Economics Bulletin

Volume 29, Issue 2

Job-Search Effort, Retirement Decision and Pension Reform: A Wage Bargaining Investigation

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Abstract

This paper studies the impact of wage bargaining on endogenous labor market participation of older workers and revisits the effects of pension reforms. Our main contribution to the literature on retirement is to show that in the context of wage flexibility, when wages are bargained, the financial gain associated with the incentive schemes to delay retirement is shared between workers and firms. In contrast, previous works on actuarially fair pension policy conventionally assume that these incentives are exclusively received by workers. Then, our model emphasizes the positive effects of incentives to delay retirement when the bargaining power of workers is positive. These incentive schemes do not only encourage employed individuals to delay their retirement, but also make searching more attractive to non-employed workers.

Citation: Fouad Khaskhoussi, (2009) "Job-Search Effort, Retirement Decision and Pension Reform: A Wage Bargaining Investigation", *Economics Bulletin*, Vol. 29 no.2 pp. 1255-1263.
Submitted: Apr 22 2009. **Published:** June 03, 2009.

1 Introduction

The primary goal of this paper is to study the impact of wage bargaining on the efficiency of pension reforms aimed at delaying the retirement age by introducing incentives to work longer. The originality of our analysis is to take into account the interaction between labor market frictions and endogenous retirement decision. To that end, we use a life-cycle job-search model in line with Hairault, Langot and Sopraseuth (2009) and simultaneously include skill and age as important dimensions of heterogeneity across workers. But, in addition we consider Nash bargaining of wages.

First, we examine the interaction between the job-search effort and the retirement age, both endogenous, taking into account all labor market transitions. Secondly, a pension reform is examined in the presence of wage bargaining. We firstly find that job-search effort and retirement age decisions are interdependent and positively related. Indeed, when the retirement age gets closer, the horizon over which the workers can recoup their job-search investments is reduced, and, thus, the non-employed workers reduce their job-search intensity. Conversely, the longer the distance to retirement, the higher the discount sum of surplus related to employment, and, thus, the larger will be the returns on job-search investments. Secondly, we show that the labor market participation decisions of older workers are crucially affected by their skill and the degree of redistribution of the pension system. In line with Cremer, Lozachmeur and Pestieau (2004), we find that the retirement age increases with the worker's skill.

More importantly, our model reveals a direct influence of wage bargaining on the worker's retirement decision. A higher bargaining power gives more incentives to search for jobs after the early retirement age. Hence, wage bargaining can significantly affect the implications of pension reforms. Our results confirm this intuition : in the context of wage flexibility, wage bargaining leads workers and firms to share the incentive schemes to delay retirement. Indeed, when bargaining takes place, the firm realizes that having a job today implies additional benefits to the employee ; this leads firms to extract part of this surplus.

Finally, our model emphasizes the positive effects of incentives to delay retirement when the bargaining power of workers is positive. This scheme does not only encourage employed workers to keep their jobs and remain employed for a long time, but also makes searching more attractive to non-employed workers after the full rate age.

2 The model

We consider an economy with labor market frictions, endogenous job-search and retirement decisions and a finite horizon of 3 periods. There is no labor force growth in the economy. The economy is populated by two types of agents, workers and firms. We suppose that workers differ with respect to their individual skill denoted h_j which is uniformly distributed over $[h_{min}, h_{max}]$.

At the beginning of period 1, all individuals have the right to retire so that they can choose to get retired or remain in the labor force. We also abstract from a number of details of the pension and fiscal systems, in particular contributions and penalties for an insufficient number of contributive years. Another equivalent assumption would be that we consider only workers with the right to full pension. The maximum (i.e, the mandatory) retirement age corresponds to the end of period 2. The *effective* retirement age is however endogenous and *freely* decided by workers, and it is perfectly observable by employers.

