Do Labor Market Conditions Affect the Strictness of Employment Protection Legislation?

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Abstract

In this paper we provide a theoretical microfoundation for the negative relationship between firing costs and labor market tightness and evaluate the effects of this relationship on labor market performance in a matching model *à la* Mortensen and Pissarides (1994). The optimal level of firing costs are chosen by the employed worker – i.e. the insider – which is the median voter, by maximizing her human capital. Performing a comparative statics exercise, we analyze the effects of labor market tightness on the optimal choice of firing costs. The results are clear cut and generalize our previous work. (a) If wages do not depend on firing costs a decreasing firing costs function unambiguously arises. (b) With flexible wages, a sufficient condition to have a decreasing relationship is that the separation rate be higher than the hiring rate. These results are illustrated with a numerical simulation. Moreover, we show that the relationship between labor market tightness and firing costs can give rise to a labor market configuration characterized by multiple equilibria: prolonged average duration of unemployment will produce a labor market with low flows and wage and high strictness of employment protection, and vice versa.

JEL classifications: J64, J65
Keywords: Firing Costs, Multiple Equilibria

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†We wish to thank Christopher Pissarides, Paolo Naticchioni, Antonio Scialà, Pietro Reichlin, Giorgio Rodano and Clifford Wymer, the participants to the Working Lunch in Labor Economics and to the EALE Conference 2006 (Prague) for useful comments and suggestions. The usual disclaimer applies.

1 Introduction

Employment protection legislation (EPL) is defined by OECD (2004) in the usual way: a set of rules regulating the hiring and firing process provided through labor legislation. This definition obviously focuses on what we can call the legislative dimension but, as we shall see in a moment, this is not the only relevant one. Its purpose is clearly to improve workers' welfare by protecting existing jobs and thus making long-term employer-employee relationships possible. But what is a benefit for the worker is a cost for the firm. From this point of view, employment protection negatively affects the firm hiring and firing decisions, with ambiguous results on unemployment.[1]

The prevalent interpretation of EPL is that of cost. In fact, the EPL indicator formulated by the $OECD$ is designed to quantify the strictness of this legislation in the $OECD$ countries; that is, to measure how expensive it is for the firm to dismiss a worker. For instance, in building the EPL index for regular workers, who still account for by far the greatest share of labor arrangements, the $OECD$ considers three main components: an interpretative one, setting the conditions under which a worker can be dismissed by the employer and the sanctions in the case of unfair dismissal; a procedural one, giving the worker the opportunity to take the employer to court; and, finally, the severance pay in the case of a decision favorable to the worker.

What is more interesting in this recent edition of the report is the emphasis placed not only on the legislative dimension of the EPL but also on what is called the "enforcement" dimension; that is, on how the rules are interpreted and applied by the judges.[2] The enforcement or actual dimension is important in evaluating the strictness of EPL, even when it has only potential effects.

It is true that the EPL for permanent workers is made up of rules setting conditions under which an employee can be dismissed, and the sanctions to be paid by the employer in case of unjustified dismissal. However, interpretation and the actual application of these rules are delegated to the judges. In most cases the rules and provisions only set minima for compensation in the case of unfair dismissal; the exact extent of this compensation depends on the judicial interpretation of the law. As we will see below (see the section 3) and also the OECD (2004) reports, there is empirical evidence suggesting that the judges' decisions are affected by existing labor market conditions: if the level of unemployment is high, these decisions tend to be favorable to the worker. In other words, in deciding the legitimacy of unfair dismissal claims, the judges' decisions are affected by the unemployment rate (which is a measure of the probability of finding a new job), thus making job security sensitive to labor market conditions. Of course, as underlined in the $OECD$ report, very often the enforcement dimension has a simple role of dissuasion. Given the costs the two parties fear they may have to pay, they often reach an agreement before taking the case to court.[3] Here

[1] It is well known that EPL leads to two opposite effects on labor market flows: on the one hand, by reducing firing, it also reduces flows into unemployment; on the other, by decreasing hiring, it lowers flows out of unemployment. The overall effect on employment is thus dubious.

[2] In the words of the 2004 report, "it is important to distinguish these rules from *practice*, which brings in the enforcement dimension. Therefore, when discussing the extent of employment protection, judicial practices and court interpretations of legislative and contractual rules have to be taken into account as well.". (OECD (2004), p.64)

[3] Notice that the threatening aspect of the enforcement dimension can even be predominant with respect

too, however, we may reasonably suppose that the worse the general economic conditions are, the stronger the dissuasive role will prove.

In this paper we focus on the enforcement or actual dimension of EPL. Our aim is to explain why at some particular times – as in the last ten or fifteen years in Europe – we speak of labor market rigidity even if no change has occurred in regulation of the labor market, at least as regards permanent workers.[4] What we noted above about the actual dimension of EPL seems to suggest a natural explanation: labor market rigidity or flexibility is related to the level of economic activity. When the economy is on a downturn and labor market conditions are getting worse, employed workers reckon that the probability of their being hired if fired will be lower. In such a case they will resist any attempt to fire them. If, on the other hand, the economy is booming and labor market conditions are looking up, employed workers tend to think the hiring probability will be higher, and their resistance to firing will consequently be lower. In formal terms, this implies a negative relation between the level of economic activity and the strictness of EPL, or what we will call the level of firing costs.

To make this relationship endogenous, we build a simple political economy model where a majority rule is in force. Since we may reasonably suppose that employed workers (the insiders) are the majority, we consider their choice of the level of firing costs in the process of maximization of their human capital. It is interesting to note that this maximization implies a trade-off between the insider current wage (which is positively affected by firing costs) and the future duration of unemployment (also positively influenced by firing costs). We first examine the case where wages are fixed (for instance because they are set by collective bargaining) and so unresponsive to firing costs. In this case the insider optimal choice of the level of firing cost always gives rise to a negative relationship between labor market conditions and the level of firing cost. If instead wages are flexible, we find that a sufficient condition to have an inverse relationship is that the firing probability is higher than hiring probability: if the insider think that it easier to be fired than to find a new job, her resistance is greater when labor market conditions get worse. In sum, our theoretical model shows the existence of an inverse relation between labor market conditions and the level of firing cost under plausible hypothesis. We conclude by demonstrating that this inverse relationship can generate multiple equilibria in the labor market.

The paper proceeds as follows. The next section briefly reviews the main features of EPL and shows that the only significant changes in the overall index have concerned temporary workers. Section 3 summarizes the theoretical literature on employment protection. Section 4 describes the labor market and how hiring and firing decisions are affected by EPL. Section 5 illustrates the insider trade-off between wage and expected unemployment duration in choosing the firing cost level. Section 6 contains the derivation of the firing cost as a function of labor market tightness, in the fixed wage case first, and then in the variable wage case. Having derived the job creation in the presence of endogenous firing costs in section 8, we show in the following section how multiple equilibria can be generated. The final section

to the actual one. The reason is that the great majority of cases are settled by the parties without bringing the case before a court. As reported by OECD (2004), this is for instance what happened in Italy in 2001.

[4] Indeed, if we look at the EPL index (see below for a more detailed analysis) as measured by the $OECD$, we see that the index for permanent workers has remained substantially unchanged since the late 80s. The only changes in the overall EPL index (concerning not only individual dismissals of regular workers, but also collective dismissals and regulation of temporary jobs) have regarded the latter form of arrangement.

contains some concluding remarks. Detailed proof of the main propositions is set out in the Appendices.

2 What is EPL

We have already seen that EPL is a set of rules regulating the interruption of the job relationship, preventing the firms from dismissing workers without ties.

There are three different rules concerning: a) the notice a firm has to guarantee the worker before dismissal; b) the administrative costs incurred when a firing decision ends up in court; c) severance payment, the amount of money that the firm has to pay to the worker on severance (usually related to the worker's qualifications and job tenure). In this case, the law provides for intervention on the part of a judge in the dismissal procedure. The judge can play an important role in verifying the correctness of the firing procedure and quantification of severance pay. In some cases, as for instance is the case in Italy, the judge decides on whether there is a just cause, or justified reason for dismissal, and otherwise can order reinstatement of the fired worker in the workplace. Garibaldi and Violante (2005) have estimated that in the Italian manufacturing sector a firm that loses a case bears a cost corresponding to twelve times the monthly wage.

