Endogenous Firing Costs and Labor Market Equilibrium

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Abstract

Using a political economy framework, we show that firing costs are a decreasing function of labor market tightness. This endogeneity produces a positive externality, which can offset the standard congestion externality generating multiple equilibria. Moreover, these equilibria are not Pareto ranked: it is not possible to state a priori which equilibrium is better. We also analyze the local stability of the equilibria: if the firing costs externality dominates, the equilibrium is a stable node; otherwise, it is an unstable saddle point. Finally, we investigate the question of social efficiency, obtaining a generalization of the Hosios (1990) condition.

JEL classifications: J41, J63, J64
Keywords: Firing Costs, Multiple Equilibria, Efficiency

Approximate word count: 7754

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1 Introduction

What is the effect of employment protection legislation (EPL) on labor market outcomes? Conventional wisdom suggests that differences in labor market performances can be explained by differences in EPL, so that different performance of U.S. and European labor market outcomes depend on different sternness of EPL. In this paper we introduce the alternative view that the strictness of EPL depends on the labor market conditions and investigate the consequences of this "reverse" causality nexus on labor market performance.

It is well known that EPL has two main components: severance payments, a transfer the worker receives at the end of the job relationship, and firing costs, a deadweight loss associated with job destruction. As for the former component, Lazear (1990) has shown that, if market are complete and competitive, the effects on overall unemployment are neutral, since the severance payment is neutralized by the bargaining between workers and firms.[1] As a consequence of this neutrality result, most of the literature has focused on the analysis of the effects of firing costs as a set of administrative procedures, legal expenses and any real and financial penalties paid by the firm.

Bentolila and Bertola (1990) show that firing costs generate two effects working in opposite directions: they prevent layoffs, but also discourage hiring. Hence, the overall effect on employment is ambiguous.[2] The theoretical result of Bentolila and Bertola (1990) has been confirmed by Mortensen and Pissarides (1999) in a search and matching framework. They show that firing costs reduce the inflows into unemployment but, at the same time, it increases the average duration of unemployment because of the effects on the propensity to hire. Even if the effect on unemployment remains ambiguous, the presence of high level of firing costs modifies the structure of the labor market in terms of average duration and inflows.[3]

In the last few years, a growing part of the literature has beginning to study the complexity of the employment protection legislation. In fact, while

[1] Garibaldi and Violante (2002) investigate the qualitative effects of severance payments and firing costs on the labor market when the wage is not fully flexible. They also estimate that in Italy, severance payments are almost twice as large as firing costs.

[2] On the empirical side, Bentolila and Bertola (1990) find that firing costs produce a lower effect on the propensity of firms to hire workers than to fire them: hence, if the latter effect dominates the former, long term employment increases. Nevertheless, if firing costs are associated with uncertainty and a low level of growth, they could give account of the dynamics of employment in the main European countries. In fact, if the economy is in downturn and the firms' expectations on a future expansion are pessimistic, firms are not willing to hire new workers, with negative effects on total employment. This is the debate on Eurosclerosis: an economic system associated with high level of firing costs is not able to react quickly to external shocks. See also Blanchard and Wolfers (2000).

[3] This result is confirmed by OECD (1995, 1999), Blanchard (2000) and Blanchard and Portugal (2001).

some elements of EPL, such as severance payment and advanced notice, are easily computable, others are more difficult to evaluate, such as the judicial interpretation of the law, specially about the notion of unfair dismissal and just cause. Moreover, it is reasonable to think that it is less likely that the worker goes to court when it is easy to find a new job in a short time. Vice versa, taking the case to court is more probable when the unemployment rate is high or there are few vacant jobs because it is difficult to exit from the state of unemployed. The consequence of a greater recourse to court when labor market conditions are bad, is to increase firing costs. In this sense, the strictness of EPL reflects the situation of the workers with respect to the ease of finding a new job.

Bertola, Boeri, and Cazes (1999) propose to revisit the criteria of the EPL index formulated by OECD, in order to take into account the growing complexity of the employment protection system of each country. They emphasize how the strictness of EPL could be affected by the interpretation activity of judges, showing that the higher is the percentage of sentences favorable to workers, the higher is the number of cases taken to court.[4]

Further, some authors show that jurisprudence could be affected by labor market conditions. Berger (1997), using data on West Germany, finds that tribunals are particularly tough on firms when the economy is in downturn, so that jurisprudence works as a kind of a stabilizer of the employment level. For Italy, Ichino, Polo, and Rettore (2002) show that judges tend to interpret the law in a way favorable to workers when the market is tight for them, that is when it is difficult to find job opportunities. Even for U.S., which has the lowest level of EPL, Donohue and Siegelman (1995) find that the amount of legal provisions increases when the economy is in recession. This empirical evidence suggests a reverse causality nexus between the strictness EPL and labor market conditions: the degree of rigidities is not due to the presence of institutions that cause poor labor market performance, but the other way around: a depressed labor market is the main responsible of the strictness of EPL.

In this paper we explore the macroeconomic implications of this reverse causality. We first provide a microfoundation of the endogeneity of firing costs end then evaluate its effects on labor market performance in a matching model *à la* Mortensen and Pissarides (1994).