There is no on-the-job search in the economy. At each period, firms and unemployed workers have at most one opportunity to meet and match. Furthermore, we assume that if a new job is matched with a worker of age i, production takes place in period $i+1$. While the contact rate λ between searchers and firms is assumed to be exogenous, the probability, π_{ij}, that jobless individuals transit to employment, however, will depend directly on the intensity with which individuals search for jobs, e_{ij}. We make the simplifying assumption that π_{ij} can be expressed as the product of the contact rate and the worker's search effort : $\pi_{ij} = \lambda e_{ij}$. We assume that $\pi_{ij} \in [0,1]$ for $e_{ij} \in [0, \infty[$. On the other hand, jobs may be exogenously destroyed at the end of each period with probability δ. The time preference rate is denoted β. Finally, it is assumed that agents do not have access to financial markets.

2.1 The workers' behavior

Individuals maximize their expected lifetime utility by choosing their labor market state and the intensity of search if not employed. Disutility associated with search effort is measured by a search cost function that increases with the intensity of search : $C(e_{ij}) = \mu \frac{e_{ij}^{\eta}}{\eta}$, where $\eta > 1$ is the elasticity of search costs with respect to search effort and $\mu > 0$ is a parameter capturing the disutility of search effort. We suppose that all non-employed individuals receive a constant pension p_j given by :

$$p_j = \rho(\alpha \overline{h} + (1-\alpha) h_j) \quad \text{with} \quad 0 < \alpha, \rho < 1$$

where $\overline{h}$ denotes the average skill of the economy, ρ denotes the replacement rate and α measures the degree of redistribution of the pay-as-you-go (PAYG) system. With the Beveridgian system ($\alpha = 1$), all workers receive the same pension $p = \rho \overline{h}$. Conversely, benefits according to the Bismarckian system ($\alpha = 0$) are completely indexed on the worker's skill at rate ρ.

For $i = 3$: All individuals of age 3 are retirees and receive their pension benefits. At the end of this period, they die. Let $\mathcal{R}_{ij}$ be the value of a retired worker of age i and skill h_j. Then :

$$\mathcal{R}_{3j} = p_j \tag{1}$$

For $i = 2$: At the start of this period, all workers are eligible to full pension benefits and can choose to stay active or to retire from the labor force. Old workers may begin the period either employed or non-employed. At that time, employees must decide either to keep working or to retire. Non-employed workers choose whether to search for jobs or not. Let

$\mathcal{W}_{ij}$ and $\mathcal{U}_{ij}$ denote the values of employed and non-employed workers. These values solve :

$$\mathcal{W}_{2j} = w_{2j} + \beta \mathcal{R}_{3j} \tag{2}$$

$$\mathcal{U}_{2j} = \max_{e_{2j}} \left\{ p_j - C(e_{2j}) + \beta \mathcal{R}_{3j} \right\} \tag{3}$$

$$\mathcal{R}_{2j} = p_j + \beta \mathcal{R}_{3j} \tag{4}$$

<u>For $i = 1$:</u> As in period 2, workers of age 1 can choose between one of the three labor states : employment, retirement or search. The value of employment for a worker is given by :

$$\mathcal{W}_{1j} = w_{1j} + \beta \left\{ (1-\delta) \max\{\mathcal{W}_{2j}, \mathcal{R}_{2j}\} + \delta \max\{\mathcal{U}_{2j}, \mathcal{R}_{2j}\} \right\} \tag{5}$$

An employed worker receives a current wage w_{1j}. With probability δ, jobs are exogenously destroyed in the end of this period, in which case workers transit to non-employment and receive their total pension benefits. They choose whether to search for jobs, and getting the associated utility $\mathcal{U}_{2j}$, or become retiree, and getting the associated utility $\mathcal{R}_{2j}$. With probability $1-\delta$ they keep their jobs. In that case, they have the option to retire immediately or to continue their employment for one more period.

