Prevention of occupational injuries moral hazard and complex agency relationship

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Résumé

Cet article mobilise les résultats de la théorie de l'agence dans l'objectif d'apporter un éclairage nouveau et une grille d'analyse du fonctionnement actuel de la branche accidents du travail et maladies professionnelles de la Sécurité sociale dans sa mission d'incitation à la prévention. Après avoir présenté l'organisation et les particularités de l'assurance des risques professionnels, un premier niveau d'analyse met en évidence la présence d'aléa de moralité dans les relations assureur-entreprise et entreprise-salarié. Un deuxième niveau d'analyse et le recours à des modèles de relations d'agence complexes, modèle multi-tâches et modèle avec tiers, est nécessaire pour prendre en compte l'incidence sur la prévention d'une rémunération indexée sur la productivité ainsi que la présence de superviseurs entre le législateur et l'entreprise.

Abstract

This paper exploits the results of agency theory with the aim of contributing a new viewpoint and a form for analysis of the current functioning of the occupational injury and disease section of the Social Security system in its mission of providing incentives for prevention. After outlining the organization and specific features of insurance against occupational risks, an initial level of analysis highlights the presence of moral hazard in relations between insurer and company and between company and employee. A second level of analysis and resort to complex agency relationship models, multitask model and third-party model, is necessary to take into account the consequences for occupational injury prevention of wage indexing on productivity and the presence of supervisors between the legislator and the company.

Note

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This article deliberately adopts a theoretical approach based on the contribution of contract theory. In this framework, the notion of *moral hazard* is the key concept underlying the analysis set out in this paper. We give here a brief definition of this concept, that the non-specialist reader may supplement by reading Brousseau (1993) or Favereau and Picard (1996).

> Moral hazard is the possibility, for a player in a contractual relationship, having economically rational behaviour and having private information, to use this information asymmetry to take a decision that affects (that he feels improves) his wellbeing. This decision then inversely affects the wellbeing of the second player in the contract.

In this framework, Favereau and Picard (*op. cit.*) observe that the concept of moral hazard implicitly contains "*the refusal – taken to the extreme – to idealize the behaviour of our fellow beings. Opportunism is the law of the human species: if it is in the interest of economic agents to cheat or lie, they will do so. This is not perversity, simply calculation: in this sense, one can speak of realism rather than cynicism*".

In light of these comments, the authors of the present article do not claim to pass a value judgement on the behaviour of the various players mentioned, but simply underline the fact that the system can, by construction, lead to moral hazard opportunities. Due to limitations on the length of this paper and the choice of a moral hazard analysis approach, it is not possible to consider all situations, especially those in which such a hazard is not apparent. This theoretical analysis of the behaviour of the various players in the occupational injury prevention system should not cause the reader to forget that over the last 30 years the number of accidents has been halved and the number of fatal accidents divided by 3 (source: CNAMTS 1999). One can reasonably credit a large part of these results to the various players in the occupational risk prevention system.

Given this, the authors claim merely to shed an economic light on complex situations. The solutions proposed are the answers proposed by economic theory. They can be adopted merely as lines of thought in a field which also includes institutional, organizational, sociological and psychological aspects.

1. INTRODUCTION

It was not until the Act of 30 October 1946 (following on from the creation of the Social Security system in 1945) that the current system of insurance against occupational risks came into being. Its management is entrusted to the Social Security system together with the three other branches, health, retirement and family benefits.

Managed on an equal representation basis, the occupational risks branch covers both compensation, insurance and prevention. It leaves exclusively (and **compulsorily**) up to the employer the financing of coverage of the risks generated

by it, introducing a risk rating system in which the rate of contribution depends, among other variables, on the quantity and severity of occupational injuries and diseases.

The two missions entrusted by the legislator to the occupational risks branch are compensation for job-related injuries (**insurance**) and the reduction at source of the risks incurred by employees in terms of both frequency and severity (**prevention**).

When the risk rating system was set up, the legislator was guided by two major considerations: systematic budget balance and incentives to prevention.

The principle of rating occupational injuries based on the real cost of the injuries incurred means that the cost of their risks can be ascribed to companies and hence the accounts of the branch can be balanced (*a posteriori*), while providing company managers with an incentive to adopt a prevention approach so as to reduce their contributions. While the objective of financial balance is achieved, the numerous changes made to the risk rating principles to avoid creating too heavy a financial burden for small enterprises (in particular by a response involving mutualization of the risks of small enterprises) can have the consequence of greatly attenuating the incentive to prevention.

Occupational risk is therefore a **company** risk (thus introducing a new player relative to the health branch) focused resolutely on **prevention** by introducing financial and regulatory incentives.

While, with fifty years' hindsight regarding risk rating operation, one observes that the objectives have been achieved from a financial viewpoint, the results in terms of incentives to prevention are more mixed. This observation and the specific features of this branch are both arguments justifying the need for theoretical thinking which would enable progress in analysis of the causes and solutions to be proposed faced with this relative failure, and could also enrich the economic thinking and analyses carried out more traditionally on operation of the health coverage system:

1) The insurance of occupational risks is based on a rationale in some ways similar to that of conventional insurance:
   - allowance for the profile of the insured (company size and risk);
   - possible premium negotiations (rebates on contributions);
   - systematic balancing of the budget by readjusting contribution rates each year.
2) The Act of 30 October 1946 places emphasis on the priority of prevention, and all the legal and financial aspects of this Act are formulated to promote occupational safety. This objective is not as clearly stated in the health branch.
3) The presence of an additional player (the company manager) distinguishes the occupational risks branch from the health branch and introduces, among other things, a new and unique dimension in the insurance area: the distinction between the payer (the company) and the beneficiary (the employee).

