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Sébastien Ménard and Coralia Quintero Rojas

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Absenteeism and productivity: the experience rating applied to employer contributions to health insurance

SÉBASTIEN MÉNARD *
GAINS-TEPP, University of Le Mans

CORALIA QUINTERO ROJAS †
Economis and Finance, University of Guanajuato

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Abstract

In this paper we analyze the effects of introducing experience rating on the employer contributions to health insurance. Generally, theoretical literature explains absenteeism by the workers' behavior. However, working conditions also has an effect on the use of sick leaves. As a result, Firms proposing good working conditions support the costs generated by the other firms. This implies a reduction of the good quality jobs on the benefit of the bad quality jobs. In this paper, we propose to introduce a modulation of employer contributions to health insurance based on historical rates of absenteeism. We show that the experience rating improves the productivity of the economy and welfare, when the unemployed are able to direct their research towards the good-quality jobs.

Keywords: Health Insurance, experience rating, productivity.

JEL Classification:I13,I18.

*TEPP-GAINS, University of Le Mans, 72000, Le Mans, France - Tel: (+33) 02 4383 2797 - E-mail: sebastien.menard@univ-lemans.fr

†Economics & Finance, University of Guanajuato, Mexico - E-mail: coralia@ugto.org

1 INTRODUCTION

Absenteeism, that is the employee's habitual absence from work, is expected to have a negative impact on productivity given the costs associated to it, for instance: wages paid to absent employees, costs of replacement workers, administrative costs of managing absenteeism, etc. People miss work for a variety of reasons, but illness and injuries are two major and legitimate causes of absenteeism directly linked to job conditions.In point of fact, statistics on occupational diseases, sickness absence, and disability pensions, show that there is still a need to improve safety and health at work (Kankaanp??, 2010). To this goal, incentives have been used in several countries as a policy tool for the promotionof safety and health at the workplace.

The economic rationale behind this is that most resource allocations in society relies on the functioning of the market, but markets function well only in very specific circumstances guaranteeing optimal allocations. Otherwise, it is necessary to look for actions to correct the market failure.On the safety and health at work context, the market does not reach the optimal solution. In part due that unsafe working conditions usually also result in costs uncovered by employers. These costs or negative externalities then must be borned by third parties, such as families and society at large. Moreover, as is pointed out by Kankaanp?? (2010), in the labor market workers usually have insufficient information about risks at work. Also employers lack information about ways and methods to reduce risks or improve working conditions. Then, the introduction of incentives may be an option to correct these failures as long as they can induce the desired behavior.

The experience rating has already been implemented for unemployment insurance[1]. In this more common context, the general method of introducing experience rating is to adjust employers? premiums according to their ex-employees? reliance on benefits, a method that is most commonly found in systems where all premiums are assessed to employers (de Raaf, Motte and Vincent, 2005).

On the safety and health side, Mansfield et.al. (2012) point that since the late 1970s, this approach has become increasingly prevalent in several countries, including Canada, the United States, Australia and New Zealand. The premise of experience rating is that employers who maintain safer workplaces should be rewarded with lower premiums, while those with more workplace accidents should be penalized with higher premiums. The approach is meant to remedy deficiencies in flat-rate or manual-rated systems by adjusting premiums on the basis of injury costs, thereby providing incentives for employers to invest in health and safety. Similarly, Lengagne (2014) present a survey on empirical literature on the incentive effects of experience rating in the field of work-related health and safety. The author finds that several studies indicate that experience rating has an effect in reducing the frequency of workplace injuries and the duration of injury-related sick leave. Similarly, a number of empirical papers focuses on working conditions. This is the case of Valssenko and Willard (1984), Strauss and Thomas (1998), Kuhn, Lalive and Zweimuller (2009), Browning, Dano and Heinesen (2009). For Ose (2005), absenteeism can be attributed to a deterioration of health capital. Using French data, Afse and Givord (2009) highlight a link between irregular schedules of working and absenteeism.

Then, conversely toprior theoretical literature on the link between health and employment usually focused on the behavior of workers,in this paper we consider the experience rating as a financial incentive addressed to firms, provided that the employer premiums are not based on average costs[2]. Instead, each employer will be charged based on its own record of claims. We expect that this toolwould improve the labor market outcomes regarding health

[1]The experiencerating in the unemployment insurance system consists on taxing companies based on their historical layoffs. On this topic, Fern and Margolis (2000) and de Raaf et.al. (2005) present a review of the literature, whereas Cahucand Malherbet (2001) develop a canonical model of experience rating applied to a European type economy with minimum wage. They show that this economic tool is likely to improve the level of employment.

[2]See, for instance, Ehrenberg (1970) and Allen (1981) who are pioneers on this issue. Allen explains absenteeism by the classic trade-off between consumption and leisure. The absenteeism corresponds then to variations in the marginal utility unanticipated in the labor contracts. For Shapiro and Stiglitz (1984), the rate of absenteeism depends on the difference between the salary and the daily allowances in an environment with moral hazard and efficiency wages. For these authors, the workers behavior is the causative of the spending linked to sickness leaves.

insurance, since we assume that when agents are incentivized, they will take actions to reduce risks at work and improve the quality of working life.

In order to analyze the effects of modulating employer contributions based on absenteeism rates, we develop a matching model á la Pissarides. We assume that the economy consists of two segments that differ in their use of absenteeism. This difference can be explained by the working conditions of each segment. A higher absenteeism rate implies (i) lower average productivity and (ii) an indirect subsidy from the low-absenteeism-rate segment to the high-absenteeism-rate segment through the public health insurance. Indeed, since the costs of the disease are not supported neither by firms nor by employers, the economic equilibrium is characterized by high levels of bad jobs at the expense of good jobs.

