Centre de Recherche en Économie et Management
Center for Research in Economics and Management

University of Caen

University of Rennes 1

Multi-Levels Bargaining and Efficiency in Search Economies

Olivier Lharidon

University of Rennes 1, CREM-CNRS

Franck Malherbet

École Polytechnique, IZA and fRDB

November 2011 - WP 2011-24

Working Paper

Multi-Levels Bargaining and Efficiency in Search Economies *

Olivier l'Haridon[†] and Franck Malherbet[‡]

November 8, 2011

Abstract

In this note, we extend the traditional search and matching framework to take account of the different levels at which negotiations may take place. We show that, in the absence of any distortion, sector-level bargaining ought to be less efficient than bargaining taking place at the other levels. This type of inefficiency leaves room for labor market policies. We show that a well designed combination of employment protection, hiring subsidy and payroll tax is able to restore efficiency. In addition, this result suggests that the relationship between the labor market performance and the level at which bargaining takes place is conditional on labor market institutions.

Keywords: Search and Matching Models, Bargaining Levels, Labor Market Policies
JEL Code: J51 - J60

1 Introduction

Search-matching models of unemployment have become the workhorse for studying aggregate labor markets. In this theoretical note, we extend this framework to take account of a neglected salient feature of European countries, *ie.* the levels at which negotiations take place[1].

2 The model

The economy is made up of J sectors indexed by the subscript $j = 1...J^2$. Each sector produces a different good in quantity y_j. There is a continuum of small firms in perfect competition, the number of which is endogenous in equilibrium. Firms have a single job slot and either produce with one worker, or search with an open vacancy. Each job is endowed with an irreversible production technology requiring one unit of labor to produce ε units of output. The productivity of a job moves according to a stochastic process which is Poisson with arrival rate λ. This process consists in drawing a new value of ε from a CDF $G(.)$ with support in the range $[\varepsilon_l, \varepsilon_u]$. The job destruction rate is given by $\lambda G(\varepsilon_{d_j})$ where ε_{d_j} is the endogenous threshold value of the productivity below which the match is destroyed. All agents discount future payoffs at rate, $r > 0$, and are risk neutral. Each worker supplies one unit of labor and can be either employed and producing or unemployed and searching. The aggregate consumption c_i of agent i is a CES type function of the different goods j produced, and represents a composite good

*We would like to thank Pierre Cahuc for insightful comments.
†CREM-University Rennes-1, Greg-HEC and Institut Universitaire de France. Email: lharidon@greg-hec.com
‡Ecole Polytechnique, IZA and fRDB. Email: f.malherbet@gmail.com
[1] The only exception we are aware of is Delacroix (2006).
[2] For the remainder of the paper, a variable indexed with the letter j refers to the sector j.

which price is normalized to unity. The instantaneous utility of agent i verifies $\phi(c_i) = c_i = J^{\frac{1}{1-\sigma}} \left[\sum_{j=1}^{J} c_{ji}^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}$, where $\sigma > 1$ is the elasticity of substitution among goods.

The labor market is perfectly segmented. In each sector j, matching is frictional and is captured by a function $m(v_j, u_j)$ where v_j and u_j stand for the total mass of unemployed workers and the total mass of vacancies respectively. This function is increasing in both its arguments, concave and homogeneous of degree one. Let $\theta_j = v_j/u_j$ denote the labor market tightness. The rate at which vacant jobs are filled and at which unemployed workers find a job are respectively given by $m(v_j, u_j)/v_j = m(\theta_j) \equiv \mu(\theta)$ and $m(v_j, u_j)/u_j = \theta_j m(\theta_j) \equiv q(\theta)$, with $\mu(\theta)^{'} < 0$ and $q(\theta)^{'} > 0$.