In this paper, we propose performing this theoretical thinking based on an analysis of the behaviour of each player by exploiting the contributions of agency theory. The aim is, more precisely, to use agency theory and its various developments as a form for reading and interpreting the behaviour of the players and the effects caused by the specific features of the occupational injury insurance system. The analysis of the moral hazard effects specific to the conditions of coverage of occupational injuries will be detailed according to the category of company concerned and based on an analysis of the relations between the various pairs of players involved. Without concealing the organizational, psychological and sociological aspects generally mentioned to explain the limits of the current risk rating system in serving as an incentive to prevention, we shall endeavour to show how opportunistic moral hazard behaviour contributes to this malfunctioning.

After briefly outlining the organization and operation of the occupational risk prevention system in France (§ 2), we shall use the principal-agent model to analyse on an initial level the risk of moral hazard between the company and the insurer on the one hand, and the company and the employee on the other hand (§ 3). The presence of additional players (CHSCT[2], CRAM[3] prevention staff) and the ambiguity of certain work situations involving both an efficiency objective and a safety objective, require, however, going beyond the bilateral principal-agent pattern. The use of complex agency relationships (multi-task and hierarchic) enables finer analysis of the moral hazards going against prevention behaviour (§ 4). We shall propose, when possible, thoughts towards solutions which would make it possible to reduce the presence of moral hazard.

2. PLAYERS AND SPECIFIC FEATURES OF THE OCCUPATIONAL INJURY INSURANCE SYSTEM

2.1. The company, key player in occupational injury insurance

The main players concerned by occupational injury[4], its compensation and its prevention are the employee, the company manager and the supervisory authority (INRS, 2000). In a diagram representing the interactions between these three major

[2] Comité d'Hygiène, de Sécurité et des Conditions de Travail (Health, Safety and Working Conditions Committee)

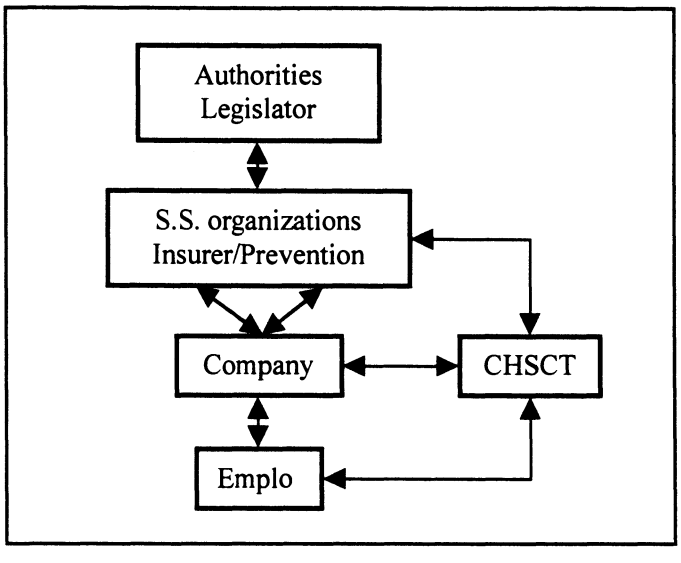
[3] Caisse Régionale d'Assurance Maladie (Regional Health Insurance Find)

[4] By confining our study to an analysis of the financing of occupational injuries and its impact on the behaviour of the players, we leave aside the occupational health branch. The fact of not taking into account the labour inspection and industrial medicine aspects in our analysis is due merely to the desire to adopt a modelling approach which does not enable an exhaustive analysis of all the players entitled to intervene in the prevention area.

players, one should add, when it is compulsory[5], the **CHSCT** that can be positioned in parallel as an interlocutor of the other three players. **The company** is the key player in the system, on which weighs the financial obligation of contribution to the occupational injury and illness insurance system and legal liability for a failing in its obligation of analysis and prevention of the risks sustained by its employees. The supervisory authority is here taken in a very broad sense covering both the legislator, the insurer and the prevention body.

The interactions between the various players considered in this analysis can be summarized by the following Figure 1 which emphasizes the pivotal role of the company within the system:

Figure 1: **Positioning of the prevention players considered**



The legislator has conferred on each of the players rights and obligations (Pluyette, 1997) that can be summarized very briefly:

- The employee has the obligation of complying with the safety instructions and benefits, in particular, from a right of withdrawal in the event of serious, imminent danger.
- The company (legal entity) has the obligation of paying contributions for its occupational injuries, evaluating its risks and applying preventive measures in conjunction with the employees. It can be sued for criminal liability in the event of an accident, for homicide, injury, non-disabling bodily harm or creating danger for others. In the event of an inexcusable or intentional fault, the employer can, beyond the legal entity, also be recognized as liable on his (her) personal assets (fine, imprisonment) for the consequences of the fault.

[5] I.e., for companies with more than 50 employees.

- The CHSCT, which is theoretically present in all companies having more than 50 employees[6], ensures compliance with the legislative and regulatory stipulations relating to health, safety and working conditions in the company, performs risk analysis and an enquiry into each accident that occurs. It assists the company manager in working out a prevention policy.
- The insurer (risk rating department of the CNAM and of the CRAMs in the occupational risks branch) collects information on all the healthcare and compensation expenditures attributable to companies under the general insurance system and establishes *a posteriori*, based on these expenses, the amount of contributions assigned to each company.
- The prevention agent (prevention department of the CRAMs in the occupational risks branch) has a twofold role of control and advice. It invites each employer to take any justified prevention measure and, in the event of a serious failing, can adopt financial sanctions (it can, after a court order, increase its rate of contribution up to a proportional factor equal to two) and legislative sanctions (via the labour inspector for safety aspects). It highlights hazardous situations and advises the company in putting in place preventive measures (it is invited to each CHSCT meeting for its portfolio of companies).