It is then possible to internalize this costs by adjusting employer contributions based on absenteeism rates. In our model, wages and supplementary health assurance of each segment result from a Nash bargaining between firms and employees. The existence of a complementary health insurance is explained by the fact that the absenteeism is at the origin of a greater surplus than the surplus associated with the destruction of the job. Thus, we can analyze the effects of a modulation of the employer contributions on salaries, allowances diseases and productivity of the economy.

In our model, according to previous studies, part of absenteeism comes from jobs, not from employees. Employees are identical and there is no moral hazard. However, we assume that on certain positions sick leaves are more frequent so that those jobs are on average less productive. Although they representa health risk, these positions offer a positive profit and an income higher than the unemployment income. This explains why these positions exist at equilibrium. However, the presence of a public health insurance indirectly encourages the creation of this kind of posts, with high risk. Indeed, part of the absenteeism generated by high risk firms is supported by low risk and low absenteeism firms, through the financing of health insurance. Then, it seems pertinent to wonder about the possibility of improving the productivity and the welfare of the economy by adjusting the employer contributions based on the firms rates of absenteeism. Finally, we analyze in particular the effects on wages, social protection and productivity. We will distinguish two cases. In the first one workers cannot move between the different segments of the economy. In the second one, workers can orient their job search.

The remaining of the article is organized as follows: In Section 2, we present the model assumptions and the equilibrium. Calibration is detailed in Section 3. Section 4 shows our numerical results and Section 5 concludes.

2 THE MODEL

The model is built from the analytical framework proposed by Pissarides (1990). It allows to study *(i)* wages formation, *(ii)* health coverage offered by firms and *(iii)* the effects on the productivity of a modulation of employer contributions to health insurance. We consider an economy with a constant active population normalized to unity and the time is continuous. Workers are identical: they are subject to the same risks of unemployment and sickness. Agents are risk neutral with discount rate r. This rate measures the interest rate and the preference for the present.

There are two segments in the labor market but unemployed workers are allowed to look for employment in both segments. Segments are distinguished by the level of health risks of jobs: positions with high health risks are in segment B whereas positions with low health risks are in segment G. This implies higher absenteeism rates for type B jobs than for type G jobs. We note λ_i $(i = B, G)$ the probability of becoming sick and by ψ_i $(i = B, G)$ the probability of healing. Then, we have $\lambda_B \geq \lambda_G$ and $\psi_B \leq \psi_G$. Absenteeism causes a loss of production for the firm, a loss of income for the worker and an higher burden for the insurance fund. This implies that when there is just a pool insurance fund for both types of jobs, the lower risk jobs G subsidize the higher risk jobs B through the health insurance fund.

2.1 The matching and the flows in the labor market

The two segments of the labor market are accessible to all workers. However, in each period, an unemployed is allowed to seek employment only on one segment of the market. At time t, the probability of seeking employment on the type G jobs at time $t+1$ is denoted π. This probability is the same for all unemployed workers. In the discussion of the model, we will distinguish two cases: the one where this probability is exogenous and the other where this probability results from the maximizing behavior of unemployed workers.

Meetings between the unemployed and employers take time and effort, so they are not instantaneous. The search process on each segment of the labor market is represented by a matching function $M_i = M(U_i, V_i)$ which links the number of new hires on each segment, M_i, to the number of unemployed workers, U_i and the disposable vacancies, V_i. The matching technology fulfill the assumptions usually adopted in the literature: The function $M_i(U_i, V_i)$ is increasing, continuously differentiable, and homogeneous of degree 1. It satisfies the Inada conditions and $M_i(0, V_i) = M_i(U_i, 0) = 0 \ \forall \ V_i, U_i \geq 0$. The assumption of homogeneity allows us to write the probability q_i of filling a vacancy as a function of the labor market tightness $\theta_i = \frac{V_i}{U_i}$. Thus, a position is fulfilled with probability $q_i = M_i(U_i, V_i)/V_i = m_i = (\theta_i)$. Similarly, the probability of finding a job for an unemployed worked in segment i is $p_i = M_i(U_i, V_i)/U_i = \theta m_i(\theta_i)$. The above assumptions for the matching function imply that $\frac{\partial q_i}{\partial \theta_i} \leq 0$ and $\frac{\partial p_i}{\partial \theta_i}$ $geq0$, so that the existence of congestion effects on the labor market is reproduced.

Once a worker is recruited on segment i, he suffers a health risk. This risk involves periods of absenteeism during which the agent is not able to produce. In fact, the health risk is similar to a transitory shock on worker's productivity. Matter of simplicity, we assume that there is no moral hazard. That is, the employer perfectly observes the health status of individuals. Thus, it is not possible for workers to be absent and healthy. We consider λ_i the sickness probability in segment i and ψ_i the cure probability. It is assumed that absenteeism follows a Poisson process which means that the average span between two periods of absenteeism is $1/\lambda_i$ and that the average duration of a period of healing is $1/\psi_i$. Workers are identical. Thus, the gap $\lambda_G - \lambda_B \geq 0$ is only due to the differences between firms. This assumption may reflect sectoral differences (*ie.* services *vs.* industry) or differences in the working conditions. Finally, the exogenous job destruction rate is noted s. This probability is the same in both segments and applies to occupied jobs as well as to unoccupied jobs because of absenteeism. We assume that the average span of absenteeism is never long enough to cause a lay-off. Therefore, the unique source of dismissal is the exogenous job destruction rate s.

