begin{aligned} P \leq P^{C_H} &\Rightarrow \mathbb{1}_{D < P \leq P^{C_H}} = 1 \\ &\Rightarrow p_H N_H (P^{C_L} - D) < p_H N_H (P - D) \leq p_H N_H (P^{C_H} - D) \end{aligned}$$

For  $H$  – type agents, the effect of the insurance market leads to a extra-cost.

- ii. For  $L$  – type agents,

$$\mathbb{1}_{D < P \leq P^{C_L}} P p_L N_L - D p_L N_L$$

with,

$$\begin{aligned} P > P^{C_L} &\Rightarrow \mathbb{1}_{D < P \leq P^{C_L}} = 0 \\ &\Rightarrow -D p_L N_L \leq 0 \end{aligned}$$

For  $L$  – type agents, the effect of the insurance market leads to a reduction of the cost.

**Lemma :** The moral hazard and adverse selection can lead to a reduction of the overall cost for the demand of healthcare.

## 4 Conclusion

This paper illustrates the effect of insurance on the search behaviour of a consumer has a direct consequence on health expenditure. Indeed due to the modification of the search behaviour, the healthcare can to be sold at a price higher than the monetary evaluation of the discomfort of the agent that we called moral hazard. We show that the willingness to pay of both types is higher in presence of insurance market than without one. We also show that under a compulsory insurance regime, the modification on the search behaviour leads to an increase of health expenditure. The central result of this paper is that the insurance market may involve a decrease in the demand for healthcare. Indeed under a voluntary regime, the situation is more ambiguous. The willingness to pay depends on the consumer type and it is higher for the  $H$  – type than for the  $L$  – type (Fombaron

and Milcent, 2006). Therefore a healthcare sold to a price higher than the willingness to pay of the  $L - type$  but lower for the  $H - type$  one, leads on one hand to exclude the  $L - type$  consumers to the healthcare market and on the other hand, to increase the benefit of the healthcare supplier on the  $H - type$  consumers. Overall, the effect of the insurance market on healthcare expenditure leads to an increase under a compulsory insurance system and may lead to a decrease under a voluntary one.

This paper highlights the reduction of the health expenditures due to the moral hazard and adverse selection. Moreover, this result is obtained without introducing a non-exogeneity of the healthcare price through a negative relationship between the premium and the level of effort. This decrease of the healthcare demand may also be considered as a public health issue. A percent of agent is excluded from the healthcare market.

## 5 Reference

### References

- [1] Arrow K. (1963), "Uncertainty and the Welfare Economics of Medical Care", *American Economic Review*, 53(5):941-973
- [2] Dionne (1984), "Search and Insurance", *International Economic Review*, Vol 25(2), 357-367
- [3] Grossman S. and Hart O. (1983), "Implicit Contracts Under Asymmetric Information", *Quarterly Journal of Economics*, Vol XCVIII, No. 3, supplement, 123-56
- [4] Fombaron N. and Milcent C. (2005), "Willingness to pay versus price of market: demand for prescription drugs and Insurance", *working paper*
- [5] Hall, J., Lippman S. and McCall J. (1979), "Expected Utility Maximization Job Search", in S.A. Lippman and J.J. McCall, eds., *Studies in the Economics of Search* (New York: N. Holland), 133-156.
- [6] Rothschild M., Stiglitz J.E. (1976), "Equilibrium in Competitive Insurance Markets : An Essay on the Economics of Imperfect Information", *Quarterly Journal of Economics*, 90, 629-649.
- [7] Stigler G. (1961), "The Economics of Information", *Journal of Political Economy*, 69, 213-225.