2.2. Occupational risk insurance versus health insurance: an additional player and a strong prevention orientation

There are many differences between these two branches of the Social Security system. We shall therefore confine ourselves to a description of the features necessary to illustrate moral hazard phenomena and complex agency relationships.

The presence of an additional player, the company, introduces a system with four players different from the health coverage system (conventionally represented by the health insurance/doctor/patient trinomial). Moreover, and this is a unique situation in the insurance area, the payer (company) is distinct from the beneficiary (employee), so that the behaviour of the latter inevitably has immediate consequences on the former.

The second specific feature lies in the major prevention incentive component put in place by the legislator via risk rating, regulations and the tools available to the prevention agents.

Risk rating (managed by the insurer, see § 2.1.) is based on *a posteriori* calculation of the cost of risk of each company, i.e. charging to each company the cost of the accidents for which it is rendered liable (INRS, 1999). Each accident is reported and gives rise to payment of compensation. This compensation is then charged to the company's employer account (increased by coefficients representing the expenses not assigned to a company in particular, such as travel injuries,

[6] The coverage rate is estimated at 70% (Monteau, 1998)

occupational diseases and accidents successfully disputed by the company). The company is left with the possibility of disputing the job-related origin of the accident, on condition it provide proof for its appeal.

Compulsory, individualized and calculated *a posteriori* from proven accidents, occupational injury insurance can no longer legitimately claim to act as insurer (excepting the coefficients which mutualize non-allocatable expenses). Since the company pays (with a time lag of two years and payment staggered over three years) the exact cost of its accidents, the insurance no longer provides the service of coverage against injury by distribution of the individual risk and mutualization of risks among the insured members. The term of company "treasurer" for occupational injuries would be more appropriate. It is legitimate to think that it is therefore entirely in the interest of large firms to develop a policy of prevention of occupational injuries for which in the end they bear all the costs.

This real-cost system applied to firms with more than 200 employees cannot, however, be applied to small enterprises without endangering their financial survival (for a death the company can be "billed" FF3,600,000[7]). The legislator has therefore grouped together companies with less than 10 employees in a given sector of activity, by assigning to them a collective rate calculated on the basis of all their compensation applications. This system therefore introduces a veritable mutualization of financing of occupational injuries among the small enterprises in each of these groups. It can therefore be assumed that the prevention incentive effect via risk rating will be attenuated, in the sense that the benefit of the prevention efforts made by a company would be distributed among all companies in its sector of activity.

For a company whose size is in between these two limits, its combined rate will be obtained by weighting (on the criterion of number of employees) between its collective rate and its real rate.

The assumption, for small enterprises, of a weak incentive to prevention via risk rating reinforces the need for regulatory measures and for making available to the prevention agents incentive resources of a financial nature (prevention contract to finance a project, rebate on contribution or on the contrary additional contribution after court order).

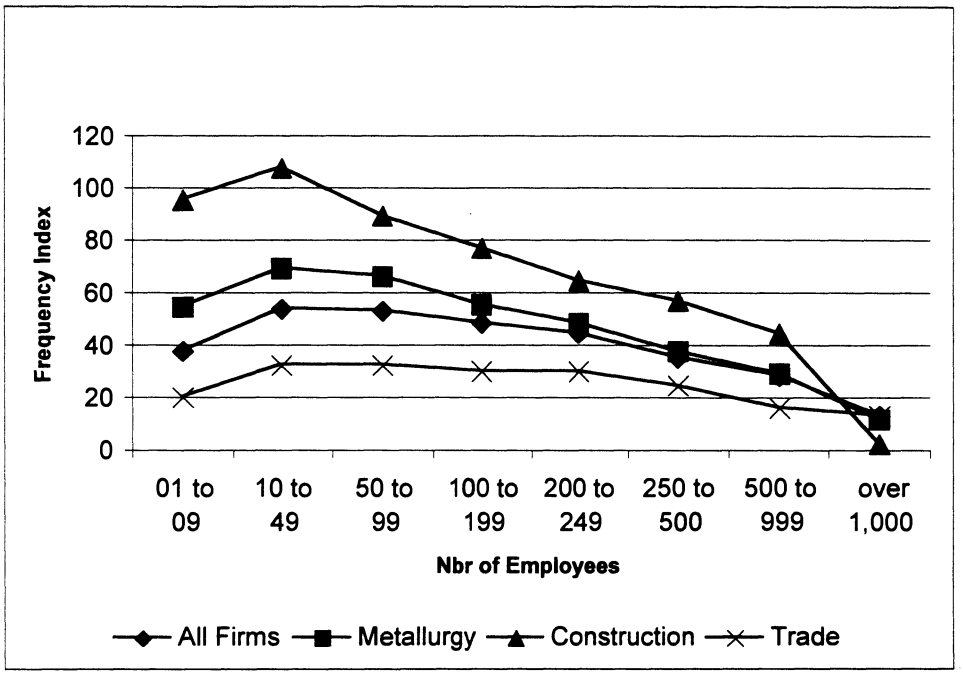
In light of this brief (and partial) description of the French system for prevention of occupational injuries, and given our assumptions, small enterprises can be expected to post rather unflattering results in terms of accident proneness (having little or no prevention), this phenomenon decreasing as the size of the company increases.