Unemployment and Production Flows: The laws of motion for unemployment and production are given by:

$$\dot{u_j} = \lambda G(\varepsilon_{d_j})(1-u_j) - \theta_j m(\theta_j) u_j \tag{1}$$

$$\dot{y_j} = \theta_j m(\theta_j) u_j \varepsilon_u + \lambda(1-u_j)\int_{\varepsilon_{d_j}}^{\varepsilon_u} \zeta dG(\zeta) - \lambda y_j \tag{2}$$

The labor market in each sector is in equilibrium when the stock-flow condition for constant unemployment holds. The equilibrium unemployment rate in sector j reads:

$$u_j = \frac{\lambda G(\varepsilon_{d_j})}{\theta_j m(\theta_j) + \lambda G(\varepsilon_{d_j})} \tag{3}$$

3 Labor Market Equilibria and Properties

We consider three levels of negotiation; *(i)* a completely decentralized bargaining level; *(ii)* an intermediate sector bargaining level; and finally *(iii)* a completely centralized bargaining level.

Decentralized Bargaining

The bargaining involves a single worker and a single firm. There is no coordination between agents and the relative prices, p_j, are considered as given. The wage is determined according to a generalized Nash criterion and the model boils down to the two traditional job creation and job destruction equations:

$$\frac{\gamma}{m(\theta_j)} = [1-\beta]\left(\frac{\varepsilon_u - \varepsilon_{d_j}}{r+\lambda}\right) p_j, \tag{JCD}$$

$$p_j \varepsilon_{d_j} = z + \frac{\beta}{1-\beta}\theta_j \gamma - p_j \frac{\lambda}{r+\lambda}\int_{\varepsilon_{d_j}}^{\varepsilon_u} (\zeta - \varepsilon_{d_j}) dG(\zeta), \tag{JDD}$$

where β stands for the bargaining power of the worker and γ is a search flow cost. In a symmetric Nash equilibrium, all sectors are *ex-post* identical and the relative prices are all equal to one.

Sector Level Bargaining

As in Cahuc and Zylberberg (2004), we assume that the agents are able of coordinating their actions in order to draw up efficient contracts. In each sector, the workers and the firms commit themselves to maximize the net surplus of the sector subject to (1) and (2) and considering the actions of the agents in the other sectors as given. Once maximized, the rent is redistributed among firms and workers thanks to lump-sum transfers. The net instantaneous output in sector j is the real value of production minus the vacancy costs. The program of the coalition reads:

$$\underset{\theta_j,\ \varepsilon_{d_j}}{Max}\ \Omega_j = \int_0^{\infty} e^{-rt}(p_j y_j + u_j z - \theta_j u_j \gamma)dt, \tag{4}$$

subject to (1) and (2). The equilibrium values of the productivity threshold ε_{d_j} and the labor market tightness θ_j satisfy:

$$\frac{\gamma}{m(\theta_j)} = [1-\eta(\theta_j)]\left(\frac{\varepsilon_u - \varepsilon_{d_j}}{r+\lambda}\right) p_j \frac{\sigma - 1}{\sigma}, \tag{JCS}$$

$$p_j \varepsilon_{d_j} = \frac{\sigma}{\sigma - 1}\left(z + \frac{\eta(\theta_j)}{1-\eta(\theta_j)}\theta_j \gamma\right) - p_j \frac{\lambda}{r+\lambda}\int_{\varepsilon_{d_j}}^{\varepsilon_u} \left(\zeta - \varepsilon_{d_j}\right) dG(\zeta), \tag{JDS}$$

where $\eta(\theta_j)$ is the elasticity of the matching function with respect to unemployment. In a symmetric Nash equilibrium the sectors are all alike and the relative prices are equal to unity, hence $p_j = 1,\ \forall j = 1...J$.

