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The Equilibrium Rate of Unemployment in Varying Micro-Institutional Settings

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Abstract

A major issue in the current economic debate is related to the striking difference between Europe, Japan and US concerning the level and evolution of unemployment. This paper explores the micro determinants of these observed stylized facts. In a first part, a theoretical framework is presented allowing to address this comparative analysis. The starting point is the definition of different micro-institutional settings encompassing: (i) the structure of the firm; (ii) the system of education or vocational training; (iii) the nature of the labor market. In particular, the notion of "mode of organization" of the firm will be defined. In a second part, a model is proposed which takes up a "radical economics" perspective to analyze the choice made by firms about wage and effort, subject to their "mode of organization". The main results point to the crucial role played by the mode of organization of the firm and the nature of workers' competence as key-determinants of the different observable levels of the unemployment rate across main developed countries.

Zusammenfassung

In den aktuellen wirtschaftswissenschaftlichen Diskussionen spielt der unübersehbare Unterschied zwischen Europa, Japan und den USA bei Höhe und Entwicklungsdynamik der Arbeitslosigkeit eine wichtige Rolle. In diesem Beitrag werden die Mikro-Determinanten der in wenige Kernaussagen und Eckdaten zusammengefaßten empirischen Beoabachtungen analysiert.

Im ersten Teil wird der theoretische Rahmen dargelegt, in den die vergleichende Analyse eingebettet ist. Zu Beginn werden die genauen institutionellen Funktionsweisen bezogen auf Unternehmensstruktur, das System von Ausbildung und beruflicher Bildung und die Verfaßtheit des Arbeitsmarkts definiert. Dabei geht es vor allem darum, das dieser Studie zugrundeliegende Verständnis für die Spezifika der Verfaßtheit von Unternehmen darzulegen. Im zweiten Teil wird ein ökonometrisches Modell vorgeschlagen, das von

dem Blickwinkel der „radical economics“ ausgeht. Mit ihm wird die Interdependenz analysiert zwischen der jeweils spezifischen Verfaßtheit eines Unternehmens und seinen Entscheidungen zur Gestaltung des Entlohnungssystems und der Leistungskontrolle der Arbeitnehmer durch das Management.

Die zentralen Ergebnisse dieser Studie weisen auf die entscheidende Rolle hin, die den Spezifika einer Unternehmensverfaßtheit ebenso zukommt wie dem Ausbildungsstand und dem Einbeziehen der Arbeitnehmer in die betrieblichen Abläufe. Sie sind Schlüsseldeterminanten bei der Erklärung der unterschiedlichen Höhe der Arbeitslosigkeit in den großen Volkwirtschaften.

Abstract. *A major issue in the current economic debate is related to the striking difference between Europe, Japan and US concerning the level and evolution of unemployment. This paper explores the micro determinants of these observed stylized facts. In a first part, a theoretical framework is presented allowing to address this comparative analysis. The starting point is the definition of different micro-institutional settings encompassing: (i) the structure of the firm; (ii) the system of education or vocational training; (iii) the nature of the labor market. In particular, the notion of "mode of organization" of the firm will be defined. In a second part, a model is proposed which takes up a "radical economics" perspective to analyze the choice made by firms about wage and effort, subject to their "mode of organization". The main results point to the crucial role played by the mode of organization of the firm and the nature of workers' competence as key-determinants of the different observable levels of the unemployment rate across main developed countries.*

Journal of Economic Literature Classification Numbers J4, J6, L2.

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1. Introduction

A major puzzle in current economic debate stems from the differences in observed rates of unemployment across developed countries. Economic analysis has generally focused on divergence in labor markets' organization (and flexibility) as the most plausible *institutional* explanation of this phenomenon.

In the present work, I will propose a theoretical framework to address this comparative analysis, that is based on the definition of a wider micro-institutional setting encompassing: (*i*) the structure of the firm; (*ii*) the system of education or vocational training; (*iii*) the nature of the labor market. In particular, the notion of "mode of organization" of the firm will be developed as a starting point of the analysis.

Building on a stylization of different institutional configurations, I propose a model that formalizes the choice of firms about employment and wages, given the institutional constraints. Following an approach proposed by the radical American economists (Bowles, 1985), the unemployment/wage equilibrium is derived through the definition of an optimal incentive scheme for the firm.

This implies addressing two related trades-off shaping firms' choice -threat versus positive incentives, and internal versus external discipline- whose resolution eventually will lead to the definition of the equilibrium configuration of wage and "opportunity rate" (see *infra*). Final equilibrium, including the unemployment and vacancy rates, is then obtained by imposing the equality of in- and out-flows from the unemployment pool. This is done through an endogenous determination of both the separation and job finding rates. In particular, I show that the equilibrium configuration of wage, unemployment rate and vacancy rate turns out to be affected by the nature of the micro-institutional setting (as defined above). This allows me to account for differences in the equilibrium rate of unemployment among developed countries.

In fact, by distinguishing on the basis of the nature of both firms' organization *and* the vocational training system, it is possible to identify a micro-institutional stylization respectively characterizing French, German, Japanese and US real institutional models. Results concerning the equilibrium rate of unemployment in a given micro-institutional setting can therefore be directly related to the originating institutional model. This allows a tentative ranking of different micro-institutional settings (and corresponding institutional models) as regards their sustainable employment performance ([1]).

Compared to previous studies (Gatti, 1997), this approach allows a widening of the scope of our cross-country comparison, progressing from the Japan-US models opposition to the analysis of a larger set of countries. Moreover, the model allows the determination of both the unemployment rate and vacancy rate, thus partially contributing to the current debate on cross-country differences in Beveridge curves.