The expected lifetime utility for an old worker who begins the period non-employed and continues searching (i.e, pays search costs) writes as :

$$\mathcal{U}_{1j} = \max_{e_{1j}} \left\{ p_j - C(e_{1j}) + \beta[\pi_{1j} \max\{\mathcal{W}_{2j}, \mathcal{R}_{2j}\} + (1-\pi_{2j}) \max\{\mathcal{U}_{2j}, \mathcal{R}_{2j}\}] \right\} \tag{6}$$

Individuals who are successful in finding jobs, with the probability π_{1j}, can transit to employment in the following period. However, those who remain non-employed continue to collecte their pension benefits and can continue to search. Finally, the value associated to a retiree is given by :

$$\mathcal{R}_{1j} = p_j + \beta \mathcal{R}_{2j} \tag{7}$$

2.2 The Firms' behavior

Each firm employs only one worker. If the job is filled, the firm earns a positive profit denoted by Π_{ij}. When the job destroyed, this profit becomes zero. The value of a job filled with a worker of age 2 and skill j is defined as :

$$\Pi_{2j} = h_j - w_{2j} \tag{8}$$

This expression shows that a job filled with a worker of age 2 lasts only one period because retirement becomes mandatory in the following period. Then, taking into account the fact that currently employed workers of age 1 have the choice to retire in the next period, the value of a filled job writes as follows :

$$\Pi_{1j} = h_j - w_{1j} + \beta \psi_j (1-\delta) \Pi_{2j} \tag{9}$$

where ψ_j is a parameter equal to unity when the employed worker decides to stay active in the following period and zero otherwise. Interestingly, equation (9) shows that the value of a filled job is crucially determined by its expected duration. The earlier the retirement age, the shorter the time horizon during which a firm can obtain revenues and then the lower the value of a filled job[1].

3 Labor market decisions and wage determination

We assume that wages are determined by the Nash solution to a bargaining problem. Let $\gamma \in [0,1]$ denote the bargaining power of workers, considered as constant across ages. Let S_{ij}^W and S_{ij}^F denote the values of the surplus of workers and firms respectively[2], we have :

$$S_{ij}^F = \Pi_{ij} \quad \text{and} \quad S_{ij}^W = \mathcal{W}_{ij} - \max\{\mathcal{U}_{ij}, \mathcal{R}_{ij}\} \quad \text{for} \quad i = 1, 2$$

Nash bargaining implies that the total surplus is shared by the firm and the worker according to the following rule : $(1-\gamma)S_{ij}^W = \gamma S_{ij}^F$.

<u>For $i = 2$:</u> Let us first characterize the job-search decision. For a given wage, equation (3) allows us to deduce the following optimal decision for job-search intensity :

$$e_{2j}^* \;\; = \;\; 0 \;\; \forall j \tag{10}$$

This equation implies that there are no workers who search for jobs in period 2. The interpretation of this result is intuitive. Indeed, because retirement becomes mandatory at age 3, the non-employed worker of age 2 has no interest to continue searching.

Proposition 1. *At age 2, only employed individuals can choose to delay retirement. So, all workers face a single choice : keep job or retire.*

Then, we deduce the following expression for the wage :

$$w_{2j} \;\; = \;\; \gamma h_j + (1-\gamma) p_j \tag{11}$$

The wage equals the a weighted average of the worker's productivity and the flow of her outside option (the retirement value).

<u>For $i = 1$:</u> Let us first consider the case when : $\mathcal{R}_{1j} = \max\{\mathcal{U}_{1j}, \mathcal{R}_{1j}\}$. We deduce the following wage function :

$$w_{1j} \;\; = \;\; \gamma h_j + (1-\gamma) p_j \tag{12}$$

[1] See Chéron, Hairault and Langot (2008), Langot and Moreno-Galbis (2008).

[2] We note here that, in order to determine the wage function, we firstly suppose that the value of employment is higher than the value of retirement.

It is important to note that this wage value is the same as in (11). In fact, if individuals have only the option to retire immediately or to stay employed, their threat point is the same at each period beyond the early retirement age. Then, workers choose to work after the full rate only and only if : $\gamma h_j + (1-\gamma)p_j > p_j$.

PROPOSITION 2. *There exists a critical skill level such that all workers with skill below this value choose to retire at the beginning of period 1 (low-skilled workers of type "L"). This critical level is defined as :*

$$h^{early} = \frac{\rho\alpha\overline{h}}{1-(1-\alpha)\rho} \tag{13}$$

This critical skill is independent of the bargaining power of workers. It is however crucially affected by the pay-as-you-go system. Indeed, it is straightforward to show that $\frac{\partial h^{early}}{\partial \rho} > 0$ and $\frac{\partial h^{early}}{\partial \alpha} > 0$, which means that the fractions of individuals who choose to retire at the full rate age increases with the generosity and the redistributivity of pension systems.