Centralized Bargaining

All the agents in all sectors coordinate each other so as to maximize the economy-wide net output. Restricting ourselves to a symmetric solution, we can directly set $p_j = 1$. All sectors being similar, the problem of the centralized coalition is equivalent to maximize (4) with $p_j = 1$ subject to (1) and (2). We get two equations that are similar to the one found in Pissarides (2000, chapter 8) and that define the socially efficient values of the labor market tightness and the reservation productivity:

$$\frac{\gamma}{m(\theta_j)} = [1-\eta(\theta_j)]\left(\frac{\varepsilon_u - \varepsilon_{d_j}}{r+\lambda}\right), \tag{JC^*}$$

$$\varepsilon_{d_j} = z + \frac{\eta(\theta_j)}{1-\eta(\theta_j)}\theta_j \gamma - \frac{\lambda}{r+\lambda}\int_{\varepsilon_{d_j}}^{\varepsilon_u} \left(\zeta - \varepsilon_{d_j}\right) dG(\zeta). \tag{JD^*}$$

The three sets of job creation and job destruction conditions defined above determine three different labor market outcomes. Remarking that the centralized case is by nature efficient, it seems natural to use it as a benchmark. The following properties shed light on the connection between the different cases.

Proposition 3.1 *A decentralized equilibrium is efficient if, and only if, $\beta = \eta(\theta_j)$. This is the traditional Diamond-Hosios-Pissarides condition.*

Proof : Straightforward by comparing (JCD) and (JC^*), and (JDD) and (JD^*) with $\beta = \eta(\theta_j)$ at the symmetric Nash equilibrium. There is thus an unique share of the surplus that makes firms open and close the efficient number of jobs.

Corollary : Distant from this condition, a decentralized equilibrium is not efficient. Job creation can be either above the efficient level (if $\beta < \eta(.)$) or below the efficient level (if $\beta > \eta(.)$) but job destruction is always too low. There is therefore no explicit justification for employment protection.

Proposition 3.2 *A sector level equilibrium is efficient if, and only if, $\sigma \to \infty$.*

Proof : Straightforward by comparing (JCS) and (JC^*), and (JDS) and (JD^*) with $\sigma \to \infty$ at the symmetric Nash equilibrium. In this case, the economy boils down to the conventional single sector case.

Sector-level bargaining entails inefficiencies. The first best solution consists in increasing competition among sectors so as to reach an efficient equilibrium. Taking monopoly power as given, a second best approach is to use labor market policies to correct for these inefficiencies.

4 Labor market policies and efficiency

Three policy instruments are now considered. For a given sector, the net instantaneous production is now made up of the positive and negative transfers associated with labor market policies which consist in the subsidies, H, given to the firms for the $\theta_j m(\theta_j) u_j$ new matches, the firing costs, F, paid by the firms for the $(1-u_j)\lambda G(\varepsilon_{d_j})$ jobs destroyed, and the taxes, τ, charged on the $(1-u_j)$ productive job-worker matches. Furthermore, and to avoid any additional distortion, firms are granted a transfer equal to $(1-u_j)rH$ which is meant to take account of the welfare loss associated with the implementation of labor market policies. The economy-wide budget constraint verifies:

$$\sum_{j=1}^{J} \left[\theta_j m(\theta_j) u_j H + (1-u_j) rH\right] = \sum_{j=1}^{J} \left[(1-u_j)\tau + (1-u_j)\lambda G(\varepsilon_{d_j}) F\right] \tag{5}$$

Otherwise stated, the subsidies and the debt's reimbursement are financed thanks to –lump-sum– taxation and firing costs. However, at the sector-level the constraint (5) is irrelevant and the effects of labor market policies are only partially internalized by the workers and the firms' coalition. It follows that the maximisation problem faced by a given sector writes[3]:

$$\underset{\varepsilon_{dj},\ \theta_j}{Max}\ \Omega_j = \int_0^{\infty} e^{-rt} \left[\begin{array}{c} p_j y_j + u_j z - \theta_j u_j \gamma + \theta_j m(\theta_j) u_j H + (1-u_j) rH \\ -(1-u_j)\tau - (1-u_j)\lambda G(\varepsilon_{d_j}) F \end{array} \right] dt, \tag{6}$$

subject to (1) and (2). This program entails:

$$\frac{\gamma}{m(\theta_j)} = [1-\eta(\theta_j)] \left(\frac{\varepsilon_u - \varepsilon_{d_j}}{r+\lambda} p_j \frac{\sigma-1}{\sigma} + H - F \right), \tag{7}$$

$$p_j \varepsilon_{d_j} = \frac{\sigma}{\sigma-1} \left[z + \tau + \frac{\eta(\theta_j)}{1-\eta(\theta_j)} \theta_j \gamma - r(H+F) \right] - p_j \frac{\lambda}{r+\lambda} \int_{\varepsilon_{d_j}}^{\varepsilon_u} \left(\zeta - \varepsilon_{d_j}\right) dG(\zeta). \tag{8}$$