The labor force is normalized to unity and is composed of the individuals from each segment of the labor market: the individuals from segment G, I_G, and the individuals from segment B, I_B. That is: $I_G + I_B = 1$. Transitions between segments can take place only during the unemployment spells. For an unemployed worker, the probability of transiting or stay on the segment G is π. At steady state, the balance of flow between the two segments is given by:

$$I_G(1 - \pi)u_G = I_B \pi u_B \tag{1}$$

with u_i the unemployment rate in sector i. Inside each sector, population is composed by unemployed workers, u_i, employees, l_i and absent workers because of sickness, a_i, so that $u_i + l_i + a_i = 1$. The equilibrium of flows is then described as follows:

$$s(1 - u_i) = p_i u_i \tag{2}$$

$$\lambda_i l_i = (\psi_i + s)a_i \tag{3}$$

$$p_i u_i + \psi a_i = (s + \lambda_i)l_i \tag{4}$$

From this, we deduce the rates of unemployment, employment and absenteeism in segment i, as well as the weight I_G of sector G in the economy:

$$u_i = \frac{s}{s + p_i} \tag{5}$$

$$l_i = \frac{(\psi + s)p_i}{(\lambda_i + \psi_i + s)(s + p_i)} \tag{6}$$

$$a_i = \frac{\lambda_i p_i}{(\lambda_i + \psi_i + s)(s + p_i)} \tag{7}$$

$$I_G = \frac{\pi(s + p_G)}{(1 - \pi)(s + p_B) + \pi(s + p_G)} \tag{8}$$

2.2 Workers

We consider an incomplete markets economy in which agents do not have access to capital markets. Therefore, they cannot self-insure against the risk of income fluctuations associated to unemployment or illness. Instead, public authorities offer coverage against these risks. The lump-sum unemployment allocation b is paid to all unemployed unconditionally and is the same for both segments. Absent workers also receive public support. The daily lump-sum allowance zp is paid to all sick workers. Funding for public insurance is the responsibility of employers. This pooling of funding of the insurance fund means that the firms in segment G finance the surplus of absenteeism of segment B firms.

In case of absence, productivity is zero. But unlike the unemployment, absenteeism is not a breakdown of the employment relationship between the firm and the worker. The company can therefore elect to pay additional health benefits, zf_i, to sick workers. This compensation is a form of deferred compensation to avoid the job destruction, that is, the time and effort of looking for a new job for the worker and the search for a new worker for the firm. Workers are risk neutral: they maximize their intertemporal flow income. Therefore, the existence of a complementary health compensation is not due to the need of smoothing the workers income over the full period of employment. Instead, it is explained by the mutual interest of workers and firms to maintain the job relationship. As for wage w_i paid to employees, compensation zf_i results from a bargaining process between the firm and the sick worker. The amount depends on the surplus created in the absent worker situation. Let's consider $V_{(l,i)}$ and $V_{(a,i)}$ as respectively the intertemporal utilities of present and absent workers in segment i, then Bellman equations are written as:

$$rV_{(l,i)} = w_i + \lambda_i[V_{(a,i)} - V_{(l,i)}] + s[V_{(u,i)} - V_{(l,i)}] \tag{9}$$

$$rV_{(a,i)} = zp + zf_i + \psi_i[V_{(l,i)} - V_{(a,i)}] + s[V_{(u,i)} - V_{(a,i)}] \tag{10}$$

An employee receives a wage w_i. With probability λ_i that he will get sick. In that case, he will suffer a loss of welfare worth to $V_{(a,i)} - V_{(l,i)}$. Instead, with probability s, a dismissal will occur. In that case, the loss is worth to $V_{(u,i)} - V_{(l,i)}$. Similarly, an absent worker receives a state compensation zp and a employer complementary health compensation zf_i. He can heal, with probability ψ, or be laid-off with probability s.

On the other side, the unemployed workers are allowed to look for employment in both segments of the labor market. Since the only difference between segments is the higher absenteeism rate in segment B jobs, it follows that the surplus is more important in segment G. Therefore, the welfare of the type G unemployed workers is always higher than the one of type B unemployed workers. However, the probability $\pi(e)$ of becoming or remaining a type G unemployed requires an amount of effort $e > 0$. We will assume that the disutility of effort $C(e)$ is an increasing and convex function ($C' > 0$ and $C'' > 0$) additively separable in revenues. Thus, the Bellman equations for the two type of unemployed are written as:

$$rV_{(u,G)} = \max_e\{b - C(e) + p_G[V_{(l,G)} - V_{(u,G)}] + (1 - \pi(e))[V_{(u,B)} - V_{(u,G)}]\} \tag{11}$$

$$rV_{(u,B)} = \max_e\{b - C(e) + p_B[V_{(l,B)} - V_{(u,B)}] + \pi(e)[V_{(u,G)} - V_{(u,B)}]\} \tag{12}$$

with $\pi(e) = \phi e$, where ϕ is a parameter to calibrate in order to reproduce the unemployment rate. Type G and type B unemployed workers receive a benefit b. A type G unemployed worker can find a job on the same segment with probability p_G, which positively depends on the tightness θ_G, or else becomes job seeker on the segment B with probability $1 - \pi(e)$. Similarly, a type B unemployed worker finds a job on the same segment with probability p_B, or else becomes job seeker on the segment G with probability $\pi(e)$. The optimal level of effort is given by the resolution of maximization programs 11 and 12:

$$C'(e) = \phi[V_{(u,G)} - V_{(u,B)}] \tag{13}$$

Thus, the marginal cost of effort is equal to the earnings $\phi[V_{(u,G)} - V_{(u,B)}]$.