The total firing cost born by the firm falls into two parts, the transfer component (for instance severance pay and legal notice) and the pure cost component (for instance the legal expenses). In what follows we will concentrate mainly on the latter component.

2.1 The EPL index

Measurement of EPL strictness is calculated by the $OECD$ according to a criterion that has been defined the "hierarchy of hierarchies". To every $OECD$ country a score is assigned taking into account the different aspects of employment protection for every existing contractual arrangement (protection against individual dismissals for regular workers, requirements for collective dismissals, regulation of temporary forms of work). The synthetic indicator is the average of a score assigned to each of these aspects.

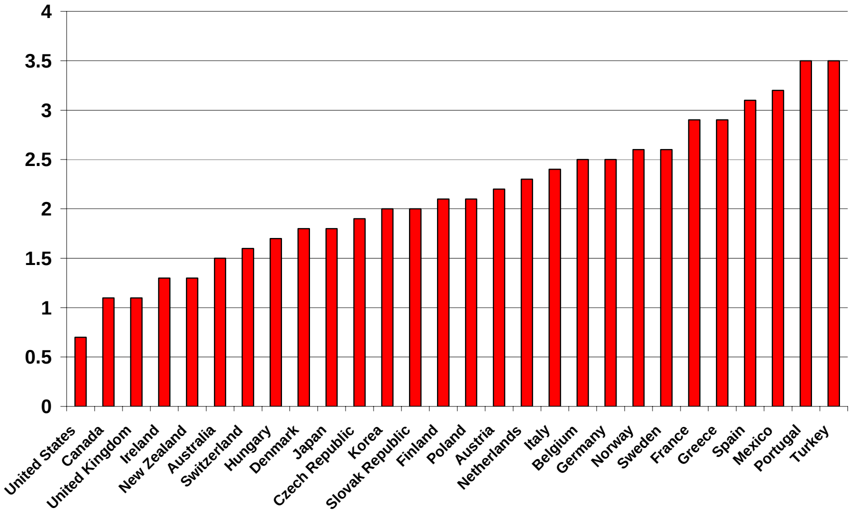
More specifically, the three components of the EPL index are: a) the protection of workers against dismissals (taking three forms: the difficulty of individual dismissals; the procedural inconvenience that the firms have to face; notice and severance payments); b) the difficulties in collective dismissal procedures; c) regulation of temporary jobs.

The changes in employment protection can be analyzed taking two different viewpoints: either looking at the cross-sectional data of the different $OECD$ countries for a single time period or examining the time series of the EPL index in a given $OECD$ country.

Looking first at cross-country comparisons, figure 1 reveals there are wide differences in the overall EPL index[5] from one country to another: the index varies from values around 1 in the Anglo-Saxon countries (Canada, United Kingdom and USA) to a value of 3.5 in Portugal and Turkey.

[5] This is index version 2, which includes collective dismissals, calculation of which dates back to the 90s. Version 1 of the index dates back to the 80s but does not take account of the requirements for collective dismissals.

FIGURE 1
EPL overall index, 2003



What makes the difference? Clearly, all of the three components contribute. But, as can be seen from the graphs 2 and 3, neither the procedures for collective dismissals nor the regulation for permanent contracts helps explain much of this difference.

FIGURE 2
Collective Dismissals, *EPL* index, 2003

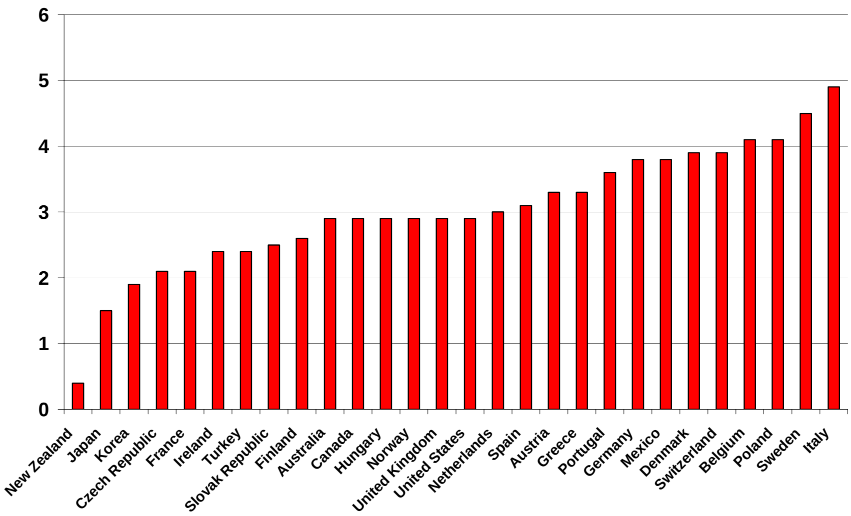
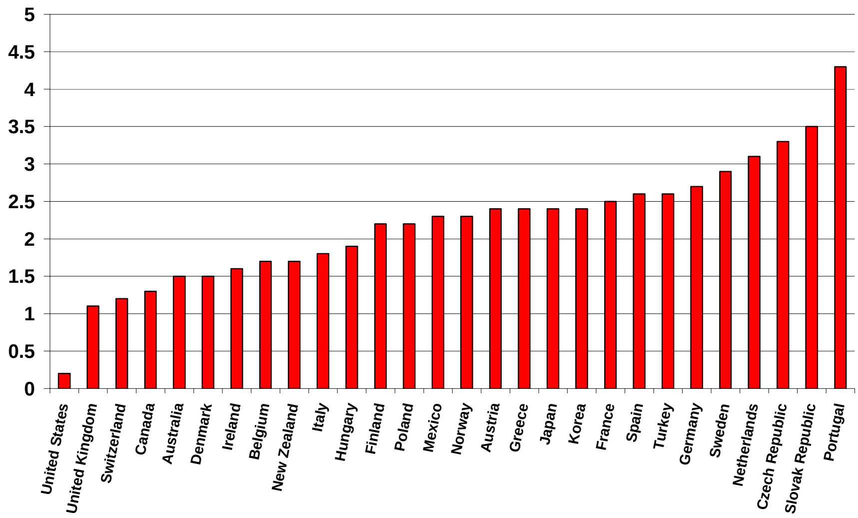
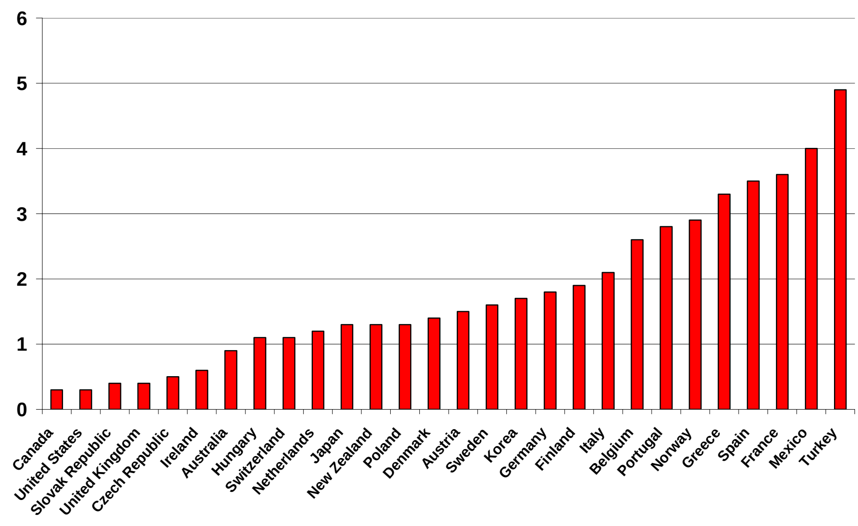