The paper is organized as follows: first I present a theoretical framework based on the notion of "mode of organization". Second, I model the choice of the firm concerning its system of control upon effort, where a central role is played by the nature and shape of the prevailing institutional setting. Then, I focus more directly on the determination of the wage/opportunity equilibrium configuration. Finally, I derive the flow equilibrium condition for unemployment and vacancy and show that the equilibrium rate of unemployment is strongly affected by micro-institutional settings.

2. The micro-institutional setting

Micro-institutional setting will be characterized in the following according to three different dimensions: (*i*) the structure of the firm; (*ii*) the system of education or vocational training; (*iii*) the nature of labor market. Here I will take up the first two aspects; I will deal with the third one later, when treating issues of effort and workers' mobility (paragraph 3.1, *infra*).

Let me start by point (*ii*). As far as training and competence are concerned, I will take up the traditional distinction (first proposed by Becker, 1962) between general and specific training. Unlike most theoretical speculations about economic consequences of different typologies of training, what I am interested in is the relationship between nature of training and workers' external mobility. This is a crucial factor -also shaping the operation of labor markets- that has been given little attention in recent theoretical and empirical works ([2]).

In what follows, competence will be supposed to range from firm-specific to generic ([3]). Firm-specific competence will be associated with a reduced or absent external transferability, in the sense that firm-specific workers will not regard themselves as being able to find comparable employment conditions elsewhere. The contrary holds for workers with generic competence.

Let the variable *l* grasps the (average) degree of competence's transferability characterizing the labor force (i.e., the proportion of firm-specific workers inside the labor force). The parameter *l* therefore grasps the prevailing nature of workers' competence in a given institutional context. The nature of workers' competence is in turn determined by the character of the vocational training system. We can therefore propose a (tentative) cross-country ranking of the value taken by *l* following existing literature and comparative studies on vocational training systems and competence formation.

Following Soskice and Hancké (Soskice-Hancké, 1997) we first have to single out institutional contexts where vocational training systems deliver generally accepted diploma (as in Germany). In this case, in fact, workers acquire competence that are more likely to be transferable -namely, through those diploma. In institutional contexts where this is not possible (namely, the US, Japan and to a less extent France), transfer of competence is more difficult and mostly depends on the actual contents of training.

Then, it is well known that: "*it is characteristic of internal labor markets that skills are attributed to the individual company...*" (Kristensen, 1996). We can also observe that: "*for very different reasons and in highly different institutional contexts, such a situation seems primarily to have existed in the US and Japan*" (Kristensen, 1996). Finally, we should consider the extremely high level of human capital specificity in Japan (Aoki, 1994), the role of German apprenticeship system in dramatically reducing this specificity and the quite general nature of French training (Maurice, 1993; Marsden, 1990). To sum up, we can finally assume ([4]):

$$l(Jap) > l(US) > l(Fr) > l(Ger).$$

We can go back now to point *i*) concerning a comparative analysis of firms' organizational structures. I will tackle this issue proposing the notion of "mode of organization" ([5]). A mode of organization (MoO) is a complex system of rules that should provide the firm with an answer to the following questions:

a) how to control work intensity and effort;

b) how to manage information and communication flows.

This can be done through the definition of a specific system of *work organization* and *knowledge distribution* inside the firm. These two aspects of firms' internal organization are actually tightly linked together (see *infra*). Therefore, we can tentatively define two opposite MoO: a *centralized* MoO that will consist of a hierarchical work organization and a concentrated knowledge; and a *decentralized* MoO that will be characterized by an horizontal work organization and a shared knowledge. Let me quickly define these different configurations taken respectively by work organization and knowledge distribution.

Concerning *work organization*, I mentioned two polar solutions, namely hierarchical vs. horizontal organization of work. In the former case, the "communication network" inside the firm is vertically oriented: central authority is in charge of all kinds of decisions and

guarantees internal coordination. The reverse holds when work organization is horizontal: in this case, decision-making is a matter of individual workers' choices and decentralized coordination. The same reasoning holds regarding *knowledge distribution*. Opposition here is between a concentrated vs. shared distribution of knowledge. In the former case, the stock of knowledge owned by the firm is concentrated at the central authority (or experts) level. Workers do not share firm's knowledge stock and their competence is determined outside the firm (see Aoki, 1986). Conversely, when knowledge is shared, the know-how is spread all around the firm through a process that I will call "involvement".

Indeed, a hierarchical (horizontal) organization of work is likely to be (and in real cases actually is) associated to a concentrated (shared) distribution of knowledge. Therefore, combining these two factors actually leads to the previous definition of two opposite MoOs: a *centralized* MoO with a hierarchical work organization and a concentrated knowledge; and a *decentralized* MoO with an horizontal work organization and a shared knowledge base. An extensive literature is now available concerning the prevailing nature of firms' MoO across different countries: it is a commonly shared view between scholars that Japanese and German firms mostly present the main characteristics of a decentralized mode of organization, while US and French firms prevalently show features of a centralized MoO.

If we consider simultaneously the typologies respectively proposed for vocational training systems and the MoO, we can describe different micro-institutional settings by their position along two axes: the "nature of competence axis" (from firm-specific to generic competence), and the "mode of organization axis" (from centralized to decentralized MoO). In figure 1 below, I propose a tentative application of this sort of exercise, representing the different micro-institutional settings prevailing in developed countries such as the United States, Germany, France and Japan.