If it is accepted that the index of frequency of accidents with sick leave (number of accidents with leave per 1,000 employees) is a sufficiently pertinent indicator of

[7] Capital representing a pension as a result of a fatal accident: 26 times the amount of the minimum annual wage (fixed by order on the 1st January of each year) increased by lump-sum amounts to cover management costs and accidents and illnesses not allocated to a company (source: CNAM, 1999).

the degree of corporate investment in terms of prevention (Derzko et al., 1982), such an indicator should decline regularly with the size of the company. The following graph (cf. Figure 2) partly invalidates this assumption and shows in particular singular points for companies of 1 to 9 employees.

Figure 2: **Index of frequency according to company size (1996)**



Source: CNAM 1997

Without claiming in this paper to present an exhaustive analysis of the relations between players in the system for financing occupational injuries, we believe that to obtain an understanding of the reasons for the imperfection of the prevention incentive system, finer analysis of the behaviour of each of the players is required via the agency theory interpretation form.

3. COMPANY AND PREVENTION: AN INITIAL LEVEL OF ANALYSIS BY THE PRINCIPAL-AGENT PARADIGM

The specific nature of the risk rating system, where medium and large firms pay for their risks whereas small enterprises are mutualized, requires making a distinction between these two categories of companies. The dividing line will be set empirically, and solely to be able to use the generic terms of small and large firms, at 50 employees. Note, however, that the choice of this limit corresponds to

the requirement of a CHSCT in the company and a higher probability of being contacted by a CRAM prevention agent (23% for companies having more than 50 employees versus only 1% for those having less than 50 for 1997, knowing that 96% of the 1,930,000 companies affiliated to the general system have less than 50 employees)[8].

3.1. The case of large firms

The large firm has resources enabling it to have access to information and to implement prevention procedures. Its conduct, which can be qualified as one of "management" (it is sensitive to control of its costs)[9] is also reflected in the determination of its "occupational injury" contribution level, and hence a watch on all its statements. It is, indeed, on the basis of its own statements that its individual contribution level will then be calculated.

3.1.1. The insurer (principal)/large firm (agent) relationship

Let us first consider the relationship maintained by a large firm with the insurer.

In the area of conventional insurance, the impossibility for the insurer of knowing the behaviour of the insured (it observes merely the cost related to the occurrence of the risk) generates a moral hazard on the part of the insured, that of more risky behaviour (Arrow, 1963, Stiglitz, 1975). Covered by insurance, individuals no longer have an incentive to adopt preventive behaviour which can prove costly for them. The insurer's response is to introduce incentives, e.g. in the form of a bonus/penalty system, thus enabling the insurer to establish an incentive to influence the behaviour of the insured.

In the case of occupational injury insurance, the large firm pays for the cost of its own risk. It is entirely in its interest to take responsibility for its claim statements so as to reduce the number and intensity of such claims and thus reduce its contributions.

One observes in this case two possible reactions by the company:

- It plays an active role in prevention campaigns designed to reduce or limit its accidents, and takes part in the insurer's policy of prevention rather than compensation. The system can then prevent any phenomenon of moral hazard inherent in the company's behaviour.

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[8] According to CNAM (1997), 1997 Annual Report of the prevention departments of the CRAM's and CGSS's, Paris. We may emphasize, however, that these results mask the orientations of these prevention departments: in 1997, 70% of their actions concerned companies with less than 50 employees.

[9] Julien and Marchesnay (1987) distinguish between "the world of the medium and large firm", specifying that it is to this world that "apply the most common precepts of economic and management analysis".

- It can also procure light medical facilities to treat minor injuries without outside help and analyse in depth each accident statement to learn its causes but also to discourage statements it considers improper. "*The aim of companies is to reduce the number of accidents. For this purpose, the causes must be sought. This search highlights circumstances which sometimes show that a certain accident is not an occupational injury, that it has other causes, or that its consequences cannot be those that have been attributed to it*" states C. Archambault[10]. The latter comment translates the presence of a moral hazard on the part of the employee who, by looking to conceal the origin of his (her) injury, is looking for better compensation under occupational injury insurance rather than apply to the health insurance system (this phenomenon will be discussed in greater depth in the following section).

In the absence of quantification of the extent of these two types of behaviour, Figure 2 confirms this concern for taking charge of safety, the frequency index improving regularly with the size of the company, above 50 employees. The phenomenon is especially noticeable in the very accident-prone sectors of construction and metallurgy.

3.1.2. The large firm (principal)/employee (agent) relationship

For the employee, on the assumption of economic rationality, it is preferable, in order to maintain their income, to be reported as an "occupational injury" rather than as an "illness" (this is especially true in the case of a long sick leave, when the income includes a part paid in the form of a bonus or again in the case of poor supplementary coverage).