FIGURE 3
Regulation of permanent employment, *EPL* index, 2003



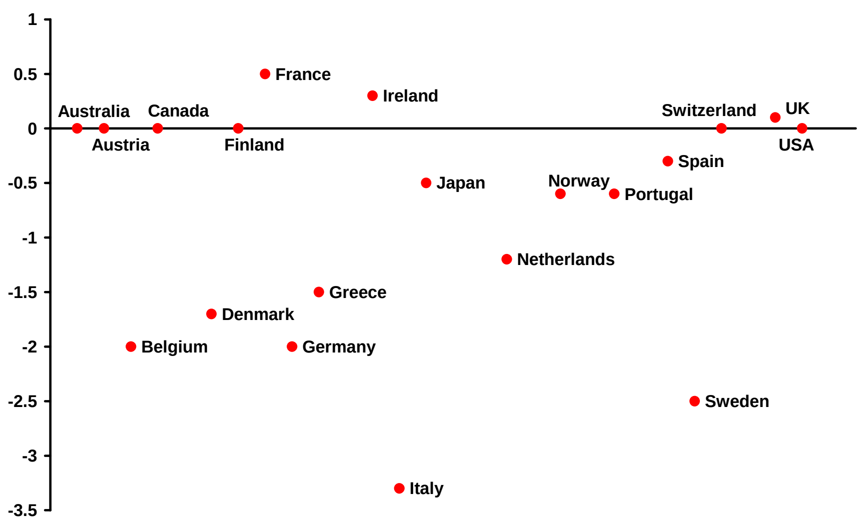
Conversely, the dispersion of the index is much greater when we look at the temporary work component (see figure 4). Thus, the 2003 *EPL* data suggest that the international variation of the summary index is mostly due to the regulation of temporary employment. This appears to be confirmed by the fact that almost all the countries with the highest over-all index values are also the countries with the strictest temporary employment protection (France, Greece, Spain, Mexico, Turkey).

FIGURE 4
Regulation of temporary work, *EPL* index, 2003



That the key element in explaining differences is the regulation of temporary work also emerges from simple observation of the EPL time series. In fact, as revealed by the graph 5 measuring changes in the EPL index for temporary work (a minus sign means a lower value of the index in 2003 than in the 80s), there was a significant easing in the regulation of this form of contract – surprisingly, perhaps, the most striking being in the case of Italy. Indeed, most of the countries implemented labor market reforms towards a higher degree of flexibility form the late 80s to 2003 only for temporary workers. In particular, there was convergence among European countries during the 90s towards the so-called reforms to the border, that is, forms of intervention primarily concerned with the regulation of temporary jobs. This is especially true for countries with particularly strict employment protection.

FIGURE 5
Changes in the Strictness of EPL for Temporary Workers from late 80s to 2003



We have seen in the 1 that the focus of this paper is on the pure cost component of the employment protection legislation. One might think that this is the less significant part of EPL in comparison to the transfer component.[6] Nevertheless, as also pointed out by Pissarides (2001) and emphasized by the figure , the two parts of the EPL have an evident positive correlation: countries where the transfer component is high also present a remarkable cost component. This latter component, even if proportionally lower, is therefore able to reproduce the structure of the employment protection for every $OECD$ country.

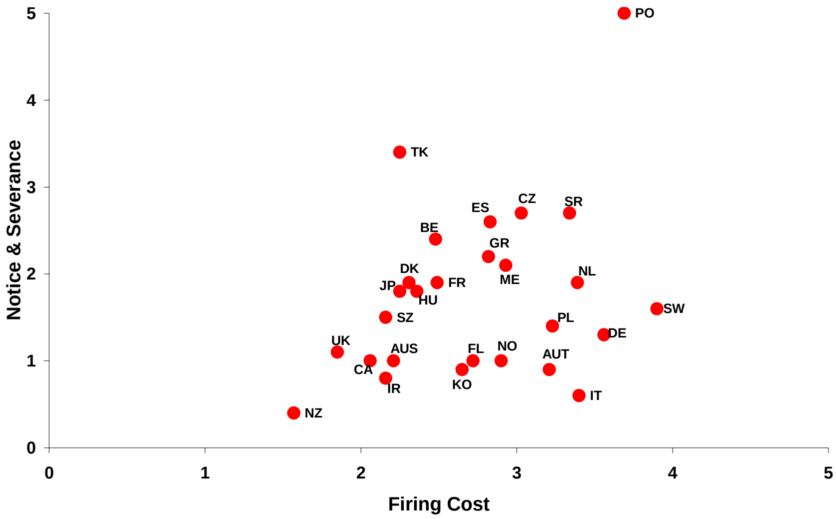
3 Related Literature

The "state of the art" of economic theory about the effects of employment protection legislation on labor market performance does not seem to be of much help for policy makers.

[6] In Italy the transfer component is preponderant: it has been quantified by Garibaldi and Violante (2005) at 80% of the total cost.

FIGURE 6

The Correlation between the Transfer Component and the Cost Component of EPL



We see an ample literature producing a variety of results, and not always with clear-cut conclusions.

One theoretical strand focusses on the interaction between shocks and labor market institutions, emphasizing the role of firing costs in particular: this is the debate on the so-called Eurosclerosis, which has been investigated, among others, by Bentolila and Bertola (1990), Blanchard (2000), Blanchard and Portugal (2001), and Ljungqvist (2002). One of the most important results regarding the effects of the firing cost on unemployment was obtained in a matching framework by Mortensen and Pissarides (1999), who pointed out the ambiguous effects of layoff costs on equilibrium unemployment —- the ambiguity resulting from the reduction of inflows into unemployment (caused by the longer duration of filled jobs) and the increase of the average duration of unemployment (because of the negative effects on the propensity to hire).

Other economists highlight the usefulness of EPL as a remedy against market failures. If unemployed workers are risk-adverse, EPL can be a form of insurance against the reduction of income associated with job loss (Pissarides (2001), Bertola (2004)). In such a situation, firms (which are less risk averse than workers) provide a form of insurance exchanging a premium in term of lower wage with a longer employment relationship. Moreover, a stable employment relationship also favours long term investment in firm specific human capital and promotes cooperation with workers, thus improving productivity (Nickell and Layard (1999)).

More recently, economic literature has begun to investigate the complexity of the employment protection systems.

Blanchard and Tirole (2004) show that firing costs are the natural counterpart to the state provision of unemployment benefits. The latter requires the former, so that they are the basic components of the optimal set of labor market institutions. The authors assess this principle in a basic framework where workers are risk adverse and adjust it to take into account labor market "imperfections", such as limits on insurance, difficulties for firms to pay layoff taxes, ex-post wage bargaining and heterogeneity of workers and/or firms. An aspect of their work directly concerns us. They argue that an issue still to be explored is the role of judges who, in many European countries, often have to play the role of deciding whether layoffs are justified or not. Since the implications of imperfections require adaptation of the layoff taxes to particular situations, they state that this could be done by leaving some discretion to judges.[7]

The role of the judges is also at the center of the empirical works of Donohue and Siegelman (1995), Berger (1997), Ichino, Polo, and Rettore (2003) and Marinescu (2005). They investigate the role of courts in influencing the strictness of employment protection legislation. Their main observation is that in countries as different as Germany, Italy, the U.S. and the UK, the quantity of legal provisions increases when the economy is on a downturn, since the tribunals tend to interpret the law favoring the workers when job opportunities are scarce.

Following these contributions, Bertola, Boeri, and Cazes (1999) revisited the criteria of the EPL index formulated by the $OECD$ (1995, 1999), in order to take into account the growing complexity of the employment protection system in force in each country. They emphasize how the strictness of EPL could be affected by the interpretations of the judges, showing that the higher the percentage of sentences favorable to workers, the higher is the number of cases taken to court.[8]

Lastly, since the main aim of this paper is to provide a microfoundation in a political economy framework for the inverse relationship between firing costs and labor market tightness and evaluate its effects on labor market performance in a matching model *à la* Mortensen and Pissarides (1994), we review the theoretical literature which directly concerns us.

There is a large economic literature addressing the political support for labor market institutions (see for instance Saint-Paul (2001), Saint-Paul (2002), Boeri, Ruiz, and Galasso (2003)). Attention focuses on the behavior of the employed worker (i.e. the median voter) and on the suitability for some group of workers to support labor market institutions claimed by other groups. Political support for employment protection arises from a conflict between insiders and outsiders, which explains why it can be difficult to implement deregulation measures on the labor market.

Our model is also based on a political economy framework. However, our aim is to shed light on the evolution of labor market institutions as to reflect the actual labor market conditions, i.e. the difficulties workers face in finding jobs. As we will show, this helps identify the theoretical conditions supporting the empirical literature cited above.