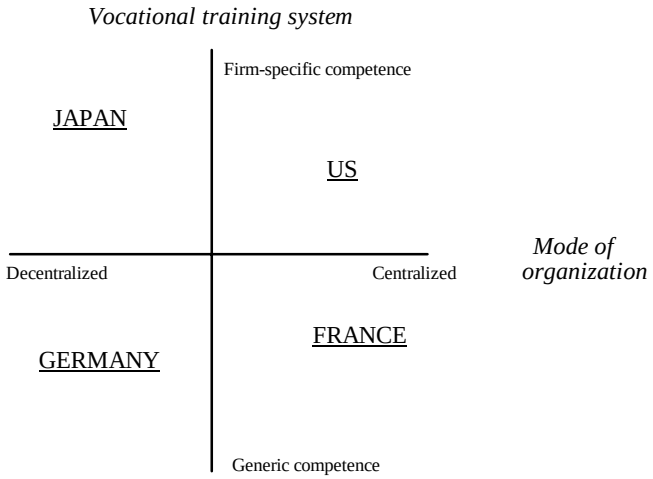

Figure 1

In the following sections, I will explore how the institutional features presented above influence the choice made by firms about their incentive scheme and eventually affect the equilibrium unemployment rate. I will first present the general setup of the model and then solve it alternatively under the different parametric assumptions characterizing each of the previous micro-institutional settings.

3. The model

Let me consider the decision problem faced by firms when determining the optimal level of production and wage. This generally consists in maximizing profits, that is ([6]):

π = profit = $Q - (w + s) \cdot Lp$, (1)

where: Q = quantity produced; w = real wage; Lp = hours of work hired; s = real cost of supervising resources per hour of work.

The introduction of s allows me to consider the twofold role played by the authority respectively in the domain of coordination between production units and control upon work intensity:

$s = t_S + m$,

where: t_s = coordination cost per hour of work; m = monitoring cost per hour of work.

The production function is:

$$Q = h \cdot F(e \cdot L_p), \qquad h \leq 1, \qquad (2)$$

where: h = coordination efficiency; e = effort per hour of work.

Contrary to other models, in this framework workers' effort and ability to coordinate are both determined by the nature and efficiency of implemented incentive schemes; and the nature of this incentive scheme is conditioned by firms' organizational structure. Let me clarify this point, by modeling explicitly effort and coordination functions.

3.1 Labor market and the effort function

As far as work intensity is concerned, firms want to make sure that workers provide a satisfactory level of effort. Given the conflicting nature of labor/capital relationship, it is then necessary to implement some devices in order to guarantee a positive level of effort.

In this respect, I will take up an efficiency wage approach and namely the framework developed by the American radical economists (see Bowles, 1985). In particular, Bowles states that effort can be increased in two different ways:

- increasing the "direct monitoring" over workers (m);
- increasing the "cost of job loss" (w_c) for every worker.

We can therefore propose a general specification of the effort function such as the following ([7]):

$$e = \text{effort per hour of labor hired} = e(w_c, m), \qquad (3)$$

with $\partial e / \partial w_c > 0, \quad \partial e / \partial m > 0.$

Following Bowles, we can define the "cost of job loss" as the income loss that workers incur when they loose their jobs. Conditional to the fact that they are fired, we can model workers' income loss as the difference between wage (w) and alternative expected income (w_d):

$$\text{cost of job loss} = w_c = w - w_d, \qquad (4)$$

where: w = wage; w_d = alternative income in case of firing.

The expression for w_d is given by the average between the alternative wage that workers can earn if re-hired, and the unemployment benefits they get if they do not find new jobs. The average is calculated on the basis of the probability that workers have to find new jobs (when they are fired). This depends on:

- the nature of workers' competence (l);
- the global availability of jobs opportunities.

Let me define a variable p called the *opportunity rate*. This variable is supposed to grasp global available opportunities for workers. I will assume:

$p = p(u,v)$, such that $0 < p < 1$,

where: u = unemployment rate; v = vacancy rate.

The unemployment/vacancy rates are supposed to grasp the global availability of job opportunities inside the economic system. The higher (lower) the unemployment (vacancy) rate, the fewer the alternative job opportunities globally available. However, it should be considered that workers who have firm-specific competence will hardly find (if fired) new jobs comparable to the original ones. Let me develop this point.

I have assumed that firm-specific workers are in a proportion of l inside the labor-force: these workers are given not transferable competence. This means that these workers will be able to find new jobs only if an "institution" exists which reconverts their competence. In the present model, no such an institution is explicitly taken into account. However, we can consider that the process of knowledge sharing inside the firm could carry on the same function, by re-shaping workers' competence. Since knowledge sharing only occurs inside decentralized firms (where the knowledge base gets shared among workers), only decentralized firms can provide "bad" workers with a new adequate competence ([8]). On the other side, the (1-l) generic

workers always have a real chance to find new jobs similar to the ones they had before being fired (i.e., earning the same wage).

We can sum up now the operation of matching process (for fired workers) on the labor market. Fired workers will find new job opportunities with a probability given by the (aggregate) opportunity rate, but only generic workers (in a proportion of 1-*l* inside the labor force) eventually will have a chance to find a good match. Firm-specific workers (in a proportion of *l*) will end up with an unsuccessful match whose outcome eventually will depend on the MoO of firms. This process can be represented as in figure 2.