Where possible, employees will therefore be tempted to take advantage of the company's difficulty in observing their behaviour to report as a job injury an extra-occupational injury, or again to "amplify" the severity of the injury to obtain a sick leave. The cost of the risk will be borne by the company, with as a consequence an increase in its rate of contribution and in the cost of absenteeism. B. Fortin and P. Lanoie (1998) report these effects under the terms of "*ex ante* causality hazard" and "*ex post* duration hazard" respectively. These same authors (studies performed in the United States and Canada) underline that in the case of asymmetry of information on the real nature of occupational injuries, an increase in compensation for occupational injuries is associated with an increase in the frequency of injuries (elasticity of between 0.4 and 1) and an increase in the average duration of leave (elasticity of between 0.2 and 0.5). Based on the analysis of 57,000 cases of injuries declared as occupational injuries (in 1978 and 1979, in nine states of the United States), Smith (1989) shows that the tendency to report injuries such as

[10] Statement by Claude Archambault, CNPF (employers' association) member of the Conseil Supérieur de la Prévention des Risques Professionnels, reported in Cahiers de la Mutualité dans l'Entreprise, n° 28-29, Mar.-Apr. 1989, p 71, Paris, Mutualité Française.

sprains increases significantly on Mondays and estimates at 4% the number of sprains whose cause is not job-related.

In addition to this perverse effect of moral hazard linked to the search for better compensation there is another phenomenon of moral hazard related to the decline in preventive and safety efforts on the part of the employee. The phenomenon therefore typically reflects the effect of *ex ante* moral hazard originally described by K.J. Arrow (1963) and then specified in a discussion with M.V. Pauly (cf. Pauly 1968 and the reply by Arrow 1968): *ex ante* the behaviour of the insured leads them to reduce their prevention efforts and thus increases the likelihood of realization of the hazard; once the accident has occurred and due to insurance coverage, it increases the level of recourse to healthcare, thus leading to an increase in the amount of damages, when one speaks of *ex post* moral hazard.

Moreover, with machinery being brought into conformance with standards and with the adoption of protective equipment, there is a real reduction in danger, but the feeling of safety perceived by the employee can be far greater than the actual reduction in risk. This lack of proportionality between real risk and perceived risk can lead to a reduction in the attention paid to residual risks. The establishment of safety measures leads paradoxically to a decline in prevention behaviour (Simard, 1997), a phenomenon which amplifies the effect of *ex ante* moral hazard described previously.

No doubt it can be recommended for the company (without introducing a prohibitive monitoring cost), faced with this double moral hazard, that it put in place systematic in-depth analyses of "undesirable events" (accidents and "quasi-accidents") and systematic interviews when the employee returns to his or her work station. In this interview, the manager may inform the employee of the cost for the company of a sick leave following an accident, give a reminder of safety instructions and motivate them to make preventive efforts through better explanation of the work pattern which led to the accident.

In short, the risk rating system applied to large firms generates no moral hazard with regard to the insurer. In his (her) relationship with the employee, the company manager must cope with the difficulty of observing the employee's actions. But the company has the human and financial resources to limit this information asymmetry with an acceptable cost of monitoring.

Due to different risk rating and smaller resources, the problems of small firms are different and require in the same way a distinction between their relationship with the insurer and their relationship with the employee.

3.2. The case of the small firm

The small firm is characterized by its lesser human and financial resources meaning it cannot devote resources to training, information and, where applicable,

the introduction of large-scale preventive measures[11]. The probability of an inspection by a prevention agent is very slight (cf. Introduction § 3) and prevention agents and company managers both emphasize that the occupational injury contribution is very often, in the absence of serious accidents, perceived by the small company manager as merely an exogenous social security contribution[12]. Another important characteristic is the family-type, paternalistic structure often found in small enterprises and especially those with between 1 and 9 employees. Hirigoyen (1981) recalls the CGPME definition: "small enterprises are those in which the company managers assume personally and directly the company's financial, technical, social and moral liabilities".

The limitation on human and financial resources and a paternalistic profile will be decisive factors in moral hazard phenomena in the principal-agent relationship between insurer and company on one hand, and between company and employee on the other hand.

3.2.1. The insurer (principal)/small firm (agent) relationship

As in the framework of the insurance company/large firm relationship, analysis of risk rating principles should clarify analysis of the perverse effects of moral hazard.

For small enterprises, the risk rating of occupational injuries adopts the principle of mutualization of expenses, full mutualization at a collective rate below ten employees, and mixed but with a strong collective weighting for 10-50 employees (see § 2.2).

Moreover, as in any insurer/insured - or principal-agent - relationship, there is an asymmetry of information concerning the behaviour of the insured. The insurer cannot observe directly the behaviour of the company[13] which, perceiving this, will have no incentive to invest in the prevention of its occupational risks. From its viewpoint, there would be a double expense for investment in prevention and an

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[11] "A good economic situation is favourable to a satisfactory level of safety measures. *A fortiori* a good level of economic and financial performance contributes to especially satisfactory safety measures in terms of both activity and the appointment of a safety manager with autonomous power of decision" (Favaro, 1997).

[12] Simulation for a firm with a staff of 30 people, risk number 273 CA, payroll FF4,500,000 and for an average cost per accident of FF13,700 (benign accident):

Year	92	93	94	95	96	97	98	99	00
No. of job-related injuries	2	5	4	3	2	4	3		
Net rate (%)					3.04	2.88	2.84	2.74	2.83

One observes a relative constancy in the net rate, and above all a very low elasticity of this rate relative to the number of accidents. Insurance contributions, for 1996 to 2000, are in a range of FF130,050 ± FF6,750 (source: CRAM Bourgogne Franche-Comté, 2000).

[13] At the very most the insurer can observe its results in terms of the company's accident proneness statistics

insurance contribution which is beyond its control. This is a case of *ex ante* moral hazard: insurance discourages prevention activities, which increases, *ex ante*, the hazard probability.