2.3 Firms

The economy consists in a large number of neutral firms with respect to the risk which discounts future at rate r. Firms may have occupied or vacant positions, type G or type B. A type i vacancy costs to the firm cy_i each period, with y_i the productivity of a type i position and $c > 0$. A vacancy type i can be filled with probability $q_i = m_i(\theta_i)$. We denote $\Pi_{(v,i)}$ the value of a vacant job and $\Pi_{(l,i)}$ the value of an occupied job in segment i. Then the Bellman equation for a vacant job is written as:

$$r\Pi_{(v,i)} = -cy_i + q_i[\Pi_{(l,i)} - \Pi_{(v,i)}] \tag{14}$$

Once the vacancy is filled, the productivity is worth y_i and the firm provides an income w_i to the worker. Each job is then destroyed with an instantaneous probability s. Employment can also cause a work stoppage with probability λ_i. In this case, the job productivity is zero and the company pays to employee a supplementary health income zf_i. All incomes paid by firms are subject to a proportional taxation τ_i in order to finance the public mechanisms of unemployment and health insurances. We consider $\Pi_{(a,i)}$ as the present value of an unoccupied position because of illness and ψ_i the healing probability of workers. Then, the Bellman equations are:

$$r\Pi_{(l,i)} = y_i - w_i(1 + \tau_i) + \lambda_i[\Pi_{(a,i)} - \Pi_{(l,i)}] + s[\Pi_{(v,i)} - \Pi_{(l,i)}] \tag{15}$$

$$r\Pi_{(a,i)} = -zf_i(1 + \tau_i) + \psi_i[\Pi_{(l,i)} - \Pi_{(a,i)}] + s[\Pi_{(v,i)} - \Pi_{(l,i)}] \tag{16}$$

There is free entry into the labor market. Therefore, job creation is given by the free entry condition $\Pi_{(v,i)} = 0$. This assumption means that new positions are created on each segment of the labor market as long as positive rents exist. At equilibrium, firms are thus indifferent between type G and type B vacancies. We have:

$$\Pi_{(l,i)} = \frac{cy_i}{q_i} \tag{17}$$

Using equations 15 and 16, we obtain the equation for job creation for each segment i:

$$\frac{(r + \psi_i + s)(y_i - (1 + \tau_i)w_i) - \lambda_i(1 + \tau_i)zf_i}{(r + \lambda_i + s)(r + \psi_i + s) - \lambda_i\psi_i} = \frac{cy_i}{q_i} \tag{18}$$

The left side of this equality is the average cost of holding a vacancy while the right one is the expected gains from an occupied position. This expression, which exhibits a decreasing relationship between workers' incomes (w_i and zf_i) and the market tightness θ_i, corresponds to the labor demand in each segment.

2.4 Wages

Wages and the complementary health insurance are determined by a continuous negotiation between firms and employees. That is, they solves the maximization of the generalized Nash criterion:

$$\max_{w_i} < \beta \ln[V_{(l,i)} - V_{(u,i)}] + (1 - \beta)\ln[\Pi_{(l,i)} - \Pi_{(v,i)}] > \tag{19}$$

$$\max_{zf_i} < \beta \ln[V_{(a,i)} - V_{(u,i)}] + (1-\beta)\ln[\Pi_{(a,i)} - \Pi_{(v,i)}] > \tag{20}$$

From equations 9, 10, 15 et 16, we can express $V_{(l,i)} - V_{(u,i)}$ and $V_{(a,i)} - V_{(u,i)}$ as functions of surpluses $S_{(l,i)}$ and $S_{a,i}$:

$$V_{(l,i)} - V_{(u,i)} = \frac{\beta}{1+\tau(1-\beta)} S_{(l,i)} \tag{21}$$

$$V_{(a,i)} - V_{(u,i)} = \frac{\beta}{1+\tau(1-\beta)} S_{(a,i)} \tag{22}$$

where $S_{(l,i)} = \Pi_{(l,i)} - \Pi_{(v,i)} + V_{(l,i)} - V_{(u,i)}$ and $S_{(a,i)} = \Pi_{(a,i)} - \Pi_{(v,i)} + V_{(a,i)} - V_{(u,i)}$.

Thus, the share received by workers in the wage negotiations is an increasing function of the bargaining power β and the surplus $S_{(l,i)}$. In case of illness, the firm and the worker can decide whether or not to end the employment relationship. In case of destruction of the post, the firm may propose a vacancy and the worker experiences an unemployment span. The trade-off therefore depends on the expected duration of the sick leave. The post will be destroyed only for long periods of leave. In our model, it is assumed that there is no heterogeneity in the duration of the sick leave: This span is always equal to $1/\psi_i$. Moreover we assume that it is always shorter than the time required to fill a vacancy. Consequently, $S_{(a,i)}$ is always greater than zero. Thus, since absenteeism prevents a new search, it is preferable for both the firm and the worker. Thus, the existence of a positive surplus when there is absenteeism explains the existence of a complementary health insurance.

Using this surplus sharing rule, 9, 10, 15 and 16, and the free entry condition $\Pi_{(v,i)} = 0$, we get the expressions for wages and complementary health benefits:

$$w_i = \frac{\beta y_i}{1+\tau_i} + (1-\beta) r V_{(u,i)} \tag{23}$$

$$zf_i = (1-\beta)(rV_{(u,i)} - zp) \tag{24}$$

These are classical results. The wage is an average of the job productivity and the reservation utility of workers, *ie.* the value of unemployment. The sharing of surplus depends on the bargaining power β, which increases wages, and on taxes which reduce them. Thus, in the bargain, the firm enforce workers to support a portion of taxes through lower wages. Complementary health benefits depend negatively on the daily public allowance. In other words, any increase in government allocations is in part received by firms which reduces the amount of zf_i.