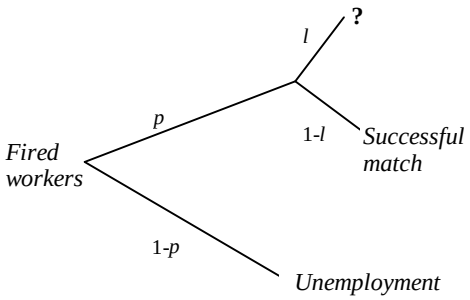

Figure 2

According to the above analysis, the (**?**) outcome is meant to represent the "unsuccessful match" either allowing workers to find a new job with a lower wage than before (when firms are decentralized), or leading them to unemployment (when firms are centralized). This implies that labor market operation actually changes in relation to the nature of vocational training system and MoO of the firm. As Aoki puts it: "*there may be a close connection between labor market characteristics and the information systematic characteristic of the firm from a comparative perspective*" (Aoki, 1985).

In case of successful matches, workers find a new job which fits their competence; then they are paid a wage (w_v) that will be equal (ex-post) to their previous one. When an unsuccessful match occurs,

workers find a job that does not fit their competence and they will receive a lower (minimum) wage ($\overline{w}$). In other words, the labor market has a dual structure with an "upper" level (corresponding to *core* firms) where workers are paid a market wage and a "lower" level (corresponding to *peripheral* firms) where workers are paid an exogenous minimum wage ([9]).

From figure 2 above we can deduce the expression for the (average) alternative income (w_d) corresponding to workers employed in a system populated, respectively, by decentralized (D) or centralized firms (C) ([10]):

$$w_d\,(D) = p(1-l)\,w_v + p\,l\,\overline{w} + (1-p)\,\underline{w}\,, \qquad (5)$$

$$w_d\,(C) = p(1-l)\,w_v + (1-p(1-l))\,\underline{w}\,, \qquad (6)$$

where: w_v = alternative market wage; $\overline{w}$ = minimum wage; $\underline{w}$ = unemployment benefits.

Substituting (5) and (6) into (4) we can easily obtain the definition of the cost of job loss in the two cases. Therefore, we have completely defined the first control device that firms can implement to obtain a positive level of effort.

The second control device is direct monitoring, consisting in actively supervising workers' behavior on the job. In this respect, one crucial difference between centralized and decentralized MoO concerns the role played by central authority in the coordination process. In fact, in a centralized firm, supervising resources have to be used for two different functions:

- direct monitoring (m);
- coordination between production units (t_S);

while in a decentralized firm workers are capable to coordinate autonomously.

Therefore, we can sum up our claim as follows:

centralized MoO $\Rightarrow$ $t_S > 0$ $\Rightarrow$ $m = s - t_S$,

decentralized MoO $\Rightarrow$ $t_S = 0$ $\Rightarrow$ $s = m$.

3.2 *Coordination and knowledge sharing*

In this section I analyze how the coordination function (h) can be specified according to the nature of firms' MoO. Let me start with the common assumption that a given amount of communication per hour of work (t) is needed inside the firm to assure coordination and avoid wasting (potential) output ([11]). We can write:

$h = h(t), \qquad \partial h / \partial t > 0. \qquad (7)$

Two options are then possible (corresponding to different MoO):

i) centralized mode of organization. The MoO is characterized by a vertical organization of work and concentrated knowledge; coordination is therefore assured by hierarchy ($t = t_S$). This allows to fully exploit the specialization of tasks. Therefore, we can put: $h(t_S) = 1$, adding a cost ($t_S \cdot Lp$) to production costs;

ii) decentralized mode of organization. MoO relies on decentralized coordination among workers implemented through a process of knowledge sharing. Intensity of this knowledge sharing can be (partially) determined by choosing the amount of "socialization activities" (that is, team work, quality circles...) undertaken. Let me define:

$t = t_d$ = amount of socialization activities per hour of work;

$h(t_d)$ = decentralized coordination ability, $h < 1$.

Therefore, firms can choose the optimal degree of decentralization taking into consideration that, in order to further socialization activities, supervision is always needed. This means that part of firm's monitoring resources must be diverted from direct control upon production effort. In particular, I will assume that a proportion ($t_d \cdot m^{\delta}$) of the firm's monitoring resources (m) are necessary in order to obtain a degree of coordination $h(t_d)$. Therefore, we have:

m_p = monitoring upon production effort = $m - t_d \cdot m^{\delta}$.

The firm has to choose an optimal amount of t_d deciding the appropriate allocation of monitoring resources among control and

socialization. To do this, each firm solves the following maximization problem:

$$\underset{t_d}{\text{Max}} \quad Q = h(t_d)\cdot e(w_c\ ;\ m - t_d\cdot m^{\delta})\cdot Lp.$$

In order to obtain explicit results, let me propose the following specifications for coordination and effort functions ([12]):

$$h(t_d) = t_d^{\varepsilon}; \tag{8}$$

$$e(w_c\ ;\ m_p) = e[(w_c)^a\cdot(m_p)^b] = e[(w_c)^a\cdot(m - t_d\cdot m^{\delta})^b]. \tag{9}$$

Solution to the maximization problem is given by:

$$\partial Q/\partial t_d = 0,$$

which means:

$$\varepsilon\cdot t_d^{(\varepsilon-1)}\cdot(m - t_d\cdot m^{\delta})^b - t_d^{\varepsilon}\cdot b\cdot(m - t_d\cdot m^{\delta})^{(b-1)}\cdot m^{\delta} = 0.$$

Then we obtain:

$$t_d = [\varepsilon / (\varepsilon + b)]\cdot[1 / m^{(\delta-1)}],$$

and:

$$h(t_d) = [\varepsilon/(\varepsilon + b)]^{\varepsilon}\cdot[1/m^{\varepsilon(\delta-1)}]. \tag{10}$$

