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## Hiring Practices, Employment Protection and Temporary Jobs

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# Hiring Practices, Employment Protection and Temporary Jobs

Anne Bucher<sup>1</sup>

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## Abstract

This paper examines the effects of a two-tier reform of the Employment Protection Legislation that increases flexibility at the margin by allowing firms to hire workers on temporary positions and investigates under which conditions temporary jobs are stepping stones to permanent employment. The analysis has far focused on the role of temporary jobs in employers adjustment to economic shocks and suggested that such reforms have increased unemployment. This study provides new insights on the role of fixed-term contracts by supporting the idea that worker turnover results from the allocation of unemployed workers with the right jobs. In such an economy, temporary contracts facilitate the screening process of match quality and increase worker turnover by inducing firms to be less selective in whom they hire. As the fundamental quality of a match is persistent, firms and workers could be induced to continue producing on a regular contract even with high termination costs. Finally, I propose to investigate how temporary jobs would affect the US economy where experience rating is an original feature of the unemployment benefit system. I ask whether or not introducing temporary jobs while increasing firing costs on regular jobs to finance a given replacement rate increases the employment rate and is welfare-improving.

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# 1 Introduction

The share of temporary employment has grown in most of the OECD countries in the past two decades. The Employment Protection legislation (EPL) has been reformed by easing the regulation concerning firings in the countries where the EPL was relatively strict at the end of the 1980s. Rather than reducing the strictness of the EPL on regular contracts, many countries adopted two-tier reforms that increase flexibility at the margin by allowing firms to hire workers on temporary positions ((OECD 2004)). The reason is straightforward: the EPL leads to two opposite effects on the labor market. It reduces outflows from both employment and unemployment. In consequence, workers who are in regular jobs have more to lose than to gain from a reduction in employment protection as it will result in higher destruction flows. On the contrary, unemployed workers may benefit from such a reduction as they will face higher employment prospects. Governments have thus favored reduced protection only for new contracts by allowing the hiring of workers on temporary basis. Although it may foster job creation, the introduction of fixed duration contracts has ambiguous effects on aggregate unemployment. The net impact depends on whether temporary jobs are used as dead-end jobs or as stepping stones to permanent employment. Such two-tier reforms have been analyzed in a number of important contributions that do not deliver a clear-cut answer. For instance, (Cahuc P. and Postel-Vinay F. 2002) and (Blanchard O. and Landier A. 2002) pointed out that unemployment is not necessarily reduced while transitions into permanent employment are low. However, the analysis has far focused on the role of temporary jobs in employers adjustment to economic shocks. The two studies examine the evolution of employment when the main reason for job destruction is the arrival of an idiosyncratic shock that renders uncertain the output flow. In a context of recurrent shocks, the firms still prefer to dissolve a temporary match at no cost and then to take a chance with a new worker rather than retain the worker on a regular job that is subject to high termination costs.

(Guell M. and Petrongolo B. 2007) found that in Spain, temporary workers move from temporary to permanent position before the expiry of the temporary contract. The authors argue that firms should use temporary jobs to screen workers for permanent jobs. Then, good matches are converted as soon as their quality is known. Similarly, the empirical analysis of (Portugal P. and Varejão J. 2009) based on data from Portugal suggested that screening for permanent jobs is the most important role of temporary jobs.

I propose to investigate theoretically the role of temporary jobs in facilitating the screening process of match quality and thus provide new insights on the effects of temporary contracts. The paper supports the idea that the fundamental quality of a match is persistent but not perfectly known at the time of meeting. Worker turnover thus results from the reallocation process between unemployed workers and firms who search for a suitable match. I extend the model developed by (Pries M. and Rogerson R. 2005) to introduce fixed-duration jobs with no termination costs. The authors consider an economy in which the search process fails in screening matches of poor quality in spirit of (Jovanovic B. 1979). Firms and workers evaluate the potential of their match at the time of meeting. Some

matches do not turn out to be potentially good enough to be formed. Firms and workers have to experience the match to reveal the quality of the employment relationship. As the match quality is persistent, they continue producing when it is revealed to be good while matches revealed to be bad are dissolved. (Pries M. and Rogerson R. 2005) argued that high levels of the EPL distort hiring practices by inducing firms to be more selective in whom they hire. A stringent regulation on firings prevents the reallocation process between workers and jobs thereby reducing both worker turnover and employment.