Moreover, full coverage of healthcare costs and compensation by the insurer — a coverage having no consequence on the amount of the company's contributions — reduces the apparent cost of compensation. In this perspective, the moral hazard is the result of economically rational behaviour (M.V. Pauly, 1968): the insurance company repays to the firm the healthcare it uses, which has the effect of reducing, or even cancelling out the cost of healthcare consumption for the insured. This is a case of *ex post* moral hazard in which insurance increases the overall cost of compensation by reducing (in our case cancelling out) the apparent cost of healthcare (Béjean, 1994).

The answer provided by insurance theory is based on three principles:

- The deductible, requiring a fixed payment by the insured (fixed co-payment) per type of service or good. By limiting the co-payment amount or indexing it on the company's capability for payment, the incentive provided by the application of a deductible is reconciled with the survival of the company faced with the financial consequences of its risks.
- Co-insurance (out-of-pocket payments) introduces a proportional sharing of risks between the insurer and the insured: a percentage of the compensation amounts to be paid is left to be paid by the employer to encourage the employer to produce occupational injury prevention actions. In addition to a deductible adapted to the company's financial capability, co-insurance reconciles the objectives of incentives to prevention and allowance for the company's financial constraints, through a veritable sharing of risks.
- The bonus/penalty system in theory enables the premium level to be adjusted according to past observation of the company's results. In practice, it is the realization of the risk which can be observed, namely the frequency of accidents and the amount of the corresponding compensation. It can therefore be assumed that the realization of the risk is effectively related to the company's preventive behaviour. The bonus/penalty system should, in this framework, encourage the company to develop its prevention actions.

Another consequence of the adoption of these principles by the insurance company could be a change in behaviour of the company manager vis-à-vis occupational injury insurance, with a strong incentive to manage the company's contract and monitor its results and their consequences for the deductible or bonus/penalty.

Given this (strong) probability of moral hazard, the index of accident frequency according to the size of the company can be a revealing sign of a decline in prevention in small enterprises due to the coverage of these risks. If one observes

an especially high frequency of accidents in smaller companies, there is then a suspicion of moral hazard. Figure 2 confirms this observation for companies with 10-50 employees but not for those in the 1-9 employee range. The moral hazard seems non-existent or lesser for the latter category, unless it is concealed by another agency phenomenon originating in the small firm/employee relationship.

3.2.2. The small firm (principal)/employee (agent) relationship

Diagram 1 shows a major drop in the accident frequency index in companies of 1 to 9 employees compared with companies of 10 to 49 employees, suggesting that for this category there exists a "group standard" which lowers the tendency to report accidents. Although there has been no evaluation of 1) the role played by this standard in the decline in the frequency index and 2) the various factors making up the standard, behaviour such as "employer pressure" and "work by the employee in the interest of the company" is foreseeable, corresponding to economically rational behaviour on the part of both players.

This would translate, for example, into a desire not to disturb the work or functioning of the company for a benign injury (the employee says nothing, has the injury treated on a personal basis without reporting it, the manager giving the employee a half-day to consult his (her) doctor without an accident report).

Such a phenomenon can be analysed as the result of a coalition between the manager and the employee with a joint objective of satisfactory operation of the company, but unknown to the insurer. In both these cases, the moral hazard originates in the insurer's inability to observe the lack of reporting in the case of a benign accident.

This observation, however, calls for two important comments.

- Can the term "risk" still be used for the insurer (that we distinguish here from the prevention agent)? Since it is not, by construction, concerned with the actuarial rationale of the private insurer, this insurer is neutral toward the risk of under- or over-reporting of accidents. If it is assumed that the insurer wants to minimize the amount of contributions demanded from all companies having between 1 and 9 employees, then the decline in the tendency to report accidents on the part of these small enterprises is in line with this intention. From the viewpoint of the prevention agent, on the other hand, it is clear that this neutrality provides no incentive for prevention.
- Following this first comment, it would be legitimate then to speak of a moral hazard vis-à-vis the health insurance system to the benefit of the occupational injury insurance system, due to the transfer to the health insurance branch of the cost of care which should be covered by the occupational risks branch. A rough estimate of the amount of such a transfer, based on an average ordinary accident cost of FF13,700 and assuming a frequency index identical to that of the category of companies

with between 10 and 50 employees (i.e. 54.1 instead of 37.6 as observed for the category of companies with between 1 and 9 employees) shows for 1996 a result of approximately FF800 million unduly paid by the health insurance branch.

For companies with between 10 and 50 employees, the size of the company results in major organizational and economic changes. The appearance of an additional level in the hierarchy and the more formal structuring (in both administrative and regulatory terms) of the company go against the conditions which, in smaller companies, made possible a coalition between employee and company manager facing the insurer. The consequence is more systematic recourse to accident reporting. The major difference in the frequency index shows that this objective alliance against the occupational injury insurance system and the health insurance system becomes blurred, giving way to phenomena of the "*ex ante* causality hazard" and "*ex post* duration hazard" type already described within the framework of the large firm/employee relationship (see § 3.1.2).

Finally, analysis of the two-level agency relationship between the insurer and the company manager on the one hand, and the company manager and the employee on the other hand, shows a third level. Healthcare expenditures which are not covered by occupational injury insurance will be covered by the health insurance system. The third level therefore concerns the relationship between occupational injury insurance and health insurance. This relationship is not really an agency relationship: it is neither deliberate nor negotiated. On the other hand, the moral hazard phenomenon is very real: in the absence of prevention by the company managers, in the absence of compliance with safety rules by the employees, the level of risk increases; in the absence of compensation by the occupational injury insurance system, it is the health insurance system that has to bear the financial burden of the phenomenon. The objective coalition then concerns three players: the employee, the small company manager and the occupational injury insurer, faced with the fourth player which suffers its consequences.