The results obtained are an important generalization of our previous works (Saltari and Tilli (2004a) and Saltari and Tilli (2004b)). First of all, with fixed wages the median voter (i.e. the employed worker), in her choice of optimal level of firing costs, minimizes the duration of unemployment during her lifetime. In this case a decreasing firing costs function unambiguously arises. If wages are flexible, a sufficient condition to have a decreasing relationship is that the separation rate be higher than the hiring rate. These results are

[7] See also Blanchard and Tirole (2003) which focusses on the French employment protection system.

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

confirmed with numerical simulation.

Moreover, different configurations of the labor market deriving from the optimal behavior of the economic agents may give rise to multiple equilibria: high average duration of unemployment will produce a labor market with low flows and wages, and particularly strict employment protection. Vice versa, short duration of the unemployment status will produce high flows and wages, and low levels of firing costs. The latter finding provides a microfoundation for the result obtained in Saltari and Tilli (2004a).

4 The Labor Market

Let us now briefly describe the characteristics of the labor market. The economy is made up of a continuum of risk-neutral workers and firms, which consume all of their income and discount the future at a constant interest rate r. Any of the workers may be employed or unemployed. When employed, a worker receives a wage w; when unemployed, she 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 y: hence, the profit obtained by the firm is $y - w$. If the job is vacant, on the other hand, the firm incurs cost c for its maintenance.

Unemployed workers and vacancies randomly match according to a Poisson process. If the unemployed workers are the only job seekers and search with fixed intensity of one unit each, and firms also search with fixed intensity of one unit for each job vacancy, the matching function gives: $h = h(u, v)$ where h denotes the flow of new matches, u is the unemployment rate and v is the vacancy rate.

The matching function is assumed (on the ground of empirical plausibility, see Petrongolo and Pissarides (2001) for a survey) to be increasing and concave in each argument and to have constant return to scale overall.

By means of the homogeneity property of the matching function, we can define the average rate at which vacancies meet potential partners with the following "intensive" representation: $m(\theta) = \frac{h(u,v)}{v}$ with $m'(\theta) < 0$ and elasticity $-\eta(\theta) \in (-1, 0)$. θ is the ratio of vacancies to unemployed workers and will be interpreted as a convenient measure of the labor market tightness.

Similarly, $\frac{h(u,v)}{u}$ or $\theta m(\theta)$ is the probability for an unemployed worker to find a job. The linear homogeneity of the matching function implies that $\theta m(\theta)$ is increasing with θ.[9]

We characterize the EPL as a cost F on job destruction which affects the flows in and out of unemployment. Thus, we do not consider the existence of severance payments. An idiosyncratic shock hits the single firm at rate s.

In order to capture the effects of firing costs on hiring and layoffs, we assume that the exit rate from unemployment, $\theta m(\theta)$, is affected in a multiplicative way by a function $\phi(F)$,

[9] The average duration of unemployment and vacancies are respectively $\frac{1}{\theta m(\theta)}$ and $\frac{1}{m(\theta)}$. This implies that the duration of unemployment decreases with labour market tightness while the duration of a vacant job increases with θ. The dependence of the two transition probabilities on the relative number of traders implies the existence of a trading externality (Diamond (1982)). During a small interval of time there is a positive probability that a vacant job will not be filled as well as a positive probability that an unemployed worker will not find a job. This probability cannot be brought to zero by any price adjustment. Increasing vacancies brings congestion on other firms just as an increasing number of unemployed job searchers brings congestion on other workers.

decreasing and linear in F. Similarly, since firing costs also affect layoffs, we assume that the separation rate is a decreasing function of F, $s(F)$, with positive second derivative.[10]

The measure of workers entering unemployment is $s(F)(1-u)$, while the measure of workers leaving unemployment is $\phi(F)\theta m(\theta)u$. The dynamics of unemployment is given by the difference between inflows and outflows: $\dot{u} = s(F)(1-u) - \phi(F)\theta m(\theta)u$. The unique steady state value of the unemployment rate is $\frac{s(F)}{s(F)+\phi(F)\theta m(\theta)}$, showing the dependence of the unemployment rate on the equilibrium values of F and θ.

Consider the "asset value" E of being an employed worker. This is defined by the following equation

$$rE = w - s(F)(E-U) \tag{1}$$

An employed worker earns a wage w, but loses her job with flow probability $s(F)$. In the latter case, her utility drops to that of an unemployed worker. In turn, the asset value U of being unemployed is

$$rU = b + \phi(F)\theta m(\theta)(E-U) \tag{2}$$

The unemployed worker earns a flow utility b, given by the value of leisure plus unemployment benefits, if any; further, with probability $\theta m(\theta)$, she finds employment and changes her status.

As for the firm, when it posts a new vacancy, the following Bellman equation must be satisfied:

$$rV = -c + \phi(F)m(\theta)(J-V) \tag{3}$$

where V is the value of a vacant job. The firm incurs in a flow search cost equal to c and has a positive probability $m(\theta)$ to fill the job and to jump to the productive state J. In turn, this latter value satisfies:

$$rJ = y - w - s(F)(J+F-V) \tag{4}$$

Equation (4) states that employing a worker yields a profit flow equal to $y-w$ net of the change in state which occurs with flow probability $s(F)$.

In equilibrium, there is no unexploited profit opportunity, so that the free entry condition holds and $V=0$. Thus, equation (3) can be rewritten as $J = \frac{c}{\phi(F)m(\theta)}$, i.e. the value of a filled job must be equal in equilibrium to its expected maintenance cost for the period it remains vacant.

As usual, we assume that the surplus produced by workers and firms is shared by Nash bargaining. Maximization of a geometric average of the surplus weighted with the relative bargaining powers determines the following sharing rule:

$$E - U = \frac{\beta}{1-\beta}(J+F-V) \tag{5}$$

where β represents the bargaining power of the worker.

[10] The assumptions on the second derivative of $\phi(F)$ and $s(F)$ are consistent with the empirical evidence. See Boeri, Ruiz, and Galasso (2003). See also Appendix A for a formal justification of these hypotheses.

Replacing equations (1), (2), (4) and (3) into equation (5), we get the wage equation (see Appendix A for details):

$$w(\theta, F) = (1 - \beta)\, b + \beta\, [y + c\theta + rF] \tag{6}$$

The bargained wage is an increasing function of labor market tightness: when it increases, there are more opportunities for the worker to find a new job. It is also increasing in the level of firing costs since they reduce the probability of being fired, giving the worker greater bargaining power.

5 The Insider Problem

Our focus is on the political support of employment protection. Since all the workers have the same level of productivity, aggregation is trivial: assuming that the number of employed workers is higher than the unemployed, the level of employment protection implemented by the political system coincides with the level of firing costs chosen by the employed worker.

The choice of the employed worker is made with the objective to maximize the profile of her intertemporal consumption with respect to F, that is to maximize E.

Subtracting (2) from (1) and substituting into (1), we get:

$$E = \frac{1}{r}\left[(1 - \alpha(\theta, F))\, w(\theta, F) + \alpha(\theta, F)\, b\right] \tag{7}$$

where

$$\alpha(\theta, F) = \frac{s(F)}{r + \phi(F)\,\theta m(\theta) + s(F)}$$

is the proportion of time that a worker will spend unemployed during her lifetime when currently employed.

Maximizing (7) with respect to F, we get the following first order condition:

$$[1 - \alpha(\theta, F)]\, w_F(\theta, F) = \alpha_F(\theta, F)\, [w(\theta, F) - b] \tag{8}$$

where $w_F(\theta, F)$ and $\alpha_F(\theta, F)$ denote the derivatives with respect to F of the wage equation and of the unemployment spell, respectively. According to (8), at the margin there must be equality between the benefits and costs caused by a variation of F. Note that in (8), since $[1 - \alpha(\theta, F)] > 0$ and $[w(\theta, F) - b] > 0$, $w_F(\theta, F)$ and $\alpha_F(\theta, F)$ must have the same sign.

Writing the first order condition explicitly and considering that $w_F(\theta, F) = \beta r$, we get:

$$\beta r \frac{r + \phi(F)\,\theta m(\theta)}{r + s + \phi(F)\,\theta m(\theta)} = \frac{s'(F)\,[r + \phi(F)\,\theta m(\theta)] - s(F)\,\phi'(F)\,\theta m(\theta)}{[r + s(F) + \phi(F)\,\theta m(\theta)]^2} \tag{9}$$

To be a maximum, the second order condition must be satisfied. The formal details proving the concavity of the objective function are set out in Appendix A.