Using a political economy framework, we find a decreasing relationship between firing costs and labor market tightness. The endogeneity of firing costs produces a positive externality, which can offset the standard congestion externality, generating multiple equilibria. These equilibria reflect a different structure of the labor market in terms of job protection and average duration of unemployment. When the average duration of unemployment is high because the labor market is tight (i.e. there are few vacant jobs per

[4]See also Boeri, Garibaldi, Macis, and Maggioni (2002).

employed), firing costs are also high. When instead finding a new job is easy (so that unemployment duration is low), firing costs are low. With endogenous firing costs, the labor market tightness is the variable that drives toward a higher or lower level of job protection.

A further interesting result we obtain is that the equilibria are not Pareto ranked, so that it is not possible to state that the equilibrium with lower firing costs is better. As a consequence, the institutional differences between European and Anglo-Saxon labor markets do not imply a related gap in terms of welfare. We also investigate social efficiency, providing a generalization of the traditional Hosios (1990) condition. We find that the achievement of the social optimum requires not only to take the congestion externality into account, but also the offsetting externality deriving from the endogeneity of firing costs.

Finally, we analyze the local stability of the equilibria. We show that when the firing costs effect is sufficiently strong to offset the search cost externality the equilibrium is a stable node, while when the search cost dominates we have an unstable saddle point.

The paper is organized as follows. Section 2 describes the model and provides a microfoundation for the firing costs function, while section 3 focuses on the condition to have multiple equilibria. Section 4 analyses local stability and the properties of the equilibria. Section 5 investigates social efficiency and its implications for labor market performance. Section 6 concludes.

2 The Model

The economy is made up of a continuum of risk-neutral workers and firms, which consume all their income. Every worker may be employed or unemployed. When employed, a worker receives a wage w; when unemployed, he enjoys leisure b. Every firm in the market has a job that may be either filled or vacant. If it is filled the economic activity yields a product yx: hence, the profit obtained by the firm is $yx - w$. If instead the job is vacant, the firm incurs a cost c for its maintenance.

We assume that the product of a filled job is made up of the product of a general component y and an idiosyncratic one x $(0 \leq x \leq 1)$. The firm's rational behaviour implies that economic activity starts at the maximum level of productivity, that is for $x = 1$. When an idiosyncratic shock arrives, it reduces productivity to a new level ys. At this new level, the firm has to decide whether to continue production or to shut the job down. Assuming that the idiosyncratic shock hits the single firm at a constant rate λ, and the idiosyncratic component x is distributed according to a generic distribution function $G(x)$ (assumed to be continuous and independent from the previous realizations of x), the firm closes the job when x goes below a threshold level

X.

Unemployed workers and vacancies are randomly matched according to a Poisson process. The matching process is summarized by a constant returns to scale function, increasing in the number of unemployed workers and in the number of vacancies.[5] Labor force is normalized to one so that the matching function is $m = m(u, v)$, where m is the number of matches, u is the unemployment rate and v is the ratio vacancies-labor force. The probability that a vacant job is matched is defined by the coverage rate of a vacancy:

$$\frac{m(u,v)}{v} = q(\theta) \text{ with } \frac{dq(\theta)}{d\theta} \leq 0 \tag{1}$$

while the probability of exit from unemployment is given by:

$$\frac{m(u,v)}{u} = \theta q(\theta) \text{ with } \frac{d\theta q(\theta)}{d\theta} = q(\theta)[1 - \eta(\theta)] \geq 0 \tag{2}$$

where θ is the ratio between vacancies and unemployment, v/u, and $\eta(\theta)$ is the absolute value of the elasticity of $q(\theta)$ with respect to θ. From this, it follows that $1/q(\theta)$ and $1/\theta q(\theta)$ are the average duration of a vacancy and the average duration of unemployment respectively.

The dependence of these transition probabilities on the relative number of vacancies and unemployed workers produces a search externality similar to the trade externality of Diamond (1982).

The dynamics of unemployment is given by the difference between the inflows into unemployment and the outflows from it, with probability $\lambda G(X)$ and $\theta q(\theta)$ respectively:

$$\dot{u} = \lambda G(X)(1-u) - \theta q(\theta) u \tag{3}$$

In steady-state $\dot{u} = 0$, and the unemployment rate is given by:

$$u = \frac{\lambda G(X)}{\lambda G(X) + \theta q(\theta)} \tag{4}$$

Equation (4) is the Beveridge curve, which determines the equilibrium unemployment rate for a given value of the market tightness θ and the reservation probability X.

2.1 The Firing Costs Function

We characterize the EPL as a cost on job destruction which affects the flows in and out of unemployment. We do not consider the existence of severance payments and their role of insurance against risk.

[5] The assumption of constant returns to scale matching function is consistent with the empirical evidence. For a survey, see Petrongolo and Pissarides (2001).

The flow of expected income can be expressed by the following Bellman equations for employed and unemployed workers respectively:

$$rV_E = w + \lambda(F)(V_U - V_E) \tag{5}$$

$$rV_U = b + \phi(F)\gamma(\theta)(V_E - V_U) \tag{6}$$

We have rewritten the transition probabilities in order to take into account the effects of firing costs on hiring and firing decisions. From the theoretical and empirical analysis (see Saint-Paul (1996, 2000)) we assume that the separation rate is decreasing and convex in F, that is $\lambda'(F) < 0$ and $\lambda''(F) > 0$; and that the exit rate from unemployment is decreasing and linear in F (that is $\phi'(F) < 0$ and $\phi''(F) = 0$) and increasing and concave in θ (that is $\gamma'(\theta) > 0$ and $\gamma''(\theta) < 0$).[6] Note that only in this section for brevity we set $\theta q(\theta) = \gamma(\theta)$.