Therefore, if $\delta > 1$ ([13]) the process of knowledge sharing determines a negative feed-back of monitoring on coordination. The coefficient of monitoring in the production function now turns out to be:

$$b' = b - \varepsilon\cdot(\delta - 1) < b.$$

This result is coherent with reported stylized facts about workers' behavior in Japanese firms (a typical example of decentralized MoO). In fact, the activities by which workers get to share their knowledge are generally of an informal nature, in the sense that they are not performed under explicit control by an authority. Quoting Okuno: "*a senior worker frequently helps junior workers in the same work line learn special skills needed for the job ..... Yet on-the-job-training is not assigned as a part of senior worker's job, nor does he receive any extra reward for his efforts*" (Okuno, 1984). These activities are therefore more likely to be observed when direct control is absent or reduced. As Marsden observes: "*under the low*

trust conditions which prevail in many firms, which are encouraged by tight managerial control, and an insistence on contractual obligations, workers have little incentive to share this information.....if anything they have every incentive to use it to make their own job easier" (Marsden, 1996).

I will sum up the assumptions that I make concerning MoO parametric specification in the following table:

Table I
A parametric characterization of the MoOs

	Mode of Organization	
	Centralized	Decentralized
Knowledge distribution	$h = 1$	$h = h(m)$, $h' < 0$
Work organization	$t > 0$ ($s = m + t$)	$t = 0$ ($s = m$)

3.3 *Choice of an optimal incentive scheme*

Let me now turn to the solution of firms' maximization problem. First, the firm has to determine the optimal combination of direct monitoring and cost of job loss in order to obtain a given level of effort. Once this combination determined, the firm has to find the optimal level of wage. As we have seen (Eq. (1) and Eq. (2)), firm's profits and production function are:

$\pi = Q - (w + s)\cdot L_p$, with $Q = h\cdot F(e\cdot L_p)$.

I will assume that the production function shows constant return to scale on labor: this does not constitute a major assumption and makes the following analysis much clearer. Moreover, I will assume that the effort function has the same specification as in (9):

$e = w_c^{\,a}\cdot m^b$.

The coordination function h is defined as in the previous section: in a centralized MoO (C), coordination is perfectly assured by hierarchy (h=1), while in a decentralized MoO (D) coordination is also

decentralized and eventually will depend on the amount of monitoring resources (as in Eq. (10)):

$h(C) = 1,$

$h(D) = [\varepsilon/(\varepsilon + b)]^{\varepsilon} \cdot [1/m^{\varepsilon(\delta-1)}].$

Finally, I make standard assumptions about coefficients a and b:

$0 < a < 1 , \qquad 0 < b < 1,$

in order to guarantee concavity of $e(w_c , m)$ in its arguments.

Maximization stands as follows:

$$\underset{m,w,Lp}{\text{Max}} \quad \pi = h \cdot e \cdot L_p - (w + s) \cdot L_p , \qquad (11)$$

Substituting respectively expressions (5) or (6) for the cost of job loss into the profit function and considering the corresponding definition of s given above (table 1), we can resolve (11) to obtain the following first-order conditions:

$\partial\pi/\partial w = \partial\pi/\partial m \quad \Rightarrow \partial e/\partial w = \partial e/\partial m, \qquad (12i)$

$\partial\pi/\partial L_p = 0 \quad \Rightarrow e = w + s, \qquad (12ii)$

$\partial\pi/\partial w = 0 \quad \Rightarrow 1/(\partial e/\partial w) = 1. \qquad (12iii)$

Condition (12i) gives the definition of the optimal relationship between the two control devices (monitoring and cost of job loss):

$m/w_c = b/a. \qquad (13)$

Substituting into the effort function (9) we obtain:

$e^* = (b/a)^b \, (w_c)^{a+b}. \qquad (14)$

This expression allows the determination of the level of effort as a function of the cost of job loss (and therefore wage). In order to rule out any possibility of perverse results due to increasing returns to scale in the effort function, I will assume: $a + b \leq 1$.

In order to determine the equilibrium configurations of wages and opportunity rates, I have to consider now the two remaining first-order conditions.To do that, I will first combine conditions (12ii) and (12iii) to obtain the wage curves associated to different MoO; then I will impose the constancy of the cost of job loss at the equilibrium (condition (12iii)).

3.4 *Equilibrium wage/opportunities configurations*

Combining conditions (12*ii*) and (12*iii*), resolving and substituting (under the ex-post equilibrium assumption that $w=w_v$) for the definitions of the cost of job loss respectively corresponding to a decentralized (*D*) and a centralized (*C*) firm, eventually we obtain the following optimal wage curves:

$$w(C) = \frac{a \cdot t + (1-b) \cdot \left[(1 - p \cdot (1-l)\right] \cdot \underline{w}}{\left[1 - p \cdot (1-l)\right] \cdot (1-b) - a}, \qquad (15)$$

$$w(D) = \frac{(1-b') \cdot \left[p \cdot l \cdot \overline{w} + (1-p) \cdot \underline{w}\right]}{\left[1 - p \cdot (1-l)\right] \cdot (1-b') - a}, \qquad (16)$$

where: $b' = b - \varepsilon \cdot (\delta - 1) < b$.

We can see from the above that both wage curves establish a positive relationship between wage and the opportunity rate *p(u,v)*. Moreover, we can easily show that a maximum opportunity rate exists that prevents wage explosion:

$$p_{max} = 1 - \frac{a - l \cdot (1-b)}{(1-l) \cdot (1-b)}. \qquad (17)$$

Two points are worth making concerning expression (17). First, since $b' < b$, the maximum opportunity rate associated to decentralized firms is higher than the one associated to centralized firms. The reason why this happens is that a lower value of the monitoring coefficient *b* (as in decentralized firms) reduces the scope for the effort enhancing mechanism relying on external discipline (i.e., linked to the threat of being fired), thus allowing a higher opportunity rate to be compatible with wage moderation.