In order to evaluate the effects of labor market tightness on the optimal value of F, we totally differentiate equation (8) with respect to F and θ to get:

$$\frac{dF}{d\theta} = -\frac{E_{F\theta}(\theta, F)}{E_{FF}(\theta, F)} = -\frac{\partial^2 E/\partial F \partial \theta}{\partial^2 E/\partial F^2} = \tag{10}$$
$$= \frac{w_F(\theta, F)\,\alpha_\theta(\theta, F) + \alpha_{F\theta}(\theta, F)\,[w(\theta, F) - b] + w_\theta(\theta, F)\,\alpha_F(\theta, F)}{E_{FF}(\theta, F)}$$

where $\alpha_i(\theta, F)$ and $w_i(\theta, F)$ are the first derivatives with respect to i of the unemployment duration and the wage equation respectively. Analogously, $\alpha_{ij}(\theta, F)$ and $w_{ij}(\theta, F)$ are the second derivatives of duration and wage with respect to the variables i and j.

Since $E_{FF}(\theta, F) < 0$, to have a negative relationship between F and θ, $E_{F\theta}(\theta, F)$ must be negative.

In the next section we will show in detail that in order for the term $\alpha_{F\theta}(\theta, F)\,[w(\theta, F) - b]$ to be positive, the condition $s(F) > \phi(F)\,\theta m(\theta)$ must be satisfied. This is a fairly intuitive condition: if the separation probability is greater than the hiring one, the insider will claim greater protection for her job, when labor market conditions worsen.

6 The Relationship between Firing Costs and Labor Market Tightness

Let us now study the conditions for an inverse relationship between firing costs and labor tightness. We begin by assuming that the wage rate is fixed, a common situation in most European countries where the wage level is set in collective bargaining. We will show that in this situation a downward sloping firing costs function emerges without ambiguity. We will next analyze the case of flexible wages.

6.1 Fixed Wage

The first case examines the situation in which the wage is fixed at a level independent of labor market conditions and the level of firing costs, so that $w_F = 0$. This situation reflects the characteristics of the European labor markets, where wages show marked elements of rigidity or are completely fixed through collective bargaining for a number of years. It follows that the effect on the wage of the layoff cost is equal to zero and the optimal choice of the firing cost derives from minimization of the unemployment duration during the lifetime.

Since in this case $w_F = 0$, the first order condition (8) becomes:

$$\alpha_F(\theta, F)\,[w(\theta, F) - b] = 0 \tag{11}$$

Thus, the optimal level of firing cost, say F^*, is determined by the condition that $\alpha_F(\theta, F) = 0$. In this case, it is clear that $F(\theta)$ is decreasing in θ.

First, we rewrite $\alpha_F(\theta, F)$ in full:

$$\frac{s'(F)\,[r + \phi(F)\,\theta m(\theta)] - s(F)\,\phi'(F)\,\theta m(\theta)}{D(\theta, F)^2} = 0 \tag{12}$$

where $D(\theta, F) = r + s(F) + \phi(F)\theta m(\theta)$. Thus, F^* is implicitly defined by:

$$s'(F)[r + \phi(F)\theta m(\theta)] = s(F)\phi'(F)\theta m(\theta)$$

To sign the relationship between F and θ, we make use of the implicit function theorem:

$$\frac{dF}{d\theta} = -\frac{\alpha_{\theta F}}{\alpha_{FF}}$$

Writing the two derivatives in full, we get:

$$\alpha_{FF}(\theta, F) = \frac{s''(F)[r + \phi(F)\theta m(\theta)]}{D(\theta, F)^2} > 0 \tag{13}$$

which is positive by the convexity of $s(F)$. Moreover, the cross derivative:

$$\alpha_{F\theta}(\theta, F) = -[\theta m'(\theta) + m(\theta)]\, s(F)\frac{\phi'(F)(r + s(F)) - s'(F)\phi(F)}{D(\theta, F)^3} \tag{14}$$

is positive. This is because the numerator is negative.

To see this, one can write the first order condition as follows:

$$s'(F)\phi(F)\theta m(\theta) - s(F)\phi'(F)\theta m(\theta) = -s'(F)r > 0$$

which is positive since $s'(F) < 0$. This implies that:

$$s(F)\phi'(F) - s'(F)\phi(F) < 0$$

is negative.

Using this result in (14), we see that $\alpha_{F\theta}(\theta, F)$ is positive. In turn, this implies a decreasing relation between θ and F.

To put it in words: Suppose firing costs are at the optimum and that labor market tightness increases. Then, as a consequence the unemployment duration increases too because we have just seen that $\alpha_{F\theta} > 0$. To return to the optimum, F must decrease (since $\alpha_{FF}(\theta, F) > 0$).

Let us see a simple example. Assume that:

1. the exit rate is $\theta m(\theta) = \theta^\gamma$ (a constant return to scale Cobb-Douglas matching function);
2. the hiring rate is $\phi(F) = 1 - F$;
3. the separation rate is $s(F) = \frac{\lambda}{1+F}$, with λ positive but less than unity.

These functional forms can be justified as follows. First, assume that the firing cost F is in the unit range, $F \in [0, 1]$: when $F = 0$, the labor market is fully "flexible"; if instead $F = 1$, the labor market is "rigid". This is because when the firing cost is equal to unity, the hiring rate is $\phi(1)\theta m(\theta) = 0$, while in contrast full flexibility implies $\phi(0)\theta m(\theta) = \theta m(\theta)$.

Finally, note that the separation rate is $s(0) = \lambda$ if there is no firing cost, while it is $s(1) = \lambda/2$ at the other extreme.

Substituting these functions into the first order condition (12), the firing cost level chosen by the worker is given by:

$$F = \frac{r}{2\theta^{\gamma}}$$

which is of course a decreasing relationship between firing costs and the labor market tightness.

6.2 Flexible Wage

Now consider what happens when the wage does react to the firing cost, that is when $w_F = \beta r > 0$. The first order condition now becomes:

$$[1 - \alpha(\theta, F)] w_F(\theta, F) = \alpha_F(\theta, F) [w(\theta, F) - b]$$

This first order condition makes it clear that there is a trade-off: on the one hand, the increase in F increases the wage (weighted by the employment duration, $1 - \alpha$); but on the other it also increases, just like unemployment duration before (weighted by the cost of being unemployed, $w - b$).

Suppose that $\alpha_{F\theta} > 0$ (we will see in a moment under which conditions this is true). Is this condition sufficient as above to guarantee that there is an inverse relation between F and θ? We will now verify that the answer to this question is indeed positive.

Let us write the comparative statics exercise relevant in this case:

$$\frac{dF}{d\theta} = -\frac{E_{\theta F}(\theta, F)}{E_{FF}(\theta, F)} =$$
$$= \frac{w_F(\theta, F)\alpha_\theta(\theta, F) + \alpha_{F\theta}(\theta, F)[w(\theta, F) - b] + w_\theta(\theta, F)\alpha_F(\theta, F)}{E_{FF}(\theta, F)}$$

As for the numerator, note that the last term is certainly positive, given that $w_F(\theta, F) = \beta r$ and thus by the first order condition $\alpha_F(\theta, F) > 0$.

Omitting the arguments of the functions for the sake of brevity, the other two terms are:

$$w_F \alpha_\theta = -\beta r [\theta m' + m] \frac{s\phi}{D^2} < 0 \tag{15}$$

$$\alpha_{F\theta}(\theta, F)[w(\theta, F) - b] =$$
$$= -[\theta m' + m] \frac{[s'\phi - s\phi'][\phi\theta m - s] + r[\phi' s + s'\phi]}{D^3}[w - b] \tag{16}$$

Under what condition is $\alpha_{F\theta}(\theta, F)$ positive? Since $\alpha_F(\theta, F) > 0$, a simple manipulation shows that:

$$\theta m(\theta)[s'(F)\phi(F) + \phi'(F)s(F)] > -rs'(F) > 0$$

from which we get $s'(F)\phi(F) - s(F)\phi'(F) > 0$. Thus, a condition assuring that $\alpha_{F\theta}(\theta, F)$ is positive is:

$$s(F) > \phi(F)\theta m(\theta) \tag{17}$$

that is, if the separation probability is greater than the hiring one.