The objective of workers is to maximize the profile of their intertemporal consumption in the two states, that is to maximize V_E and V_U.

Subtracting equation (6) from equation (5) in order to obtain $V_E - V_U$ and substituting into equations (5) and (6), we get for the employed worker:

$$V_E = \frac{1}{r}\left[(1 - \xi_E)w + \xi_E b\right] \tag{7}$$

while for the unemployed worker, we get:

$$V_U = \frac{1}{r}\left[(1 - \xi_U)w + \xi_U b\right] \tag{8}$$

where $\xi_E = \frac{\lambda(F)}{r+\phi(F)\gamma(\theta)+\lambda(F)}$ and $\xi_U = \frac{r+\lambda(F)}{r+\phi(F)\gamma(\theta)+\lambda(F)}$ are the proportion of time that a worker will spend unemployed during their lifetime when is currently employed or unemployed respectively, since $w > b$.

Looking at equation (7) and (8), it is easy to note that the maximization of the lifetime profiles of consumption V_E and V_U is equivalent to minimize the unemployment spell ξ_E and ξ_U.

Deriving the expressions for ξ_E and ξ_U with respect to F, we get the following first order conditions (for a given value of θ):

$$\frac{\lambda'(F)}{\phi'(F)} - \frac{\lambda(F)\gamma(\theta)}{r + \phi(F)\gamma(\theta)} = 0 \tag{9}$$

[6] See Boeri, Ruiz, and Galasso (2003).

$$\frac{\lambda'(F)}{\phi'(F)} - \frac{r+\lambda(F)}{\phi(F)} = 0 \tag{10}$$

Equations (9) and (10) allow to determine the optimal values of the firing costs F_E^* and F_U^* chosen by the employed and the unemployed workers respectively.

Note that the level of firing costs chosen by the employed worker is always higher than the one chosen by the unemployed. In fact, for any given value of F the second term of equation (9) is lower than the one in equation (10). It follows that the optimal value of F that satisfies the two first order conditions will be higher for the employed workers.

In order to evaluate the effects of labor market tightness on the optimal value of F chosen by workers, we totally differentiate equations (9) and (10) with respect to F and θ.

As for the employed workers, we get:

$$\frac{dF_E}{d\theta} = -\frac{\lambda'(F)\,\phi'(F)\,\gamma(\theta) - \lambda(F)\,\phi'(F)\,\gamma'(\theta)}{r\lambda''(F) + \lambda''(F)\,\phi(F)\,\gamma(\theta)} \tag{11}$$

Since $\lambda''(F) > 0$, the sign of equation (11) only depends on the sign of the numerator.

Using equation (9), we verify that the numerator of equation (11):

$$-\frac{r\lambda(F)}{\gamma(\theta)\,[r+\gamma(\theta)]}$$

is negative. As a result, the optimal value of firing costs chosen by the employed worker is decreasing in labor market tightness.

As for unemployed workers, totally differentiating equation (10), we get:

$$\frac{dF_U}{d\theta} = 0 \tag{12}$$

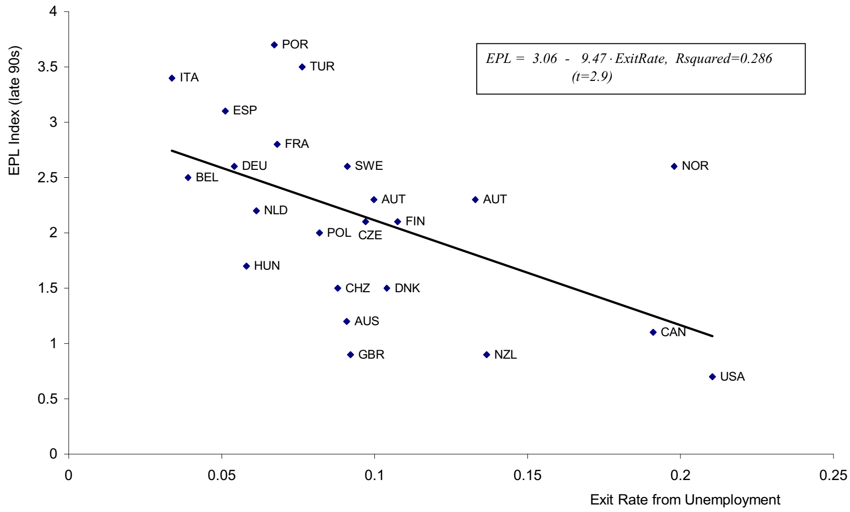
that is, unemployed worker chooses a constant level of firing costs that does not depend on labor market tightness.