2.5 Optimal research effort et the reservation utility

To characterize the equilibrium of the model, we must determine the optimal effort and then the value $V_{(u,i)}$. From 11 and 12 we get the expression for the difference between the value of type G unemployment and the value of type B unemployment:

$$V_{(u,G)} - V_{(u,B)} = \frac{p_G[V_{(l,G)} - V_{(u,G)}] - p_B[V_{(l,B)} - V_{(u,B)}]}{r+1} \tag{25}$$

Using the free-entry condition $\Pi_{(l,i)} = \frac{cy_i}{q_i}$ and the expression for the surplus $V_{(l,i)} - V_{u,i} = \frac{\beta}{(1+\tau_i)(1-\beta)} \Pi_{(l,i)}$, we get:

$$V_{(u,G)} - V_{(u,B)} = \frac{\beta\theta_G c y_G}{(1+\tau_G)(1-\beta)(r+1)} - \frac{\beta\theta_B c y_B}{(1+\tau_B)(1-\beta)(r+1)} \tag{26}$$

Assuming that $C(e) = \frac{e^2}{2}$, we obtain the expressions for the value of type G unemployment, the value of type B unemployment, and the optimal level of effort, e^*:

$$rV_{(u,G)} = b - \frac{e^{*2}}{2} + (r+\pi(e^*))\frac{\beta\theta_G c y_G}{(1+\tau_G)(1-\beta)(r+1)} + (1-\pi(e^*))\frac{\beta\theta_B c y_B}{(1+\tau_B)(1-\beta)(r+1)} \tag{27}$$

$$rV_{(u,B)} = b - \frac{e^{*2}}{2} + \pi(e^*)\frac{\beta\theta_G c y_G}{(1+\tau_G)(1-\beta)(r+1)} + (r+1-\pi(e^*))\frac{\beta\theta_B c y_B}{(1+\tau_B)(1-\beta)(r+1)} \quad (28)$$

$$e^* = \frac{\phi\beta c}{(1-\beta)(r+1)}\left(\frac{\theta_G y_G}{(1+\tau_G)} - \frac{\theta_B y_B}{(1+\tau_B)}\right) \quad (29)$$

Thus, the choice to seek employment in segment G depends, on the one hand, on the tightness gap between segments and, one the other hand, on the tax gap. Expressions 23 and 24 then lead us to the wage and the complementary health income equations:

$$w_G = \beta\left(\frac{y_G}{1+\tau_G} + \frac{(r+\pi(e^*))cy_G\theta_G}{(r+1)(1+\tau_G)} + \frac{(1-\pi(e^*))cy_B\theta_B}{(r+1)(1+\tau_B)}\right) + (1-\beta)\left(b - C(e^*)\right) \quad (30)$$

$$w_B = \beta\left(\frac{y_B}{1+\tau_B} + \frac{\pi(e^*)cy_G\theta_G}{(r+1)(1+\tau_G)} + \frac{(r+1-\pi(e^*))cy_B\theta_B}{(r+1)(1+\tau_B)}\right) + (1-\beta)\left(b - C(e^*)\right) \quad (31)$$

$$zf_G = \beta\left(\frac{(r+\pi(e^*))cy_G\theta_G}{(r+1)(1+\tau_G)} + \frac{(1-\pi(e^*))cy_B\theta_B}{(r+1)(1+\tau_B)}\right) + (1-\beta)\left(b - zp - C(e^*)\right) \quad (32)$$

$$zf_B = \beta\left(\frac{\pi(e^*)cy_G\theta_G}{(r+1)(1+\tau_G)} + \frac{(r+1-\pi(e^*))cy_B\theta_B}{(r+1)(1+\tau_B)}\right) + (1-\beta)\left(b - zp - C(e^*)\right) \quad (33)$$

2.6 Endogenous taxation and balanced budget

To conclude the presentation of the model, we present the balanced budget. The only difference between the two labor market segments are health risks. We have $\lambda_G \leq \lambda_B$ and $\psi_G \geq \psi_B$. These differences just come from the position characteristics and not from workers. Thus, the absenteeism rate is higher in segment B and thereby the average productivity of these positions is reduced and the unemployment rate is increased.

The existence of public unemployment and health insurances means that firms in segment G indirectly subsidize the firms in segment B. Indeed, some of the expenses generated by firms in segment B is supported by taxes payed by firms in segment G. Thus, in order to internalize these costs, we will assume that the tax system is characterized by two taxes: *(i)* a τ tax charged to all firms and *(ii)* a T tax only charged to firms in the segment B of the market where absenteeism is higher. Therefore, we have $\tau_G = \tau$ and $\tau_B = \tau + T$. The budget constraint is then:

$$\tau = \frac{b(u_G + u_B) + zp(a_G + a_B) - T(w_B l_B + zf_B a_B)}{(w_G l_G + w_B l_B + zf_G a_G + zf_B a_B)} \quad (34)$$

It appears that for a given population and income structure, an increase of T implies a decrease of τ. In the following section, we propose numerical applications to analyze the consequences of modulating contributions depending on the employer's type.

3 CALIBRATION

The reference period in the model is the journey. In France, the absenteeism rate is around 4.5%, which corresponds to 16.5 days of absence per year. We assume that each sick leave lasts 7 days ($\psi_i = 1/7$). In order to reproduce this absenteeism rate, we set $\lambda_G = 1/200$ $\lambda_B = 1/100$. Thus, we assume that the type B positions originates two times the sick leaves caused by type G positions. Production is normalized to $y_i = 1$. Then the differences in productivity between segments are only due to absenteeism. For the calibration, we assume that the experience rating tax T is equal to 0. We retain a conventional calibration for the matching function:

$$M_i(U_i, V_i) = mU_i^{0.5}V_i^{0.5} \quad (35)$$

with $m = 0.01$ and $c = 2$ so as to reproduce an unemployment rate of 12%. The bargaining power β is equal to 0.5 and the interest rate r is set at 0.000125, that is 4.5% annual. Finally, we set $b = 0.5$ and $zp = 0.5$ which reproduces a replacement rate of 60 % and sickness coverage (both public and complementary health insurances) of 78 %. The rate of type G positions is set at 25% before the introduction of the experience rating.