We saw above that $w_\theta(\theta, F)\alpha_F(\theta, F)$ is positive. Thus, to show that the condition (17) is also sufficient for $E_{F\theta}(\theta, F) > 0$ and thus to have a negative relation between F and θ, it is sufficient to verify that:

$$w_F(\theta, F)\alpha_\theta(\theta, F) + \alpha_{F\theta}(\theta, F)[w(\theta, F) - b]$$

is positive. Given the condition (17), we concentrate on the remaining two terms:

$$w_F(\theta, F)\alpha_\theta(\theta, F) - [\theta m'(\theta) + m(\theta)]\frac{r[\phi'(F)s(F) + s'(F)\phi(F)]}{D(\theta, F)^3}[w(\theta, F) - b]$$

or:

$$-\beta r\frac{[\theta m'(\theta) + m(\theta)]}{D^2}s(F)\phi(F)\left[1 + \left(\frac{\phi'(F)}{\phi(F)} + \frac{s'(F)}{s(F)}\right)\frac{1 + c\theta + rF - b}{D(\theta, F)}\right]$$

Thus, to have $E_{FF}(\theta, F) > 0$, it is sufficient that the last addend in square brackets be greater than 1 in absolute value (remember that both $\phi'(F)$ and $s'(F)$ are negative). For plausible values of the parameters, this is certainly true.

First, we saw before that $\phi(F) = 1 - F$, so that in modulus $\frac{\phi'(F)}{\phi(F)} = \frac{1}{1-F}$; for $F > 0$, this is greater than 1. Second, the fraction in square brackets is also likely to be greater than one. On the one hand, the numerator of the fraction – $1 + c\theta + rF - b$ – is one or greater than one. In fact, if it is equal to 1, it implies that $w - b = \beta$. If as usual we suppose that β is one-half, it means that the alternative income b (unemployment insurance, income in irregular jobs, home production and so on) is half the wage, again a plausible value. On the other hand, the denominator $D(\theta, F)$ of the fraction is a rate of discount and so is less than 1. Summing up, even without considering the other term $\frac{s'(F)}{s(F)}$, the second addend in square brackets is likely to be greater than 1.

Thus, we have seen that the condition (17) is sufficient to assure that $E_{F\theta}(\theta, F) > 0$ and thus that there exists a negative relation between firing costs and labor market conditions. The intuitive meaning of this conclusion is clear, namely that the insider will claim greater protection for her job, when labor market conditions worsen. It is interesting to note that this condition is always satisfied when θ is sufficiently low. That is, if labor market conditions are particularly bad and threaten to get worse, the insider will always require greater employment protection.

The next section provides an example of such a decreasing relationship.

7 An Illustrative Simulation

We now simulate our model in order to give a quantitative answer to the relationship between firing costs and labor market conditions. Our purpose is to calibrate the model in order to match the characteristics of the main European labor markets.

As for the functional forms, we use the same as applied at the end of subsection 6.1. The hiring function is assumed linear, $\phi(F) = 1 - F$, while the separation function is hyperbolic, $s(F) = \dfrac{\lambda}{1+F}$.

TABLE 1

Baseline Parameters of the Simulation

workers' bargaining power	β	0.5
matching elasticity	η	0.5
interest rate	r	0.02
unemployed utility flow	b	0.2
productivity	y	1
vacancy maintenance cost	c	0.4
separation parameter	λ	0.25

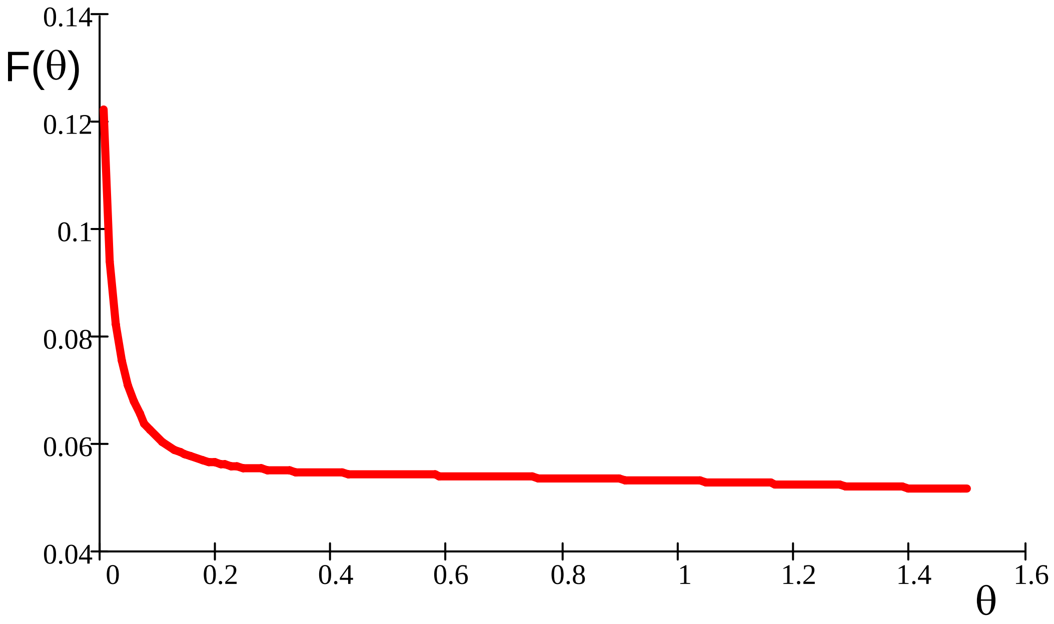
The numerical values assigned (on a quarterly basis) to the parameters are given in table 1. The workers' bargaining power, β, is set equal to 0.5. The elasticity η of the matches with respect to unemployment is set to 0.5, so the Hosios (1990) condition is satisfied[11]. Productivity y is normalized to unity, while the value of the utility flow of the unemployed worker b is based on a 20% replacement ratio (see Mortensen and Pissarides (1999)). The cost of maintenance of a vacancy is equal to 0.4 per quarter.

As for the separation and the hiring functions, let us assume as above that the firing cost F varies in the unit interval, $F \in [0, 1]$. Then, for the separation function, the two values of the parameters h and λ are such that we have a separation rate equal to 0.25 when the dismissal cost is null. For the hiring function, the values of a and d imply that if $F = 0$, the hirings are $\phi(0)\,\theta m(\theta) = \theta m(\theta)$, while if the layoff costs are $F = 1$ (complete rigidity), there are no hirings.

Figure 7 shows the relationship between firing costs and labor market conditions obtained from the simulation.

[11] Petrongolo and Pissarides (2001) suggests values for this elasticity between 0.5 and 0.7.

FIGURE 7
The firing cost function



8 Job Creation

From now on, we proceed by supposing fixed wages. Recalling the free entry condition $V = 0$ and making use of equation (4), the job creation condition is:

$$\frac{[r + s(F)]\, c}{\phi(F)\, m(\theta)} = y - w - s(F)\, F \tag{18}$$

This equation states that the cost of creating and maintaining a vacancy in equilibrium must be equal to the profits the firm expects to obtain from the job once created, equal to the operating profits net of the (expected) firing costs.

The sign of the relationship between of the F and θ for job creation may again be derived from the implicit function theorem. Equation (18) gives:

$$\frac{dF}{d\theta} = \frac{[r + s(F)]\, \phi(F)\, m'(\theta)\, c}{m(\theta)\, c \frac{s(F)\phi(F)}{F} [\epsilon_\phi(F) - \epsilon_s(F)] - [\phi(F)\, m(\theta)]^2 s(F) [\epsilon_s(F) - 1] - m(\theta)\, cr\phi'(F)} \tag{19}$$

where $\epsilon_s(F) = -F\frac{s'(F)}{s(F)}$ and $\epsilon_\phi(F) = -F\frac{\phi'(F)}{\phi(F)}$ are the elasticities of the separation and hiring rates.

Since $m'(\theta) < 0$, the sign of the derivative in (19) depends on the sign of the denominator. As $\phi'(F)$ is negative, this sign depends on the particular functional forms hypothesized for $s(F)$ and $\phi(F)$. The first term in the denominator depends on the difference between these two elasticities, while the second depends on the elasticity of separation being greater or less than 1. Hence, the sign of the relationship between F and θ as far as the job creation is concerned cannot be determined *a priori*. This indeterminacy raises the possibility of multiple equilibria.