Then, workers who find optimal to work after the full rate age, i.e, those with skill $h_j > h^{early}$ (high-skilled workers of type "H"), but are non-employed must decide whether to continue searching or to leave the labor force. It follows that the optimal job-search effort is given by :

$$C'(e_{1j}^{H}) \equiv \mu(e_{1j}^{*H})^{\eta-1} = \beta\lambda[\mathcal{W}_{2j}^{H} - \mathcal{R}_{2j}^{H}] \tag{14}$$

Equation (14) shows that the marginal disutility of job search activity (the left hand side) is equal to its expected return (the right hand side), which is captured by the gap between employment and retirement at age 2. This equation can be rewritten as :

$$e_{1j}^{*H} = \left[\frac{\beta\lambda\gamma[h_j(1-(1-\alpha)\rho) - \rho\alpha\overline{h}]}{\mu}\right]^{\frac{1}{\eta-1}} \tag{15}$$

This equation shows that the job-search effort increases with the skill level (h_j), the bargaining power of workers (γ), the contact rate (λ) and the degree of indexation of the pension on worker's skill (ρ). However, it decreases with the disutility of search (μ). Finally, the wage is given in this case by :

$$w_{1j}^{H} = \gamma(h_j + \beta\pi_{1j}^{H}\Pi_{2j}^{H}) + (1-\gamma)(p_j - C(e_{1j}^{H})) \tag{16}$$

This wage function shows that workers of age 1 can expect that their jobs will last beyond one period and negotiate higher wages. Indeed, if the employment relationship is not exogenously destroyed with probability δ, workers remain in their jobs, then the value of current filled jobs for firms is more than just the instantaneous surplus $(h_j - w_{1j}^{H})$. Workers are able to extract a share of that expected surplus which is reflected by the term $\gamma\pi_{1j}^{H}\Pi_{2j}^{H}$ in equation (16).

PROPOSITION 3. *All non-employed workers with skill above the critical value h^{early} stay active and continue searching at age 1.*

4 The impact of pension reform

Let us now introduce a pension reform aimed at delaying retirement. This reform consists in giving individuals who work beyond the full rate age a fraction κ of their pension benefits (κ provides a measure of the actuarially fairness of the pension system). This means that only currently employed workers are eligible for these incentives, non-employed workers who continue searching after the full retirement age, however, do not receive any incentive transfer.

<u>For $i = 3$:</u> The introduction of incentives does not modify the value of retirement which is the same as the case without incentive policy :

$$\mathcal{R}^s_{4j} = p_j \quad \text{for} \quad s = L, H \tag{17}$$

<u>For $i = 2$:</u> Remember that only workers of type "H" can be employed and that there is no job search at this age, the values of employed and retired workers become :

$$\widehat{\mathcal{W}}^H_{2j} = \widehat{w}^H_{2j} + \kappa p_j + \beta \mathcal{R}^H_{3j} \tag{18}$$
$$\mathcal{R}^s_{2j} = p_j + \beta \mathcal{R}^s_{3j} \quad \text{for} \quad s = L, H \tag{19}$$

Equation (18) shows that the instantaneous value for employed workers is greater than their current labor market income. Indeed, they receive a total income denoted $\widehat{\Omega}^H_{2j} = \widehat{w}^H_{2j} + \kappa p_j$. Then, we can deduce the following wage function :

$$\widehat{w}^H_{2j} \quad = \quad \gamma h_j + (1-\gamma)(1-\kappa) p_j \tag{20}$$

The introduction of incentives to work longer leads to a decrease in wages. Indeed, the reservation wage which is defined as : $(1-\kappa)p_j$, shows that the employer must compensate the worker for the part of the retirement benefits which is not adjusted in an actuarially fair way $((1-\kappa)p_j)$.