A summary of all these types of behaviour analysed from the viewpoint of the principal-agent paradigm is given in the following table:

<table>
<tr><td></td><td colspan="2">Less than 50 employees</td><td>More than 50 employees</td></tr>
<tr><td>Company / Insurer relation-ship</td><td colspan="2">Moral hazard:
- ex ante through presence of insurance
- ex post through total healthcare coverage without affecting the premium
Response in terms of prevention:
- traditional insurance tools: deductible or bonus/penalty system or co-insurance</td><td>No moral hazard</td></tr>
<tr><td>Company/</td><td>From 1 to 9 employees</td><td>From 10 to 50</td><td>Moral hazard:</td></tr>
</table>

Employee relation-ship	Moral hazard: - company manager / employee coalition against insurer - triple coalition, employee / company manager / occupational injury insurer, vs the health insurance branch	employees Identical to companies with over 50 employees	- "Monday morning accident" - Stiglitz phenomenon Response in terms of prevention: - Accident monitoring by the company - Work resumption interview

Table 2: **Company behaviour with regard to prevention**

In short, insurance seems to play a role as an incentive to prevention in the case of large firms. Many companies have seen an improvement in their accident statistics by paying closer attention to their accident reports and developing a policy of communication with employees on this topic.

On the other hand, the strong presence of moral hazards in the relations maintained by the small firm with the insurer and the employee hinders the dissemination of a strong "prevention" culture. Incentives for a reversal of this trend should therefore also be sought in specific insurance tools and, as for the larger firms, by hoping to thus arouse in the company manager the feeling that prevention should be a subject taken into account more systematically.

Although the latter point in this summary is a purely theoretical response to the presence of moral hazard, all the prevention agents unanimously assert that it remains justified although somewhat utopian. Another solution could therefore be to involve other players, supervisors, who within the framework of more complex agency relationships could counter forces offering little incentive for prevention.

4. COMPANY AND PREVENTION: MULTIPLE OBJECTIVES AND COMPLEX AGENCY RELATIONSHIPS

Given the number and diversity of companies, the multiple causality of occupational injury risks, and organizational changes, it is necessary to go beyond the mere contractual relationship between two players. Applying recent research developments regarding situations of multiple tasks entrusted to one agent and the introduction of a third party into the principal-agent relationship, we shall analyse the case of remuneration indexed on productivity objectives and the introduction of supervisors with a view to monitoring companies' compliance with occupational risk legislation and regulations.

4.1. The ambivalence of the company manager's objectives: between productivity and safety

4.1.1. "Multi-task" models: introduction of multiple tasks into the principal-agent relationship

While staying within the framework of bilateral models with a principal and an agent, the multi-task model nevertheless introduces an additional dimension by allowing, in the contract, for the possibility of multiple tasks requested of an agent[14].

In the case of several tasks entrusted to the agent, Holmstrom and Milgrom (1991) emphasize the need to distinguish between situations in which the tasks are complementary and those in which they can be substituted for one another. The example of a company entrusting to a marketing agency the campaign for advertising and listing of a product with distributors illustrates the first case and shows the need for the principal to encourage the agent to direct its effort towards the advertising action to reduce the costs of the product listing phase. In the case of substitutable tasks, encouraging the agent to perform a task has the effect of discouraging him (her) from performing the other task. Entrusting to an employee a production activity with a twofold objective of quantity and quality, with a wage incentive indexed on the sole criterion of production performed, makes the company manager run the risk of high productivity but with a high rate of rejects: quantity increases at the expense of quality.

The multi-task model in the case of substitute tasks is especially appropriate for analysing particular work situations involving both an efficiency constraint and a constraint of compliance with safety instructions.

4.1.2. The company manager/employee relationship in a multi-task model

Many companies have established systems of remuneration rewarding productivity with bonus or profit sharing systems. In parallel to this system, a whole safety approach is developed, with evaluation in terms of results leading to rewards, citations and pay rises for the enterprise, workshop or employee.

In this context, the principal (company manager) requests the agent (employee) to perform two tasks appearing to be antagonistic (substitutes) for the agent: comply with safety procedures and increase the productivity of his (her) work (Cazamian, 1970), (Dwyer, 1991).

Berthelette and Abenhaim (1984) report the results of ten studies performed in various countries on the subject of efficiency-based remuneration and occupational

[14] The overview of the multi-task and hierarchic models is largely based on the article by L. Rochaix (1998).

safety. The results show a strong correlation between this type of remuneration and a high accident rate. One study in particular, performed on the forestry industry in Sweden, underlines a 32% reduction in frequency and a 35% reduction in severity of occupational injuries attributable to the transition from wages indexed on production to a fixed wage. In this situation of moral hazard (the company manager cannot observe the agent's actions), the incentive to productivity provided by efficiency-based wages is an immediate incentive for the employee to take more risks running counter to compliance with safety rules.

Faced with this dilemma which is left to be arbitraged by the employee (who spontaneously chooses a financial objective in the short term), the possible solutions are:

- Introduction of safety bonuses or penalties to try to counter the safety problems associated with remuneration based on efficiency. Apart from the difficulty of evaluating the level above which these bonuses and penalties would act as incentives, there is the problem of moral hazard related to non-reporting of the accident by the employee; there is also the question of the acceptability of a system which would involve penalizing workers who are accident victims!