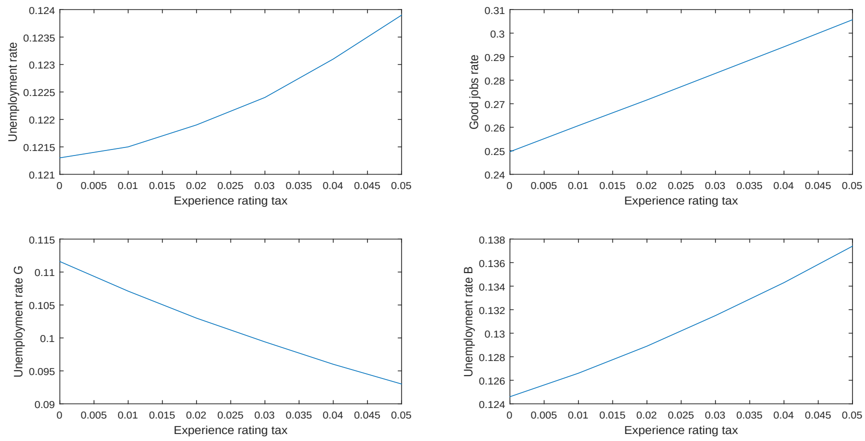
4 MODULATION OF THE EMPLOYER CONTRIBUTIONS

We are now able to study the effects of the employer's modulating contributions based on the mobility of unemployed from one segment to another.

4.1 The lack of mobility

First, we assume that the unemployed workers can not choose the segment in which they are seeking a job. It is equivalent to fix the value of $\Pi(e)$. In this case, the introduction of the experience rating allows to transfer a part of the financial burden from type G jobs to the type B jobs. This is worth a rebalancing since as we said before, imposing the same tax implies that the sick leaves of firms in segment G are subsidized by firms in segment B.

Figure 1: Unemployment in lack of mobility



It appears that when the unemployed can not choose their research effort, the experience rating slightly increases unemployment rate. More specifically, the unemployment rate in segment G decreases due to the lower tax burden. Conversely, the unemployment rate in segment B increases. The latter effect dominates insofar this policy has the effect of increasing the labor market tightness in segment G which already is the tightest. Note that the share of type G individuals increases slightly. This increase is not due to directing research towards segment G, rather it is explained by the fact that the unemployed go out faster to type G jobs than before the experience rating.

The fact that unemployment rate increases does not imply the rejection of this policy. Indeed, graphics 1 and 2 show *(i)* a rise in wages and a reduction of absenteeism rate in segment G. The reduction of the the tax burden in segment G enhances the surplus. Therefore, wages, welfare of workers (that is, their expected consumption) and profit of firms all increase. This implies a more important creation of type G positions relative to type B positions, so that absenteeism decreases. Thereby, the higher unemployment rate in segment B may be interpreted as a substitution from absenteeism by unemployment.

Figure 2: Wages in lack of mobility

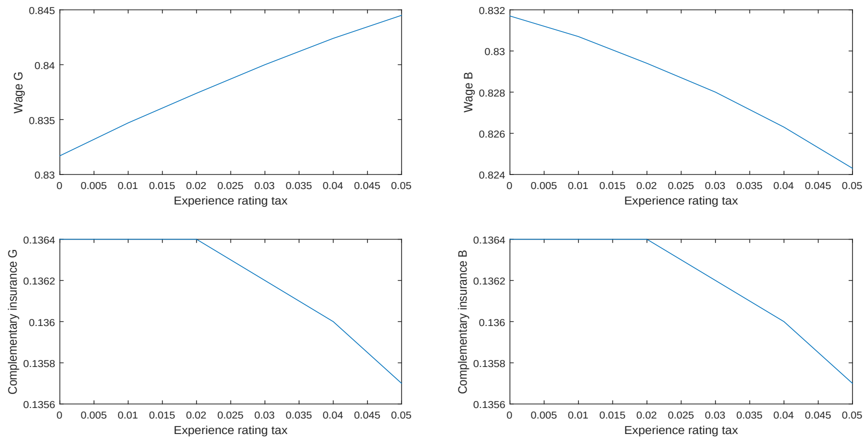
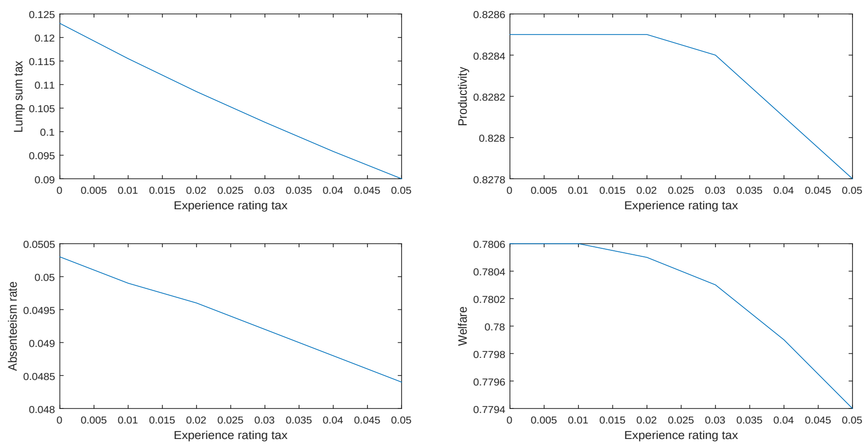


Figure 3: Absenteeism and productivity in lack of mobility



Regardless of destruction of jobs in segment B, both the jobs creation in segment G and the reduction in absenteeism dominate. This is in part explained by our calibration (before the experience rating the market tightness is already heavy in segment G), but also by the fact that unemployed workers are not allowed to direct their job search. However, the increase in wages in segment G together with the falling of wages in segment B should encourage unemployed workers to direct their research towards the segment G. To explore this intuition, in next section the search effort of type G positions is endogeneous.