Proposition 4. *The critical skill level from which workers with a skill level bellow it exit the labor force at the full rate age becomes :*

$$\widehat{h}^{early} \quad = \quad \frac{\rho\alpha(1-\kappa)\overline{h}}{1-(1-\alpha)(1-\kappa)\rho} \tag{21}$$

This equation shows that the introduction of incentive schemes make employment more attractive for a larger number of workers as $\widehat{h}^{early} < h^{early}$. The fraction of individuals who prefer to remain active after the full rate age increases with the parameter κ, i.e, the value of incentive benefits. Finally, given equation (20), we deduce :

$$\widehat{\Omega}^H_{2j} = \widehat{w}^H_{2j} + \kappa p_j \equiv w^H_{2j} + \gamma\kappa p_j \tag{22}$$

The term $\gamma\kappa p_j$ represents the value of incentive benefits *really* obtained by individuals who work after the full rate age compared to the situation without incentives, Indeed, since the incentives represent an additional revenue that workers obtain from working, when bargaining, firms *naturally* extract a fraction of this additional revenue by paying them lower wages. Then, we can verify that : $\widehat{\Pi}^H_{2j} = \Pi^H_{2j} + (1-\gamma)\kappa p_j$.

For $i = 1$ **:** At this age, individuals are classified in one of three labor states ; employed, retired (all workers of type "L") or non-employed who search for jobs. We have :

$$\widehat{\mathcal{W}}^H_{1j} = \widehat{w}^H_{1j} + \kappa p_j + \beta\left\{(1-\delta)\widehat{\mathcal{W}}^H_{2j} + \delta\mathcal{R}^H_{2j}\right\} \tag{23}$$

$$\mathcal{R}^L_{1j} = p_j + \beta\mathcal{R}^L_{2j} \tag{24}$$

$$\widehat{\mathcal{U}}^H_{1j} = p_j - C(\widehat{e}^H_{1j}) + \beta\left\{\widehat{\pi}_{1j}\widehat{\mathcal{W}}^H_{2j} + (1-\widehat{\pi}^H_{1j})\mathcal{R}^H_{2j}\right\} \tag{25}$$

Then, we can deduce the following results :

$$\mu(\widehat{e}^{*H}_{1j})^{\eta-1} = \beta\lambda[\widehat{\mathcal{W}}^H_{2j} - \mathcal{R}^H_{2j}] \equiv \beta\lambda[\mathcal{W}^H_{2j} + \gamma\kappa p_j - \mathcal{R}^H_{2j}] \tag{26}$$

$$\widehat{w}^H_{1j} = \gamma(h_j + \beta\widehat{\pi}^H_{1j}\widehat{\Pi}^H_{2j}) + (1-\gamma)[(1-\kappa)p_j - C(\widehat{e}^H_{1j})] \tag{27}$$

From equation (26), it can easily be shown that incentives to work longer, which create a gap between employment and retirement, positively affects the job-search intensity of workers who continue searching after the full rate age.

5 Conclusion

This paper aims at examining the effects of pension reforms taking into account the presence of labor market frictions. Contrarily to a large number of studies on pension reforms which assume that individuals receive the total value of financial incentives for delayed retirement, our approach reveals that, in a context with wage bargaining, firms *naturally* extract a part of these financial incentives. As a borderline case, it clearly appears that when the bargaining power of workers is equal to zero, firms receive the total value of these incentives. Finally, for a positive bargaining power of workers, our model emphasizes the fact that incentives schemes not only encourage employed individuals to keep their jobs, but also make searching more attractive to non-employed workers.

However, something is missing in our approach. We believe that under wage bargaining, pension reforms would positively affects the labor demand of older workers. Indeed, since wage bargaining allows firms to extract a part of financial incentives to delay retirement, this gives firms incentives to increase (reduce) hiring (firing) of older workers. In order to evaluate the aggregate impact of pension reforme, it should be interesting to simultaneously introduce both labor supply and labor demand of older workers. In that context, we think that it is important to take into account the impact of wage rigidity, in particular the existence of a minimum wage. Our framework will be extended in that way.

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