- Reduction of information asymmetry by entrusting productivity/safety arbitraging to the supervisory staff. By delegating power (with a content in terms of authority, competencies and resources), the company manager can impose on his (her) supervisory staff an additional safety objective (in addition to productivity and quality) and thus arbitrage between efficiency and safety. This arbitraging is not transferred to the team or the blue-collar worker, and the fact that the company manager assesses the results of his or her executives based on the **three** criteria encourages the latter to optimize the behaviour of the workers (Dupont de Nemours method[15]).

A second level of interpretation is possible concerning moral hazard in this multi-task situation. Based on the assumptions that 1) the economic rationale of the company manager is to give priority to productivity, and 2) that the company manager is statutorily required to assess and reduce risks, then it is the company manager who adopts moral hazard behaviour if he (she) is capable of sending to the prevention agent strong signals of a prevention effort (revitalization of the CHSCT, development of prevention campaigns involving the prevention agent, etc.) while maintaining a system of efficiency-based remuneration encouraging the employee to give priority to the productivity objective.

Faced with this risk due to the impossibility of observing the company's behaviour and the fact that efficiency-based remuneration generates a higher accident rate, the solution is recourse to external supervision by the legislator which can either prohibit this form of remuneration or delegate its supervisory role

[15] Developed by the American firm Dupont de Nemours, this method of providing incentives to allow for safety is based on extensive prevention training provided for executive staff, then supplemented by assessment of executives based on three criteria of equal weighting concerning productivity, quality and safety.

by entrusting to third parties (prevention agents, CHSCT) the responsibility for regulation.

4.2. Presence of a supervisor in the insurance system/company relationship and contribution of hierarchic models

Faced with two million companies covered by the general Social Security insurance system, the legislator has delegated to several outside players (labour inspectorate, prevention department of the CRAM) and internal players (CHSCT, industrial medicine) the task of checking companies' compliance with the laws and regulations.

The labour inspectorate and industrial medicine being outside the study framework set by us, we shall confine our analysis to the CRAM prevention agents and the CHSCT.

To analyse the role of these players with regard to incentives and checking of prevention actions, hierarchic models of agency theory can be useful. "*Third-party models (or hierarchic models) consider explicitly the introduction of a third party between the supervision system and agent, which leads to a hierarchic structure of the following type: supervision system / supervisor / producer. This introduction is due to the asymmetry of information between government and service producers, the supervisor being assumed to make good this information deficit. The latter has, however, major discretionary power and can accordingly be "captured" by the service producer. The perspective of collusion between supervisor and producer is central to the concerns of these models.*" (Rochaix, 1997).

Although they do not have the same hierarchic link (the prevention agent is one of the executive powers of the legislator whereas the CHSCT is an internal body in the company[16]), these two players have, however, a shared mission which is to ensure compliance with the legislative and regulatory stipulations adopted regarding protection of the health and safety of the company's employees. By confining ourselves to this monitoring aspect, the presence of these players is a response to the desire to reduce information asymmetry between the legislator and the companies and thereby reduce the resultant moral hazard. Their powers are different, however, and result in different possibilities for "capture" by companies.

While it is hard to measure the extent of this phenomenon of capture related to the possibility of opportunistic behaviour by the company, prevention agents and CHSCT members agree that the risk of capture cannot be ruled out in their relations with the company. Their "invitation to do" is answered with negotiation on what should be done.

Thus the prevention agent and the CHSCT, faced with the arguments of limited resources and survival of the company (real or amplified, the company using to its

[16] The CHSCT (committee for health, safety and working conditions) is a separate institution representing the personnel and has its own resources. It is one of the players in the company and benefits from relative independence vis-à-vis the manager.

advantage these two bodies' lack of knowledge or inability to assess its financial situation), can, at best, arbitrage between the prevention actions to be carried out or, at worst, validate actions inferior to the legal or regulatory obligations.

Concerning the CHSCT, the perspective of collusion is intrinsic to its formation. The company manager is its chairman, and the elected members, although protected, are employees of the company and as such it cannot be ruled out that they could be exposed to pressure by the employer.

"In companies, discussions on occupational health and safety questions are dealt with in terms of financial investments. The employment situation reinforces the possibility of applying pressure on the Committee, to which the company's survival is objected on all occasions. " (Francis Bourdon, 1998).

While the institutional remoteness of the prevention agent (compared with the CHSCT) relative to the company manager reduces the risks of collusion[17], the CHSCT, however, has a major information advantage due to its position within the company. Accordingly, the appropriateness of the existence of these two supervisors and their effectiveness cannot be brought into question, but in-depth analysis of this risk of collusion would make it possible to propose solutions for improving their capability for providing incentives to prevention.

5. CONCLUSION

The interpretative viewpoint adopted by us has enabled us to exploit the results of agency theory to perform an analysis of some complex situations which characterize the functioning of the occupational injury insurance system. The interpretation form offered by agency theory seems relevant for showing the effects of deviation linked to certain information asymmetries, or certain systems of remuneration. This analysis can therefore contribute to the identification of obstacles to the development of prevention in companies, and thereby enable measures to be proposed to remedy this, an analysis which substantiates or supplements the explanations of an organizational, psychological or sociological nature given elsewhere. The proposals that we have outlined nevertheless need to be confirmed by deeper research[18].

[17] "The more independent the auditor, the less the principal has to take into account the risk of capture in working out his (her) incentive measures" (Barrow, 1996)

[18] Research work in progress as part of the PhD thesis prepared by Christian Trontin under the supervision of Sophie Béjean.

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