4.2 The case with mobility: Directed search

Graphics 4 show the different rates of unemployment when the search effort is endogenous, that is when unemployed workers can direct their job search towards any type of jobs. In this case, the unemployment rate in the economy declines. This result is explained by the moving of a portion of workers towards the type G positions. Thus, the share of type G jobs changes from 25% to 75%. This mobility of workers stimulates the creation of many vacancies in segment G without affecting the market tightness in this segment.

Figure 4: Unemployment with mobility

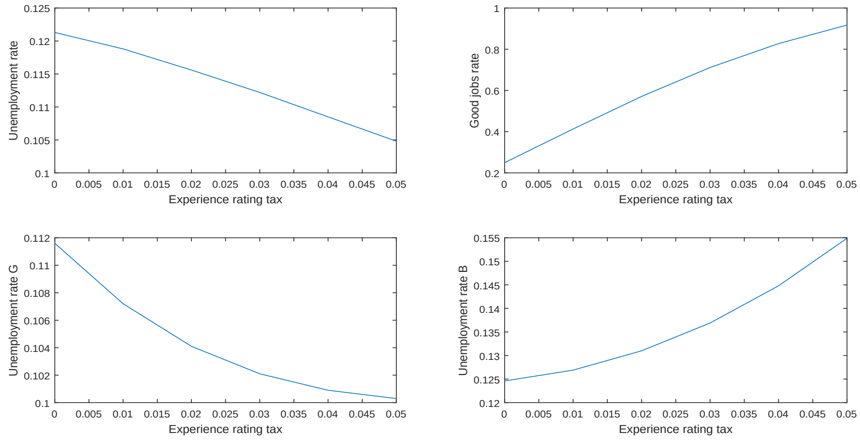


Figure 5: Wages with mobility

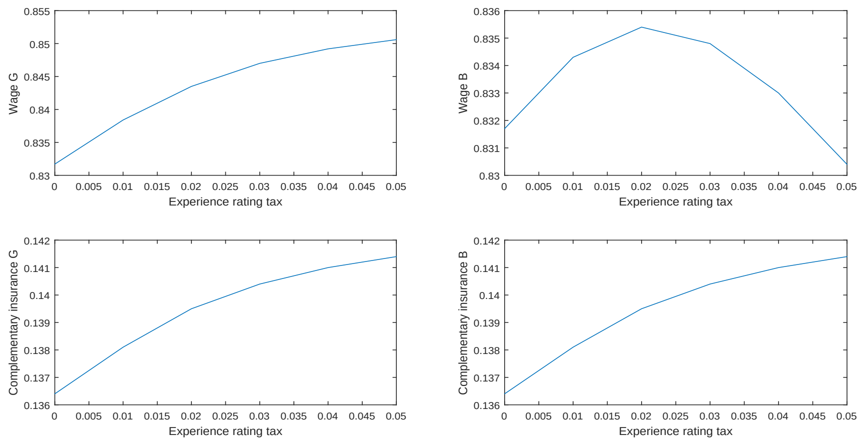
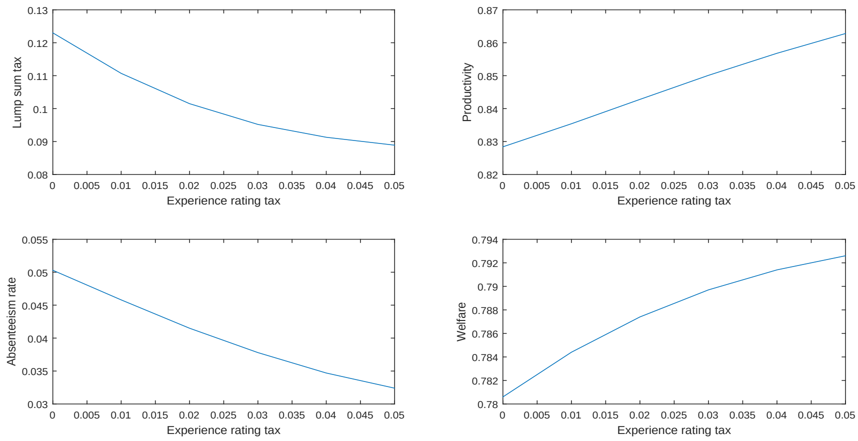


Figure 6: Absenteeism and productivity with mobility



In this context, the experience rating is to make the firms which are responsible of higher absenteeism rates finance the health insurance expenditures. This policy implies a rise in earnings (wages and complementary health benefits) in the segment G where taxation decreases. In parallel, the recomposition of employment permits a better utilization of the labor resource and thus works up productivity. This is in part due to the decline in the unemployment rate (since type of jobs G are more profitable) but also by the lowering of absenteeism rate from 5% to 3.5%. Naturally, this implies an increase in the welfare of workers which in our model is measured as the expected consumtion each period.

4.3 Public health insurance vs Complementary private health insurance

The issues discussed in the previous sections are based on the existence of sick leaves financed by all firms. Firms in segment B pass over firms in segment G part of the health spending which they are responsible for. Moreover, universal social protection allows the unemployed workers to accept jobs with higher risks for health. However, we have seen that firms offered complementary health insurance. Indeed, absenteeism is associated with a positive surplus as it prevents the company from finding a new worker and the worker from finding a new job. Thus, the lack of public insurance does not mean the lack of social protection. Substituting public insurance by a complementary health insurance financed by firms may be a way to reduce the externalities between the two segments.