Summarizing, the strictness of EPL, that is the effective level of firing costs $F(\cdot)$, can be expressed as:

$$F = F(\theta) \tag{13}$$

with $F'(\theta) < 0$. When the number of vacancies is low with respect to the number of unemployed workers, firing costs decrease. In other words, the

FIGURE 1
The Relationship between EPL and Labor Market Tightness



tighter the labor market for workers (the fewer the vacancies per unemployed), the higher the firing costs. We add just two technical assumptions to be used in the analysis of the shutdown equilibrium: we assume there is an upper bound to the firing cost function so that it cannot exceed a given positive level, and that the marginal firing cost has a finite value for $\theta = 0$.

To support this result, we provide some preliminary evidence using the OECD data on EPL index (late 90s) and long term unemployment (as the percentage of unemployed workers for at least 12 months in 1998). The relationship between long term unemployment x and the exit rate from unemployment $\theta q(\theta)$ is $x = e^{-\theta q(\theta)12}$. Hence, knowing the long term unemployment, we can deduce the exit rate from unemployment:

$$\theta q(\theta) = -\frac{\ln x}{12}$$

We take the exit rate as a proxy of labor market tightness. Figure 1 shows that there is a statistically significant negative correlation between this measure of labor market tightness and the EPL index. This preliminary evidence appears to be consistent with our result.

2.2 Workers and Firms

The presence of firing costs affects the intertemporal optimization of workers and firms because the two parties take it into account when they decide to start the match. We assume that the level of wage object of the bargaining between the two parties can be renegotiated continuously. In the initial phase of the match a certain wage w_0 is bargained corresponding to the maximum level of productivity. Thereafter, production goes on until the job is hit by an idiosyncratic shock, in which case the wage is renegotiated and will be $w(x)$, since its value depends on the value of the idiosyncratic component of productivity. When x goes below the threshold X, the filled job is destroyed and the firm must pay the firing cost.

Let V_E and V_U be the value functions of the worker respectively when employed and unemployed. In the initial phase of the match optimization requires that the following Bellman equations must be satisfied:

$$rV_{E0} = w_0 + \lambda \int_X^1 \left[V_E(s) - V_{E0}\right] dG(s) + \lambda G(X)(V_U - V_{E0}) \quad (14)$$

$$rV_U = b + \theta q(\theta)(V_{E0} - V_U) \quad (15)$$

Where V_{E0} is the value of the employed worker in the initial phase of the match, for $x = 1$ and for the initial wage w_0.

Thereafter the wage is renegotiated and equation (14) becomes:

$$rV_E(x) = w(x) + \lambda \int_X^1 \left[V_E(s) - V_E(x)\right] dG(s) + \lambda G(X)\left[V_U - V_E(x)\right] \quad (16)$$

As for the firm, the flow of expected profits from a filled job rV_F and from a vacant job rV_V in the initial phase of the match must satisfy the following equations:

$$rV_{F0} = y - w_0 + \lambda \int_X^1 \left[V_F(s) - V_{F0}\right] dG(s) + \lambda G(X)\left[V_V - F(\theta) - V_{F0}\right] \quad (17)$$

$$rV_V = -c + q(\theta)(V_{F0} - V_V) - \lambda V_V \quad (18)$$

where V_{F0} is the value of a filled job for $x = 1$ and for the initial wage w_0.

In the continuous phase of the match equation (17) becomes:

$$rV_F(x) = yx - w(x) + \lambda \int_X^1 \left[V_F(s) - V_F(x)\right] dG(s) + \lambda G(X)\left[V_V - F(\theta) - V_F(x)\right] \quad (19)$$

Equations (14)-(16) for the worker and (17)-(19) for the firm are standard valuation equation which must hold by the no arbitrage principle.

2.3 Wage Bargaining and Job Destruction

The surplus produced by workers and firms is shared by Nash bargaining. The assumption that the wage can be continuously renegotiated implies that the initial wage differs from the continuation one because of the presence of firing costs.

At the beginning of the bargaining process, the maximization of a geometric average of the surplus weighed with the relative bargaining powers determines the following sharing rule:

$$V_{E0} - V_U = \frac{\beta}{1-\beta} \left(V_{F0} - V_V \right) \tag{20}$$

while afterwards we have:

$$V_E \left(x \right) - V_U = \frac{\beta}{1-\beta} \left(V_F \left(x \right) + F \left(\theta \right) - V_V \right) \tag{21}$$

where β represents the bargaining power of the worker.

These two sharing rules determine two different wage equations: following Lindbeck and Snower (1988), we define the outsider wage equation as that corresponding to the initial phase and the insider wage equation as that corresponding to the next one.

Replacing equations (14), (15), (17) and (18) into equation (20), we get the outsider wage equation:

$$w_0 = \left(1 - \beta \right) b + \beta \left[y + c\theta - \lambda F \left(\theta \right) \right] \tag{22}$$

As for the insider wage equation, replacing equations (16), (15), (19) and (18) into equation (21), we get:

$$w \left(x \right) = \left(1 - \beta \right) b + \beta \left[yx + c\theta + rF \left(\theta \right) \right] \tag{23}$$

Equation (22) and (23) state an increasing relationship between the level of wage w and labor market conditions θ. Note that firing costs in equation (22) reduce the outsider wage since firms take them into account in wage bargaining, while in equation (23) they increase the insider wage since they become concretely operative and give greater bargaining power to the workers.