Second, we can see from (17) that the maximum opportunity rate is a decreasing function of the proportion of firm-specific workers (*l*). This results from the role played by specificity of competence as an alternative disciplinary device which replaces the external mechanism relying on the unemployment and vacancy rates. Therefore, we can easily show that:

$p_{max}(Jap) > p_{max}(Ger)$, and:

$p_{max}(US) > p_{max}(Fr)$.

More generally, combining the above observations on the relative values of coefficients b and l, and their effects on p_{max}, we can show that:

$p_{max}(D) > p_{max}(C)$ if:

$$l(C) - l(D) < a\cdot(b-b')\,/\,[(1-b)\cdot(1-b')]. \qquad (18)$$

According to the proposed ranking for l (section 2), that is:

$$l(Jap) > l(US) > l(Fr) > l(Ger),$$

condition (18) on $p_{max}(D)$ is always satisfied for Japan (since in this case $l(D) > l(C)$), while the result is uncertain for Germany. Since $l(US) > l(Fr)$, condition (18) for Germany is more easily verified against France than against US, so that we can expect the following tentative ranking to hold:

$$p_{max}(Jap) > p_{max}(US) > p_{max}(Ger) > p_{max}(Fr). \qquad (19)$$

Considering now condition (12*iii*) above leads to define a complementary relationship between wage and opportunity rate, which allows me to determine the equilibrium configuration for these two variables. Condition (12*iii*) states that the cost of job loss has to be constant at equilibrium. This condition can actually be rewritten as follows:

$$(\partial e/\partial w) = 1 \quad \Rightarrow \quad w_c(I) = B(I),$$

where: I = D,C respectively indicates decentralized and centralized MoO. Considering that B values are:

$$B(D) = \{(b'/a)^{b'}\,(a+b')\,[\varepsilon/(\varepsilon + b)]^{\varepsilon}\}^{\,1/(1-a-b')},$$

$$B(C) = \{(b/a)^{b}\,(a+b)\}^{\,1/(1-a-b)},$$

we can show that the inequality $B(D) < B(C)$ generally holds.

The condition above simply states that cost of job loss has to be constant at equilibrium. Substituting the corresponding expression of the cost of job loss for $w_c(I)$ into the above condition, we obtain the following complementary positive relationships between wage and opportunity rate:

$$p(D) = \frac{w - \underline{w} - B(D)}{(w - \underline{w}) - l \cdot (w - \overline{w})}, \qquad (20)$$

$$p(C) = \frac{w - \underline{w} - B(C)}{(1 - l) \cdot (w - \underline{w})}. \qquad (20')$$

In order for the predicted value of p to be positive the following condition must hold:

$w > w_{min} = \underline{w} + B(I)$,

stating that a minimum wage level exists (even assuming away unemployment benefits). Actually, a maximum wage level also exists corresponding to p=1. In this case, in fact:

$w(D) = w_{max}(D) = \overline{w} + B(D)/l(D)$,

$w(C) = w_{max}(C) = \underline{w} + B(C)/l(C)$.

The maximum wage level always increases when human capital specificity (l) decreases (so it is higher for France compared to US, and for Germany compared to Japan). We can also show that:

$w_{max}(D) > w_{max}(C)$, if:

$\overline{w} - \underline{w} > \{B(C) \cdot l(D) - B(D) \cdot l(C)\} / l(C) \cdot l(D)$.

For the above condition to hold we need: either $l(D)$ to be very low (i.e., Germany) or ($\overline{w} - \underline{w}$) value to be sufficiently large. Therefore, we can reasonably assume the condition to hold for Germany. Concerning Japan, the above condition is more easily verified against the US than against France (because $l(US) > l(Fr)$). Depending on this, the final equilibrium configurations for centralized and decentralized MoO are respectively defined considering both the wage curve and the corresponding complementary relationship (20). The result is illustrated below (figure 3): the picture shows both the wage curves as well as the opportunity curves corresponding to the different micro-institutional settings that have been singled out. On the horizontal axis I consider the complement to one of the opportunity rate p: countries showing higher equilibrium opportunity rates are therefore found closer to the origin.

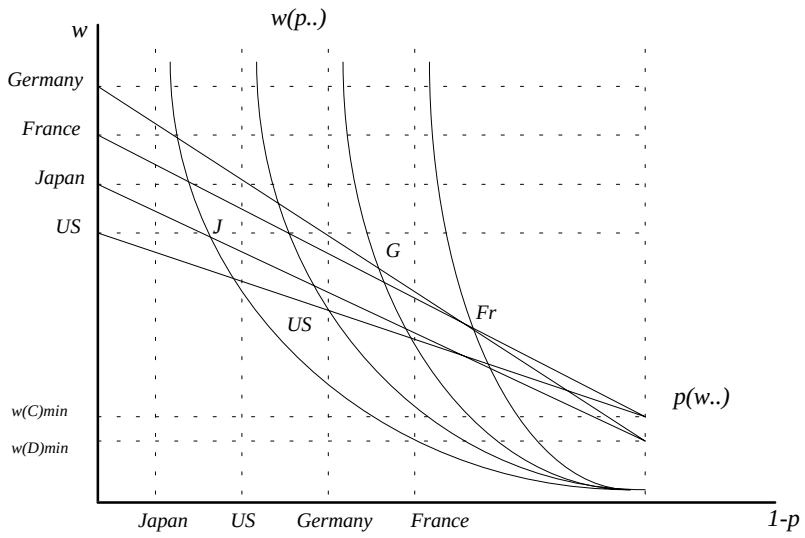

Figure 3

4. Equilibrium unemployment

4.1 The equilibrium level of the opportunity rate

Figure above shows different equilibrium configurations for the opportunity rate p. Up until now we have retained a general specification of the opportunity rate. However, we know that this rate actually depends on unemployment and vacancy rates. Therefore, we should also consider that the above result -concerning the equilibrium opportunity rate- actually defines a first equilibrium relationship between unemployment and vacancy:

$$p(u,v) = p^*, \qquad (21)$$

with: $\partial u/\partial v > 0$.