In a symmetric Nash equilibrium all sectors are *ex-post* similar and $p_j = 1$. The efficient economic policy consists in finding the triplet (τ, H, F) that allows the sector-level equilibrium defined by (7) and (8) to reach the efficient decentralized equilibrium defined by (JC^*) and (JD^*). By identification and assuming a balanced budget constraint, the optimal policy vector is given by (9), (10) and (11).

$$rF = \underbrace{\frac{1}{\sigma} \lambda G(\varepsilon^*_{d_j}) \left(\frac{\varepsilon_u - \varepsilon^*_{d_j}}{r+\lambda} \right)}_{Fiscal\ \ Distortion} + \underbrace{\frac{1}{\sigma} \left(z + \frac{\eta(\theta^*_j)}{1-\eta(\theta^*_j)} \theta^*_j \gamma \right)}_{Monopoly\ \ Power\ \ Distortion}. \tag{9}$$

Firing costs correct for the excess job destruction induced by the taxation and the monopoly power. They are made up of two components: The first term on the RHS gives the amount of

[3]A technical appendix is available upon request from the authors.

employment protection required to compensate for the increase in the reservation's productivity induced by the lump-sum payroll tax. The second term represents the amount of job protection necessary to correct for the distortion induced by the sector's monopoly power.

$$rH = rF + \frac{r}{\sigma}\left(\frac{\varepsilon_u - \varepsilon^*_{d_j}}{r+\lambda}\right) \tag{10}$$

The hiring subsidy compensates for the loss in job creations induced, in the first place, by the dismissal costs, and in the second place, by the restriction in the production due to the monopoly power.

$$\tau = \frac{2r + \lambda G(\varepsilon^*_{d_j})}{\sigma}\left(\frac{\varepsilon_u - \varepsilon^*_{d_j}}{r+\lambda}\right) + \frac{1}{\sigma}\left(z + \frac{\eta(\theta^*_j)}{1-\eta(\theta^*_j)}\theta^*_j\gamma\right) \tag{11}$$

Proposition 4.1 *For any sector-level bargaining, there is an optimal labor market policies vector* (τ, H, F) *defined by equations (9), (10) and (11) that ensures the efficiency of the negotiation at the sector-level.*

5 Conclusion

In this note, we have extended the traditional search and matching framework to take account of the different levels at which negotiations may take place. We show that absent from any distortion sector-level bargaining ought to be less efficient than bargaining taking place at the other levels. The introduction of labor market policies leads us to argue that a proper combination of employment protection, hiring subsidy and payroll tax is able to restore the labor market efficiency. As a corollary, it appears that the relationship between the labor market performance and the level at which bargaining takes place is conditional on labor market institutions as advocated by Flanagan (1999) or Driffill (2006).

References

[1] Cahuc, P. and Zylberberg, A., (2004), *Labor Economics*, Cambridge : MIT Press.

[2] Delacroix A. (2006). "A Multisectorial Matching Model of Unions", *Journal of Monetary Economics*, vol. 53, pp.573-596.

[3] Driffill J. (2006). "The Centralization of Wage Bargaining Revisited: What Have We Learned?", *Journal of Common Market Studies*, vol. 44, pp.731-756.

[4] Flanagan, R. (1999), "Macroeconomic Performance and Collective Bargaining: An International Perspective", *Journal of Economic Literature*, 37, pp. 1150-1175.

[5] Pissarides C. (2000). *Equilibrium Unemployment Theory*, Cambridge MA: MIT Press.