In equilibrium, the exploiting of all profit opportunities by the economic agents implies that $V_V = 0$ so that we can rewrite equation (18) as:

$$V_{F0} = \frac{c}{q \left(\theta \right)} \tag{24}$$

which states that the value of a filled job at the maximum level of productivity and at the initial level of wage must be equal to its expected maintenance cost for the period it remains vacant.

When productivity x goes below the threshold X, the job is destroyed: hence, the firm loses $V_F(x)$ and pays a firing cost $F(\theta)$. As a result, a job is maintained active if productivity x is such that $V_F(x) > -F(\theta)$, while it is destroyed if $V_F(x) < -F(\theta)$. The threshold X is then defined by the following relationship:

$$V_F(X) + F(\theta) = 0 \tag{25}$$

We now have all the elements to determine the job destruction condition. It is obtained by making use of the insider wage equation (23), and the two equations (19) and (25):

$$yX + rF(\theta) - \frac{\beta c\theta}{1-\beta} - b + \frac{\lambda y}{r+\lambda}\int_X^1 (s-X)\, dG(s) = 0 \tag{26}$$

Equation (26) yields an increasing relationship between θ and X, because better labour market conditions for the workers improve their external opportunities with a higher level of wage and a larger number of jobs destroyed.

3 Job Creation and Multiple Equilibria

We now derive the job creation curve. This requires a bit of algebra.

First, subtract equation (19) evaluated in X from equation (17). Then, replace in the result the outsider wage equation (22) and the insider wage equation (23) also evaluated in X. Finally making use of (24) and (25), we express the job creation condition as:

$$\frac{c}{q(\theta)} = (1-\beta)\left[\frac{y(1-X)}{r+\lambda} - F(\theta)\right] \tag{27}$$

With endogenous firing costs are, we note that the left hand side of equation (27) is increasing in θ, since greater market tightness implies lower firing costs. The right hand side is also increasing in θ, since greater θ reduces $q(\theta)$ and increases the average search costs.

Totally differentiating the job creation condition (27) yields:

$$\left.\frac{dX}{d\theta}\right|_{JC} = \frac{\frac{cq'(\theta)}{[q(\theta)]^2} - (1-\beta)F'(\theta)}{\frac{(1-\beta)y}{r+\lambda}} \tag{28}$$

Since the sign of equation (28) depends on the sign of the numerator, the slope of the job creation depends on the marginal search cost and the marginal firing cost. This latter effect reflects one of the major feature of the model: when a firm decides to open up one more vacancy, it reduces firing costs at the aggregate level, giving rise to a positive externality and improving the situation of the other firms. Thus, the decision to open a vacancy causes two types of externalities: a positive one deriving from the reduction of firing costs and a negative one deriving from the increase of search costs. In absence of any positive firing costs externality, the sign of condition (28) is unambiguously negative: since the job destruction curve is upward sloping, there is a unique equilibrium. However, if there is a positive externality, there could be multiple equilibria.

Note that the job creation curve is upper bounded, because there is a maximum level of the productivity threshold ($X = 1$) where all jobs are destroyed. Thus, for low values of θ the firing cost effect is stronger than the search cost effect and the job creation curve is increasing. When θ keeps on increasing, however, the search cost becomes dominant while the positive effect exerted by the reduction of firing cost vanishes; the job creation curve becomes decreasing. Looking at the second derivative of equation (27), we get:

$$\frac{d^2X}{d\theta^2} = \frac{(r+\lambda)\,c}{(1-\beta)\,y}\left[\frac{\theta q''(\theta) + 2q'(\theta)\,\eta(\theta)}{\theta q(\theta)^2}\right] - \frac{r+\lambda}{y}F''(\theta) \tag{29}$$

Assuming that initially the firing cost effect dominates the search cost effect is equivalent to assume that condition (29) is negative, that is that the job creation curve be concave.

In this case, there is a value of θ, say θ^*, such that for $\theta < \theta^*$ the job creation curve is increasing, while for $\theta > \theta^*$ the job creation curve is decreasing. Therefore, the job destruction curve can potentially meet the job creation curve twice, as shown in Figure 2. Moreover, the origin is always an equilibrium (the shutdown equilibrium).

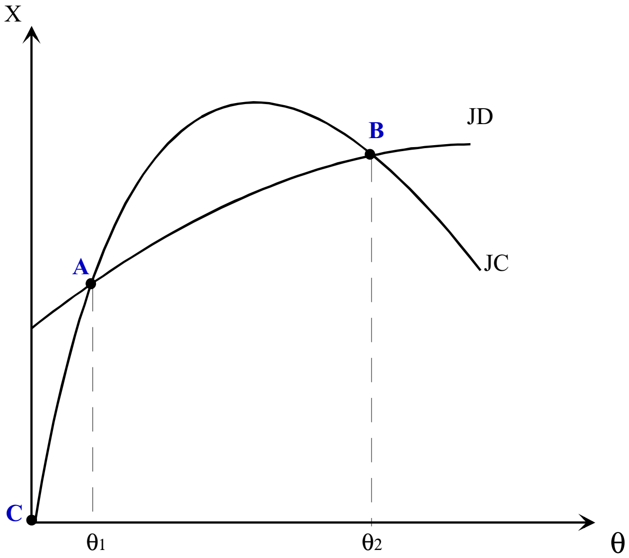
Formally, in order to have multiple equilibria, the slope of the job creation condition must be greater than the slope of the job destruction for low level of θ and must be lower for high level of θ. Differentiating the job destruction condition (26) yields:

$$\left.\frac{dX}{d\theta}\right|_{JD} = -\frac{rF'(\theta) - \frac{\beta c}{1-\beta}}{y - \frac{\lambda y}{r+\lambda}\left[1 - G(X)\right]} \tag{30}$$