An example may help fix ideas. Consider the functional forms used above. If $\epsilon_{\phi}(F) = \frac{F}{1-F}$, the elasticity of the hiring rate is increasing in F and is 0 if firing costs are equal to zero. As for the separation rate, the elasticity is $\epsilon_{s}(F) = \frac{F}{1+F}$: it is equal to 0 if firing costs are zero and it is decreasing in F. Substituting these functional forms in (19) gives a relationship between F and θ implicit in the job creation equation that is decreasing.

Intuitively, the sign of this relation can be understood if we remember that the job creation must satisfy equation (18). When θ increases, the expected cost of maintaining a vacancy increases since it has now become more difficult to fill it: the increase in the ratio of vacancies to unemployed reduces the probability of filling a vacancy. This implies a decrease in profits. Since condition (18) states that in equilibrium profits must be equal to 0, the increase in θ should be followed by a decrease in F. This is because, given the functional forms seen above, the decrease in F reduces both the expected firing costs (since $\frac{ds(F)F}{dF} \geq 0$, so that $\epsilon_{s}(F) \leq 1$) and the expected cost of creating and maintaining a vacancy decrease (since $\epsilon_{\phi}(F) \geq \epsilon_{s}(F)$).

9 Multiple Equilibria

Taking stock of what we have so far seen, three equations describe the equilibrium: the job creation condition, the firing cost function implicitly defined by the insider first order condition, the Beveridge curve. Let us take another look at them:

$$w = y - \frac{[r + s(F)]\,c}{\phi(F)\, m(\theta)} - s(F)\, F \tag{20}$$

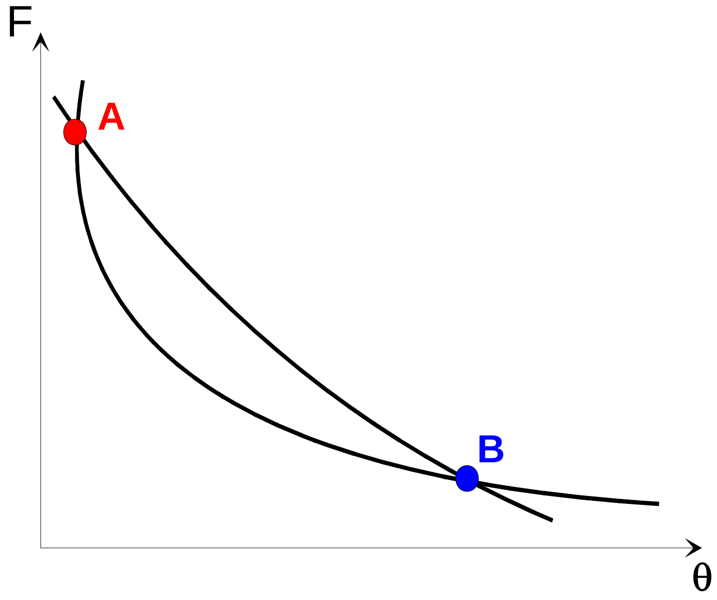
$$\frac{s'(F)\,[r + \phi(F)\,\theta m(\theta)] - s(F)\,\phi'(F)\,\theta m(\theta)}{[r + s(F) + \phi(F)\,\theta m(\theta)]^{2}} = 0 \tag{21}$$

$$u = \frac{s(F)}{s(F) + \theta m(\theta)} \tag{22}$$

These equations determine the equilibrium values of θ, F and u. Note that the first two equations form an independent subset from which we obtain the values of labor market tightness and of firing costs. Plugging these two values into the Beveridge curve, we get the equilibrium unemployment rate. Figure 8 illustrates a situation with two equilibria.

Note that equilibrium A is characterized by a high level of firing costs and lesser market tightness, while equilibrium B features a low level of firing costs and a high level of marked tightness. We can interpret the two equilibria as reflecting two different characteristics of the labor market. The endogeneity of firing costs implies that when the labor market is thin (the level of labor market tightness is low), the average duration of a filled job $\frac{1}{s(F)}$ is high (because firing costs are high), but the average duration of unemployment $\frac{1}{\theta m(\theta)}$ is also high . When, on the other hand, the labor market is thick (the level of labor market tightness

FIGURE 8
Multiple equilibria in the labor market



is high), the average duration of a filled job is low but the worker has a high duration of a filled job (because firing costs are low) but also a high probability of finding a new job when unemployed.[12]

Given the two equilibrium values of F and θ, we derive the equilibrium unemployment level from (22). It should be noted that since firing costs affects the unemployment rate in opposite directions, the two equilibria could produce similar unemployment rates.

10 Concluding Remarks

Institutions change and evolve over time and space. In this paper, we account for such an evolution providing a theoretical microfoundation for the relationship between EPL and the tightness of the labor market. On the basis of this result we are able to study the macroeconomic implications for equilibrium unemployment.

We have shown the condition to have a decreasing firing costs function, with two different hypotheses of wage determination: a) if wages are fixed, the insider choice of the optimal level of firing costs reduces to the minimization of unemployment duration giving rise to a decreasing firing costs function; b) if wages are flexible, a sufficient condition to have a decreasing relationship is that the separation rate be higher than the hiring rate.

Moreover, different configurations of the labor market deriving from the optimal behavior of the economic agents give rise to multiple equilibria: prolonged average duration of un-

[12] This is consistent with the results of Saltari and Tilli (2004b), which establishes that the two equilibria are not rankable. In fact, since the median voter is the employed worker, the two equilibria in figure 8 give rise to a trade-off between job tenure and unemployment duration.

employment will produce a labor market with low flows and wages and marked strictness of employment protection. Vice versa, short duration in the unemployment status will produce high flows and wages and low levels of firing costs.

There is an issue for which our analysis proves useful and can be extended. This involves the role of the institutional actors that determine the evolution of institutions. If the job is done by the judiciary, we should investigate as to whether their behavior can drive towards higher or lower level of efficiency. We believe this is essentially an empirical question.

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Appendix A. The Convexity of the Separation Rate and the Linearity of the Hiring Rate

In this appendix, we show that support for our hypothesis on the analytical forms of $s(F)$ and $\phi(F)$ can be found in the standard matching model of Mortensen and Pissarides (1994).

Let us first consider the job creation curve with endogenous job destruction:

$$(1-\beta)\left[\frac{1-R}{r+s}-F\right]=\frac{c}{m(\theta)} \tag{A.1}$$

where R is the level of the reservation productivity. Assuming $m(\theta)=\theta^{\alpha}$ (using a Cobb-Douglas matching function with constant returns to scale), we explicitly solve this equation for θ:

$$\theta=\left[\frac{1-\beta}{c}\left(\frac{1-R}{r+s}-F\right)\right]^{\frac{1}{\alpha}} \tag{A.2}$$

Consider now the job destruction condition:

$$R+rF-b-\frac{\beta c\theta}{1-\beta}+\frac{s}{r+s}\int_{R}^{1}(s-R)\,dG(s)=0 \tag{A.3}$$

Substituting (A.2) into (A.3), we get:

$$R+rF-b-\frac{\beta c}{1-\beta}\left[\frac{1-\beta}{c}\left(\frac{1-R}{r+s}-F\right)\right]^{\frac{1}{\alpha}}+\frac{s}{r+s}\int_{R}^{1}(s-R)\,dG(s)=0 \tag{A.4}$$

In order to evaluate the effects of firing costs on labor market flows, we need to find the effect of F on the reservation probability R. Totally differentiating equation (A.4), we get:

$$\frac{dR}{dF}=-\frac{r+\frac{\beta c}{1-\beta}\left(\frac{1-\beta}{c}\right)^{\frac{1}{\alpha}}\frac{1}{\alpha}\left[\left(\frac{1-R}{r+s}-F\right)\right]^{\frac{1-\alpha}{\alpha}}}{1+\frac{\beta c}{1-\beta}\left(\frac{1-\beta}{c}\right)^{\frac{1}{\alpha}}\frac{1}{\alpha}\left[\left(\frac{1-R}{r+s}-F\right)\right]^{\frac{1-\alpha}{\alpha}}\frac{1}{r+s}+\frac{s}{r+s}\left[1-G(R)\right]}<0 \tag{A.5}$$

which is negative since both the numerator and the denominator of the fraction are positive. Hence, an increase in firing costs causes a reduction in the reservation probability inducing firms to fire less, i.e. there is a negative relationship between the firing cost and the separation probability.