We will call this relationship the *opportunity locus*. In order to simplify calculations, in the following I will assume the opportunity rate to be characterized by a linear functional form such as:

$$p = v\cdot(1-u). \qquad (22)$$

This is a minor (and reasonable) assumption that has the merit to allow me to derive explicit results concerning the role of micro-institutional settings on equilibrium unemployment rates.

Given the above specification, we can easily see that the relative position (in the *(u,v)* space) of the opportunity locus corresponding to different micro-institutional settings actually depends on the optimal *p* value derived in previous sections, that is:

$p^*(Jap) > p^*(US) > p^*(Ger) > p^*(Fr)$.

In the following section, we derive the aggregate unemployment/vacancy relationship implied by equilibrium flows condition on the labor market, under the hypothesis of an endogenous determination of both separation and job finding rates.

4.2 *Flows equilibrium*

In order to determine the equilibrium unemployment rate, we have to consider a complementary relationship ensuring the equilibrium on the labor market. Therefore, a flows' equilibrium condition is required to impose equality of flows in and out the unemployment pool. Let me define:

d = separation rate; f = job finding rate.

The flows' equilibrium condition is then:

$$L \cdot d = (N - L) \cdot f,$$

where: L = employed people, N = active population.

From this we obtain:

$$u = (N-L) / N = d / (d+f). \qquad (23)$$

Let me define now separation and job finding rates. Since all workers are identical and have the same probability of finding a job when entering the labor market (either for the first time or after being fired), the job finding rate can actually be understood as the probability of finding a new job (when fired). As we have seen (section 3.1), this probability is determined by the opportunity rate combined with the degree of specificity of workers' human capital. In particular, the probability of finding a new job is different for a decentralized (D) and a centralized (C) firm:

$$f(D) = p, \qquad (24)$$

$f(C) = p \cdot (1-l)$, (24′)

Substituting (22) and (24) (or (24′)) for p into (23) we obtain the following equilibrium conditions ([14]):

$u \cdot v = d$ for decentralized MoO, (25)

$u \cdot v = d/(1-l)$ for centralized MoO. (25′)

Let me turn now to the definition of the separation rate. In my model, separations from the firm occur only when a worker is discovered not working. The probability of being discovered not working is likely to be a function of the quantity of resources affected to monitoring activities ([15]). I will define:

γ = probability of being discovered not working = $\gamma(m)$,

such that: $\gamma' > 0$, $\gamma(0) = 0$, $\gamma(\infty) = 1$.

The separation rate is then:

d = separation rate = $\gamma(m)$, (26)

which is endogenously determined inside the model by the quantity of resources affected to monitoring activities.

From (26), and considering that the optimal level of (m) is such that (Eq. (13)):

$m^* = (b/a) \cdot w_c^*$,

with (from condition (12*iii*)):

$w_c^*(I) = B(I)$, $I = D$ or C, (27)

we can deduce that the equilibrium conditions (25) and (25′) imply a negative relationship between vacancy rate and unemployment rate:

$u = u(v; b, l)$, $\partial u/\partial v < 0$.

Building on this framework, the following section will present explicit results for the model considering a particular functional specification of the separation rate. In this way, it is possible to interpret differences in the equilibrium rate of unemployment across developed countries as a consequence of the varying nature of the micro-institutional settings.

4.3 The equilibrium rate of unemployment in varying micro-institutional settings

Let me assume that the probability of being discovered not working (and fired) is simply specified as follows:

$$\gamma(m) = m/M, \tag{28}$$

where M is an arbitrarily large constant.

Since $d = \gamma$, we can substitute (28) for γ into conditions (25) and (25′). Considering the optimal level of direct monitoring (Eq. (13)) and of cost of job loss (Eq. (27)), we can easily obtain an explicit formulation of conditions (25) establishing a negative relationship between unemployment rate and vacancy rate. We finally get to the two following unemployment/vacancy curves, respectively for a centralized (C) and a decentralized (D) MoO:

$$u(C) = \frac{b \cdot B(C)}{a \cdot M \cdot v \cdot (1-l)}, \tag{29}$$

$$u(D) = \frac{b' \cdot B(D)}{a \cdot M \cdot v}. \tag{30}$$

We can see from the equations above that the minimum unemployment rate (corresponding to a vacancy rate value $v = 1$) is such that:

$u_{\min}(C) > u_{\min}(D)$,

because of assumptions about coefficient (b) characterizing the MoO (section 3.2), and:

$u_{\min}(US) > u_{\min}(Fr)$,

because of assumptions about relative values of workers' human capital specificity (section 2.).

Therefore, the relative position of $u(v)$ curves crucially depends on parameters identifying the different micro-institutional settings. Combining Eq. (26) with the corresponding (Beveridge) curve allows us to define the final equilibrium configuration for unemployment and vacancy rates, respectively for a decentralized and a centralized MoO. In the following, I present a simple graphical representation of the

equilibrium unemployment/vacancy configuration across different micro-institutional settings (figure 4).