Subtracting equation (28) from equation (30), we obtain:

$$\left.\frac{dX}{d\theta}\right|_{JD} - \left.\frac{dX}{d\theta}\right|_{JC} = \frac{\beta c - \frac{[r+\lambda G(X)]cq'(\theta)}{q(\theta)^2} + \lambda G(X)(1-\beta)F'(\theta)}{(1-\beta)\,y\frac{r+\lambda G(X)}{r+\lambda}} \tag{31}$$

FIGURE 2
Multiple Equilibria with Endogenous Firing Costs



Multiple equilibria arise only if condition (31) is negative for low level of θ and positive for high level of θ. That is, if the level of marginal firing costs dominates (is dominated by) the level of marginal search costs when θ is low (high).

Looking at Figure 2, equilibrium A is characterized by a low level of flows into unemployment and market tightness, while equilibrium B features high level of flows and tightness. We can interpret the two equilibria as reflecting two different characteristics of the labor market. The endogeneity of firing costs implies that the worker faces a sort of trade off between job protection and unemployment duration: when labor market is thin (the labor market tightness is low), the average duration of a filled job is high (because firing costs are high), but is also high the average duration of unemployment. When instead labor market is thick (the labor market tightness is high), the worker has lower duration of a filled job (because firing costs are low) but also a high probability to find a new job when unemployed.

Given the two equilibrium values of X and θ, from the Beveridge curve we can obtain the corresponding level of equilibrium unemployment. Since the productivity threshold and the labor market tightness effect the unemployment rate in opposite directions, the two equilibria could produce similar unemployment rate in the model.

The main implication of multiple equilibria concerns the direction of causality between job protection and labor market outcomes. The Euroslerosis view considers the high level of employment protection as responsible for the poor labor market performance. In our model, multiple equilibria reflect labor market conditions, which in turn determine the level of firing costs, i.e. labor market tightness determines the degree of rigidity. Labor market tightness is then the ruling variable as it affects the level of firing costs.

If the effect of labor market conditions on firing costs is sufficiently strong (that is, it dominates the one on search costs so that we are on the increasing portion of the job creation curve) equilibrium requires a higher level of θ and thus a more flexible labor market. Vice versa, when the search costs dominate, equilibrium needs a more rigid labor market.

In conclusion, it is not labor market rigidities (in terms of job protection) that cause labor market performance, but rather it is labor market conditions that cause the degree of rigidities of the labor market.

4 Stability

To examine the stability properties of the two equilibria found above, we consider what happens out of steady state. To this end, rewrite the Bellman equation (17) and (19), the latter evaluated in X, as:

$$rV_{F0} = y - w_0 + \lambda \int_X^1 [V_F(s)]\, dG(s) - \lambda [V_{F0} + G(X) F(\theta)] + \dot{V}_{F0} \quad (32)$$

$$rV_F(X) = yX - w(X) + \lambda \int_X^1 [V_F(s) - V_F(X)]\, dG(s) + \dot{V}_F(X) \quad (33)$$

where $\dot{V}_F$ is the time derivative of the value of the filled job. We should consider an analogous equation for the vacant job, but since the free entry condition $V_V = 0$ also holds out of steady state, the condition $\dot{V}_V = 0$ is satisfied as well, and we can omit it.

We rewrite equations (32) and (33) as follows:

$$\dot{V}_{F0} = -y + w_0 - \lambda \int_X^1 V_F(s)\, dG(s) + (r + \lambda) V_{F0} + \lambda G(X) F(\theta) \quad (34)$$

$$\dot{V}_F(X) = -yX + w(X) - \lambda \int_X^1 [V_F(s) - V_F(X)]\, dG(s) + rV_F(X) \quad (35)$$

These equations and equation (3) allow us to obtain three (nonlinear) differential equations for θ, X and u.

A Taylor's expansion in the neighborhood of a generic steady state of the three equations above yields:

$$\dot{u} = -[\lambda G(X) + \theta q(\theta)]\, \bar{u} - u\left[q(\theta) + \theta q'(\theta)\right] \bar{\theta} + \lambda G'(X)(1-u)\, \bar{X} \quad (36)$$

$$\dot{X} = \left[\frac{\beta \left[c + rF'(\theta) \right]}{V_F^X} \right] \bar{\theta} - \left[\frac{(1-\beta)\, y}{V_F^X} \right] \bar{X} \tag{37}$$