Further differentiation of (A.5) shows that $s(F)$ is convex:

$$\frac{d^2R}{dF^2} = -\frac{\left[-\frac{\beta c}{1-\beta}\left(\frac{1-\beta}{c}\right)^{\frac{1}{\alpha}}\frac{1}{\alpha}\left(\frac{1-\alpha}{\alpha}\right)\left[\left(\frac{1-R}{r+s}-F\right)\right]^{\frac{1-2\alpha}{\alpha}}\right]D}{\left[1+\frac{\beta c}{1-\beta}\left(\frac{1-\beta}{c}\right)^{\frac{1}{\alpha}}\frac{1}{\alpha}\left[\left(\frac{1-R}{r+s}-F\right)\right]^{\frac{1-\alpha}{\alpha}}\frac{1}{r+s}+\frac{s}{r+s}\left[1-G(R)\right]\right]^2}+ \\ +\frac{\left[-\frac{\beta c}{1-\beta}\left(\frac{1-\beta}{c}\right)^{\frac{1}{\alpha}}\frac{1}{\alpha}\left(\frac{1-\alpha}{\alpha}\right)\left[\left(\frac{1-R}{r+s}-F\right)\right]^{\frac{1-2\alpha}{\alpha}}\right]N}{\left[1+\frac{\beta c}{1-\beta}\left(\frac{1-\beta}{c}\right)^{\frac{1}{\alpha}}\frac{1}{\alpha}\left[\left(\frac{1-R}{r+s}-F\right)\right]^{\frac{1-\alpha}{\alpha}}\frac{1}{r+s}+\frac{s}{r+s}\left[1-G(R)\right]\right]^2} \tag{A.6}$$

where the two terms D and N stand for the denominator and numerator of equation (A.5) respectively.

The sign of equation (A.6) depends on the difference between D and N. Letting $\Psi = \beta\left(\frac{c}{1-\beta}\right)^{\frac{1}{\alpha}}\frac{1}{\alpha}\left[\left(\frac{1-R}{r+s}-F\right)\right]^{\frac{1-\alpha}{\alpha}}$, this difference is:

$$D-N=\frac{1}{r+s}\left[r\left(1-(r+s)\right)+sG(R)+\Psi\left(1-(r+s)\right)\right]>0 \tag{A.7}$$

which is unambiguously positive. This implies that the separation probability $s(F)$ is convex.

As for the hiring probability $\phi(F)$, from the job creation condition (A.1) we get:

$$\frac{dR}{dF}=-(r+s)\left[1+\frac{c}{1-\beta}\alpha\theta^{\alpha-1}\frac{d\theta}{dF}\right]$$

From the job destruction condition (A.3) we obtain $\frac{d\theta}{dF}$:

$$\frac{d\theta}{dF}=\frac{s}{\frac{c}{1-\beta}\left[-\beta-r\alpha\theta^{\alpha-1}+sG(R)\right]}<0 \tag{A.8}$$

This expression is negative. That is, a higher level of firing costs negatively affects the hiring rate (and hence the unemployment duration). Further, since the derivative does not depend on F, the relationship is linear in F.

Appendix B. The Insider Wage Equation

This Appendix derives the insider wage equation starting from the asset value equations for the firm and the worker.

Let us begin with the unemployed worker (the outsider) value equation:

$$rU=b+\phi(F)\,\theta m(\theta)\,(E-U) \tag{A.9}$$

We now look for an expression for the outsider surplus $E-U$ to substitute into this equation. First, recall the value equation for the vacancy:

$$rV=-c+\phi(F)\,m(\theta)\,(J-V) \tag{A.10}$$

Using the free entry condition ($V=0$), we get the value of a filled job:

$$J=\frac{c}{\phi(F)\,m(\theta)} \tag{A.11}$$

We substitute this result into the Nash sharing rule for the outsider, i.e.:

$$E - U = \frac{\beta}{1-\beta}\left(J - V\right) \tag{A.12}$$

to obtain the (prospective) outsider surplus:[13]

$$E - U = \frac{\beta}{1-\beta}\frac{c}{\phi\left(F\right)m\left(\theta\right)}$$

Plug it into the unemployed equation to obtain:

$$\begin{aligned} rU &= b + \phi\left(F\right)\theta m\left(\theta\right)\frac{\beta}{1-\beta}\frac{c}{\phi\left(F\right)m\left(\theta\right)} \\ &= b + \frac{\beta}{1-\beta}c\theta \end{aligned} \tag{A.13}$$

To get the insider wage equation, we now need an expression for U.

First, multiply the asset equation for the employed worker (1) by $1-\beta$:

$$\left(1-\beta\right)\left(r + s\left(F\right)\right)E = \left(1-\beta\right)\left(w + s\left(F\right)U\right) \tag{A.14}$$

Next, multiply the asset equation for the filled job (4) by β:

$$\beta\left(r + s\left(F\right)\right)J = \beta\left(y - w - s\left(F\right)F\right) \tag{A.15}$$

Subtracting equation (A.15) from equation (A.14), we get

$$\left(1-\beta\right)E - \beta J = \frac{1}{\left(r + s\left(F\right)\right)}\left(1-\beta\right)\left(w + s\left(F\right)U\right) - \beta\left(y - w - s\left(F\right)F\right) \tag{A.16}$$

We now use the bargaining rule for the insider, which is:

$$E - U = \frac{\beta}{1-\beta}\left(J + F - V\right)$$

It is to be noted that in the insider sharing rule the value of the filled job is now not simply J but $J + F$.

Using this equation in (A.16), we obtain an expression for rU:

$$rU = \frac{w - \beta y - r\beta F}{1-\beta} \tag{A.17}$$

Equating equation (A.13) with equation (A.17):

$$b + \frac{\beta}{1-\beta}c\theta = \frac{w - \beta y - r\beta F}{1-\beta}$$

we finally get the insider wage equation:

$$w = \left(1-\beta\right)b + \beta\left[y + c\theta + rF\right]$$

This is equation (6) of the main text (see the insider wage equation in Pissarides (2000)).

[13] This is the surplus the unemployed worker would receive once employed in her first job.

Appendix C. The Concavity of the Insider Objective Function

This appendix shows that $E_{FF}(\theta, F) < 0$ so that the maximization problem of the insider in choosing the optimal level of firing costs is well defined.

To begin with, let us return to the first order condition:

$$[1 - \alpha(\theta, F)]\, w_F(\theta, F) = \alpha_F(\theta, F)\, [w(\theta, F) - b] \tag{A.18}$$

where $w_F(\theta, F)$ and $\alpha_F(\theta, F)$ denotes the derivative with respect to F of the wage equation and of the unemployment spell, respectively.

Writing the first order condition in full, we have:

$$\beta r \frac{r + \phi(F)\, \theta m(\theta)}{D(\theta, F)} = \frac{s'(F)\, [r + \phi(F)\, \theta m(\theta)] - s(F)\, \phi'(F)\, \theta m(\theta)}{D(\theta, F)^2} [w(\theta, F) - b] \tag{A.19}$$

Now, $E_{FF}(\theta, F)$ is:

$$w_{FF}(\theta, F)\, [1 - \alpha(\theta, F)] - \alpha_{FF}(\theta, F)\, [w(\theta, F) - b] - 2\alpha_F(\theta, F)\, w_F(\theta, F)$$

Given that $[1 - \alpha(\theta, F)]$ and $[w(\theta, F) - b]$ are both positive, $w_F(\theta, F)$ and $\alpha_F(\theta, F)$ must be positive too, since $w_F(\theta, F) = \beta r > 0$. Further, since $w_{FF}(\theta, F) = 0$, to show that $E_{FF}(\theta, F) < 0$ it is sufficient to verify that $\alpha_{FF}(\theta, F)$ is positive. This term is (omitting the arguments for the sake of simplicity):

$$\alpha_{FF} = \frac{Ds''(r + \phi\theta m) - 2(s' + \phi'\theta m)[s'(r + \phi\theta m) - s\phi'\theta m]}{D^3} > 0 \tag{A.20}$$

which is positive by the convexity of the separation probability function and the first order condition (A.18).