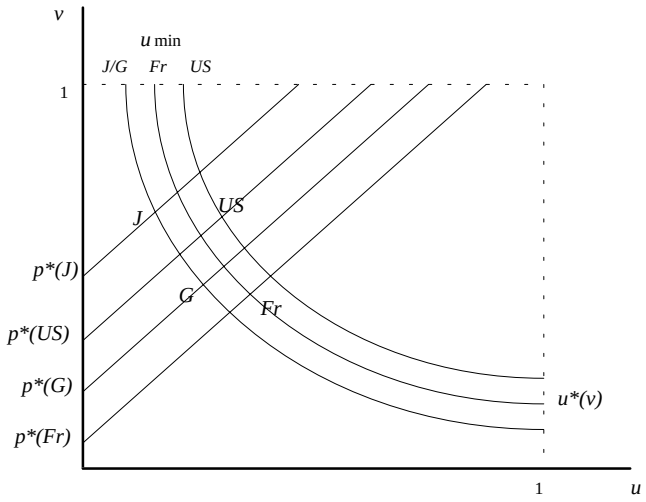

Figure 4

5. Conclusions

In this paper, I build on an efficiency wage framework to model firms' choice on wage and effort as an "institutionally-biased" optimization. In order to do that, a stylization of different micro-institutional settings is proposed and the notion of "mode of organization" is introduced. This allows me to take into account the influence of micro-institutional parameters on firms' behavior.

The proposed stylization deals with varying micro-institutional settings across developed countries (namely France, Germany, Japan, and the US) and interprets them as a consequence of two factors:

i) the nature of workers' competence (the parameter *l*);

ii) the MoO of firms (the parameter *b*).

Based on this approach, I present a model combining an efficiency wage determination of wage/opportunity equilibrium configurations, and a flow equilibrium condition for unemployment and vacancy rates. Results concerning the equilibrium

unemployment/vacancy configurations are derived in the paper, which point to a major role played by the mode of organization of firms and the nature of workers' competence as key-determinants of cross-country differences in the equilibrium rate of unemployment. These results throw some lights on the structural causes underlying France high unemployment experience and on possible determinants of Japan exceptional employment performance.

More work is needed to incorporate into the model a stylization of the micro-institutional settings characterizing other European countries (such as Italy or Spain), which is indispensable to a better understanding of the structural determinants of unemployment throughout Europe. Moreover, an empirical evaluation of the actual strength of provided results is also necessary.

The paper has of course some limitations, one of the main ones being probably the static perspective adopted throughout the analysis. Several features of the model could actually be turned into a dynamic approach and this would lead us to study the very process of emergence of a given micro-institutional setting.

FOOTNOTES

[1] This is actually a crucial point in our approach. Our concept of equilibrium rate of unemployment is meant to grasp the sustainable level of unemployment inside the economy, compatible with labor market equilibrium. It can easily be shown (see Carlin-Soskice, 1990) that in an open economy framework the equilibrium rate of unemployment actually defines a minimum sustainable rate of unemployment while the actual rate is also determined by other factors (i.e., demand factors).

[2] For an interesting empirical work on British data, concerning the intensity of labor mobility associated to different forms of apprenticeship, see Booth and Satchell, 1996.

[3] The definition of "generic competence" encompasses both low, generic skills as well as high, general skills. In different words, the distinction between skills' quality will not be taken into account; I will focus only on the distinction in competence's nature.

[4] The same kind of ranking, based on an comparative analysis of individual countries training systems, can be found in Hancké-Soskice, 1997. Inequalities given in the text can actually be weakened (for example, considering only two groups of countries -high vs. low firm-specific competence countries) without substantially changing our argument. Strong inequalities are given just to simplify exposition.

[5] A more comprehensive analysis of the nature and characteristics of the mode of organization of the firm can be found in Gatti, 1997.

[6] Given the assumption of perfectly competitive markets, the relative product price P has been directly assumed equal to 1.

[7] The specification of the effort function has a sociological justification relying on the conflicting nature of the labor/capital relationship. Under the same assumption Bowles (Bowles, 1985) obtains a similar specification considering explicitly workers' utility maximization.

[8] This interpretation comes from the commonly shared view that initial competence is not so crucial to a decentralized firms, whose priority is rather to get workers accustomed with the internal "stock of knowledge" of the firm. The opposite generally holds for the centralized firm to which competence is somehow given from outside. In this case, initial competence actually matters and determines the eligibility of a worker for a given job (see Aoki, 1994).

[9] We could easily consider the minimum wage as endogenously determined by the employment level on the secondary market.

[10] The retained alternative income definition is derived under two crucial assumptions: *i*) there is no distinction in nature of jobs offered by firms, and *ii*) workers acquire their competence after being hired the first time: it is therefore impossible for firms to make any distinction between specific and generic workers

upon the first hiring. These assumptions are rather common ones in matching models literature. In the present context, they allow me to define the alternative income simply as an aggregate average.

[11] A similar approach is generally taken up in recent models of firm's organization (see Greenan-Guellec, 1994).

[12] The specification taken up is a generalization of the functional form proposed by Bowles and Boyer (1988).

[13] This is actually a standard hypotheses, being m^{δ} a cost and therefore generally a convex function.

[14] There is actually a second root which is always equal to 1; so I will not consider it as a possible solution for the equilibrium unemployment rate.

[15] As Bowles points it out (Bowles, 1985), this probability also plays a role in the definition of the effort function. In my model, this still holds but remains implicit because I directly take up a “reduced form” of the effort function (see footnote 7).

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