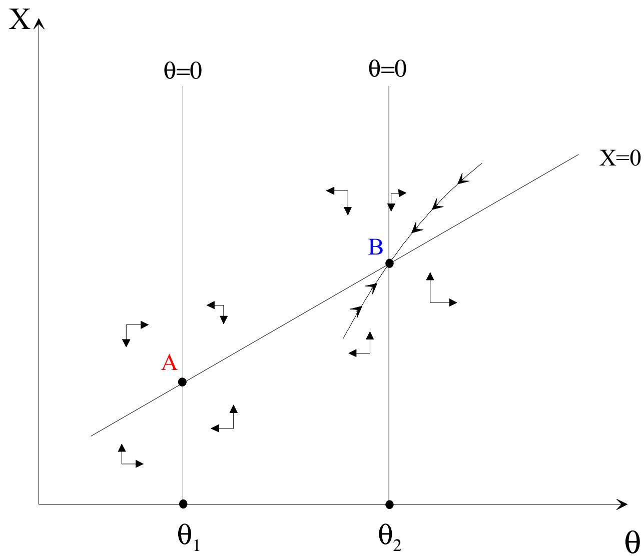
$$\dot{\theta} = \left[\left(-\frac{cq'(\theta)}{q(\theta)^2} \right)^{-1} \left[\beta c + \left[G(X) - \beta \right] \lambda F'(\theta) \right] + r + \lambda \right] \bar{\theta} \tag{38}$$

where $\overline{u}$, $\bar{X}$ and $\overline{\theta}$ represent deviations from steady state values. V_F^X is the first derivative of $V_F(x)$ with respect to x. The sign pattern of the linearized system is:

$$\begin{pmatrix} \dot{u} \\ \dot{X} \\ \dot{\theta} \end{pmatrix} = \begin{pmatrix} - & - & + \\ 0 & - & ? \\ 0 & 0 & ? \end{pmatrix} \begin{pmatrix} \bar{u} \\ \bar{X} \\ \bar{\theta} \end{pmatrix} \tag{39}$$

The triangular nature of the stability matrix implies that the characteristic roots are equal to the elements on the main diagonal. Thus, it all depends on the differential equation for θ: if this equation is stable, then the steady state is a stable node, while if it is unstable we have a positive sign, and the steady state is a saddle point. Looking at the phase diagram in 3, one can verify that the former is the situation of point A, while the latter is the situation of points B and C.

FIGURE 3
The Local Stability of the Equilibria



To see this, rewrite equation (31) as follows:

$$\left.\frac{dX}{d\theta}\right|_{JD}-\left.\frac{dX}{d\theta}\right|_{JC}=\frac{\beta c-r\frac{cq'(\theta)}{q(\theta)^2}-\lambda G\left(X\right)\left[\frac{cq'(\theta)}{q(\theta)^2}+\beta F'\left(\theta\right)\right]+\lambda G\left(X\right)F'\left(\theta\right)}{\left(1-\beta\right)y\frac{r+\lambda G(X)}{r+\lambda}} \tag{40}$$

If the differential equation for $\dot{\theta}$ is stable, it must be:

$$\beta c-r\frac{cq'\left(\theta\right)}{q\left(\theta\right)^2}-\lambda\left[\frac{cq'\left(\theta\right)}{q\left(\theta\right)^2}+\beta F'\left(\theta\right)\right]+\lambda G\left(X\right)F'\left(\theta\right)<0$$

If this condition is verified, the numerator of equation (40) is negative. This implies that we are at point A where the job creation curve is steeper than the job destruction, that is the firing costs effect dominates the search cost effect. As a consequence, if $\dot{\theta}$ is stable and the steady state is a node, the equilibrium is in the upward-sloping portion of the job creation curve. Vice versa, if $\dot{\theta}$ is unstable and the steady state is a saddle, the equilibrium is at points B or C where the job creation is flatter than the job destruction, that is the firing costs effect is dominated by the search cost effect.[7]

The endogeneity of firing costs thus has interesting implications not only for the multiplicity of equilibria but also for their stability, since if firing costs were fixed we would have just one unstable equilibrium.

5 Efficiency

The two equilibria described in Figure 2 are not Pareto ordered. This is because they lie on the job destruction which is positively sloped; hence the equilibrium with the low level of X is also the one with the low level of market tightness. In equilibrium A workers enjoy longer average duration of a filled job (if employed) but also longer duration of unemployment (if unemployed). In equilibrium B is the other way round: if employed, workers have shorter duration of a productive job and if unemployed shorter duration in the unemployed status.

As described above, the equilibrium in matching models is characterized by the presence of search externalities, by the dependence of the transition probabilities on the relative number of unemployed workers and vacant jobs. The externalities affect firms and workers when they are in the phase of search, while the wage is determined by the firm and the worker after they meet. Hence, when a firm and a worker join a match, they do not take the effect of their choices on firms and workers still searching into account.

[7] In the shutdown equilibrium this result derives from the assumption on the finite value of the marginal cost function for $\theta = 0$.

Under the assumption of exogenous firing costs, the question of social efficiency has been investigated by Hosios (1990) and Pissarides (2000). Comparing the market solution of the model with that of the social planner maximizing a social welfare function for an infinitely lived economy, they find that search externalities are internalized when the elasticity of the coverage rate of a vacancy with respect to the market tightness, $\eta(\theta)$, is equal to the relative bargaining power of the workers, β.

Since the control variables of the social planner maximization problem are θ and X, exogenous firing costs do not modify the efficiency condition. But, if firing costs are decreasing in θ, the optimal choice of the social planner is modifies.