Figure 7: Public insurance and unemployment

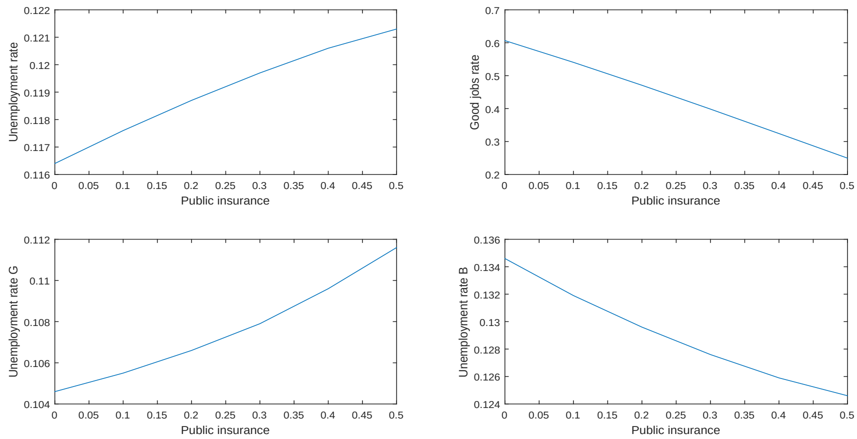


Figure 8: Public insurance and earnings

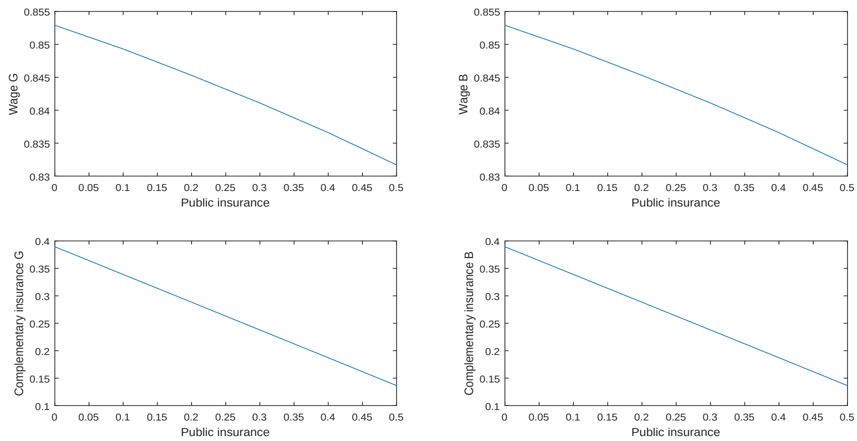
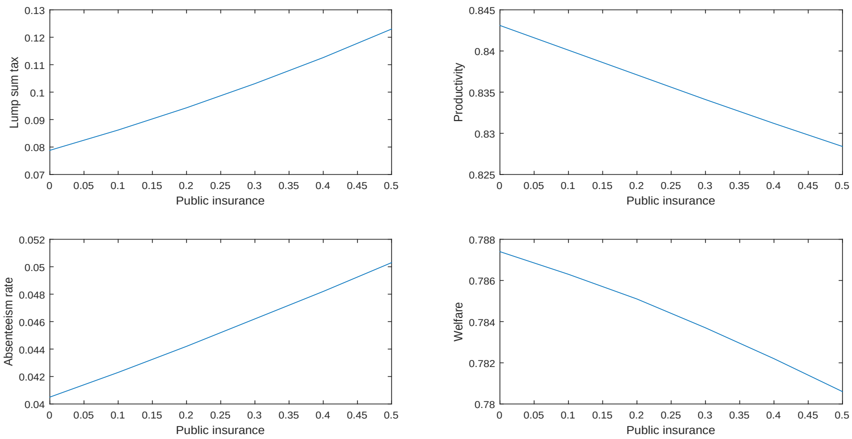


Figure 9: Public insurance and productivity



Graphics 7 show the effects of the amount of daily allowances on the unemployment rate. It clearly appears that an increase in compensation leads to an increase in global unemployment. Daily allowances indirectly subsidize the posts with high health risks. Thus, we note that an increase in allowances is accompanied by an increase in the number of type B positions and by a reduction of the unemployment rate in this segment.

This policy is therefore accompanied by a decline in productivity due to a change in the structure of employment in favor of segment B. In parallel, the financing of allowances involves higher taxes. Thus, the surplus generated by the creation of an occupied job decreases, which results in a reduction in both remuneration (wages or complementary health benefits) and profits. Then welfare is decreasing with respect to the amount of daily allowances. This comes from the fact that the lack of indemnities does not mean the lack of insurance coverage since firms propose a complementary health insurance. Reductions in public insurance are offset by increases in the complementary health insurance.

We note that in the absence of public benefits, the amount of complementary benefits is 0.39, which is 45% of wage. However, this value still remain lower than the benchmark equilibrium value where the level of social protection (public insurance and complementary insurance) reached 75% of wage. Thus, in terms of welfare, the experience rating remains more efficient than the privatization of social protection. It allows to reach high levels of productivity (85.25 for $T = 0.05$ *vs.* 84.5 for $zp = 0$) in order to fund a more generous health coverage.

5 CONCLUSION

In this article, we focus on the modulation of employers' social contributions for health insurance. This system already exists in the United States to finance unemployment insurance. It is based on the idea that some companies may externalize some of their costs toward the social system. In our model economy, firms may create risky positions by making other firms bear part of their cost due to absenteeism via the public health insurance. We then show that the modulation of employers' social security contributions based on the firm's absenteeism rates allows to improve economic productivity by limiting externalities. Furthermore, the experience rating promotes the creation of high productivity jobs with low absenteeism rates. This improvement in economic productivity allows to maintain a generous health coverage, which is more favorable to the welfare of workers than the privatization of the health insurance system.

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