With endogenous firing costs the problem of the social planner is:

$$\max_{\theta,X} \Phi(y,u) = \int_0^\infty e^{-rt}\left[y_M + bu - c\theta u - \lambda G(X)(1-u)F(\theta)\right]dt \tag{41}$$

$$s.t.\ \dot{u} = \lambda G(X)(1-u) - \theta q(\theta)u \tag{42}$$

$$\dot{y}_M = y\theta q(\theta)u + \lambda(1-u)\int_R^1 ysdG(s) - \lambda y_M \tag{43}$$

where y_M is the average output per person in the labor force. The social planner maximizes an aggregate welfare function in which θ and X are the control variables – maximization subject to the evolution over time of the state variables, the unemployment rate u and the average product per active person y_M. The current value of the Hamiltonian is:

$$\begin{aligned} H = {} & y_M + bu - c\theta u - \lambda G(X)(1-u)F(\theta) + \mu_1\left[\lambda G(X)(1-u) - \theta q(\theta)u\right] \\ & + \mu_2\left[y\theta q(\theta)u + \lambda(1-u)\int_R^1 ysdG(s) - \lambda y_M\right] \end{aligned} \tag{44}$$

where μ_1 and μ_2 are the costate variables associated with the two constraints.

The first order conditions for this problem are:

$$-c - \theta q(\theta)F'(\theta) - \mu_1 q(\theta)\left[1-\eta(\theta)\right] + \mu_2 q(\theta)y\left[1-\eta(\theta)\right] = 0 \tag{45}$$

$$\mu_1 - F(\theta) - \mu_2 yX = 0 \tag{46}$$

$$\dot{\mu}_1 = [r + \lambda G(X) + \theta q(\theta)]\,\mu_1 - b + c\theta - \lambda G(X)\,F(\theta) + \tag{47}$$
$$-\mu_2 \left[y\theta q(\theta) - \lambda y \int_R^1 s dG(s) \right]$$

$$\dot{\mu}_2 = (r + \lambda)\,\mu_2 - 1. \tag{48}$$

Evaluating the first order conditions in steady state and getting rid of the two costate variables, we obtain the job creation and the job destruction equations for the social planner in the two endogenous variables θ and X:

$$[1 - \eta(\theta)] \left[y \frac{1 - X}{r + \lambda} - F(\theta) \right] = \frac{c}{q(\theta)} + \theta F'(\theta) \tag{49}$$

$$yX - b - c\theta \frac{\eta(\theta)}{1 - \eta(\theta)} + \frac{\lambda y}{r + \lambda} \int_R^1 (s - X)\, dG(s) - \frac{\theta^2 q(\theta)\, F'(\theta)}{1 - \eta(\theta)} = 0 \tag{50}$$

Comparing equations (49) and (50) with the market solutions (equations (27) and (26)) the efficiency condition is:

$$\eta(\theta) = \beta - \frac{(1 - \beta)\,\theta q(\theta)}{c} F'(\theta) \tag{51}$$

If firing costs are fixed, $F'(\theta) = 0$, we return to the Hosios condition. If, instead, firing costs are decreasing in θ, the second term of the right side of the equation (51) is positive. Starting from a situation where firing costs are fixed and $\eta(\theta) = \beta$, the introduction of endogenous firing costs switches an efficient situation to an inefficient one.

In this case, for every value of the productivity threshold X, the optimal value of θ chosen by the social planner needs not only internalize the congestion caused by workers and firms in the market, but also compensate the distortion produced by the presence of firing costs. For example, for a given value of β, if firms are causing too much congestion in the market (i.e., the elasticity of the coverage rate of a vacancy with respect to the market tightness is high) and the level of firing costs is high, the market value of θ is too low. Hence, to achieve social efficiency, the optimal value of θ must be higher in order to reduce the level of $\eta(\theta)$ and the effective level of firing costs.

6 Concluding Remarks

In this paper, using a political economy framework, we have provided a microfoundation of the inverse relationship between the strictness of employment protection and labor market tightness. We have then investigated the macroeconomic implications of this result on equilibrium unemployment.

One main result is that the model produces multiple equilibria suggesting a causality nexus between labor market rigidities and economic outcomes different from the conventional one. It is not employment protection that causes poor labor market performance, but rather the other way around: one can think that a depressed labor market – with few jobs created and high average duration of unemployment – be the main responsible for the level of rigidities.

We have also investigated the question of efficiency. First, we have shown that the equilibria are not Pareto ranked. It follows that a lower level of rigidities are not associated with a higher level of welfare. As for social efficiency, we have obtained a generalization of the Hosios condition. If firing costs are endogenous, the achievement of social optimum requires not only taking the congestion that workers and firms cause in the market into account, but also the offsetting externality produced by firing costs.

Finally, we analyzed the local stability of the equilibria. We find that, when the firing costs externality is sufficiently strong to offset the search cost externality, the equilibrium is a stable node. Vice versa, when the search cost effect dominates, the equilibrium is an unstable saddle point.

The results obtained in the paper rise an interesting issue for future research. We consider a partial equilibrium analysis of the labor market without taking into account the potential interactions with other markets. Hence, a natural question arises: what affects labor market conditions? We think an answer could come from the analysis of the causes of the low level of growth and aggregate demand experienced by the most of the European countries in the last ten years.

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