In such an economy, allowing firms to hire workers on a temporary basis enables them to screen the match quality and to weed out all bad matches at no cost. By integrating temporary job in the benchmark framework of (Pries M. and Rogerson R. 2005), I demonstrate that a two-tier reform of the EPL facilitates hiring practices thereby increasing aggregate employment. One can question the use of temporary contracts while a hiring subsidy policy is well known to offset the negative effects of firing costs on job creations as demonstrated by (Mortensen D. and Pissarides C. 2003). Similarly, a hiring subsidy is found to offset all the negative effects of firing costs on hiring practices in the framework developed by (Pries M. and Rogerson R. 2005). However, this policy might not be self-financing contrary to temporary jobs. Indeed, firing costs are usually firms' expenditures on administrative proceedings and do not fit into the government's resources. Implementing a hiring subsidy would require a taxation on workers' incomes. Fixed-term contracts are basically a temporary exemption of firing costs and thus constitute a self-financing measure.

The analysis I provide on temporary employment is close to the one proposed by (Nagypal E. 2002) and (Faccini R. 2008). The authors both consider that firms use temporary contracts as a screening device. (Faccini R. 2008) develops an extension of the model proposed by (Pries M. and Rogerson R. 2005). Temporary contracts differ from permanent jobs only by the exemption of dismissal costs. They cannot be exhausted but will be transformed into regular contracts once the match quality is revealed to be good. It is assumed that firms are allowed to offer a temporary position only with an exogenous probability. The aim of the paper is to account for the empirical evidence showing that in Europe, temporary contracts correlate positively with employment rates. The assumption of an all-or-nothing learning process on match quality produces a different mechanism through which firing costs affect the equilibrium and reverse the findings of (Nagypal E. 2002) that temporary contracts increase the unemployment rate. The framework I propose differs from the one of (Faccini R. 2008). The author considers that some matches will exogenously benefit from an exemption of firing costs during the learning process on match quality but does not provide any political support to this measure. Which firms can benefit from temporary positions and how long? On the contrary, I consider that every jobs can be created in temporary positions but once exhausted, firms and workers can decide whether or not to continue with the match that will be subject to high termination costs. It thus allows me to analyze under which condition temporary jobs are stepping stones to permanent employment. The analysis first shows that all hirings are made on a temporary basis. Matches that are revealed

to be good lead to permanency. The decision of keeping the worker while the match quality remains unknown at the temporary contract's expiry depends not only on firing costs but also on the potential quality of the match. Firms and workers could be induced to continue producing in a permanent match even with high firing costs if the match has a high probability to be of good quality. They will have more to lose than to gain from taking a chance with a new match. I provide an illustrative simulation by computing the model for the U.S economy as (Pries M. and Rogerson R. 2005). The quantitative analysis suggests that 60% of temporary jobs are stepping-stones to permanent work. In consequence, temporary jobs increase both employment and the aggregate welfare of the economy whatever the job duration. As the learning process on match quality is time-consuming, the marginal gain from temporary employment is reduced when the duration of fixed-term contract exceeds the time necessary to sort matches of poor quality. Besides, the analysis suggests that a greater EPL on regular contracts induces firms to be less selective in whom they hire on a temporary basis while they are more selective in whom they promote on permanent jobs.

Finally, I do not propose to evaluate the reforms that have been implemented in most of the European countries but to investigate how temporary jobs would affect an economy as the U.S economy where experience rating is an original feature of the unemployment benefit system. The United States does not display a strict EPL but makes use of firing costs to finance unemployment insurance to dismissed workers. Firing costs are fixed in proportions of firms' separations to finance unemployment benefits instead of payrolls taxes and social contributions as in European countries. The US model has often been advocated by economists to reduce European unemployment. (Cahuc P. and Malherbet F. 2002) argued that introducing experience rating in a typical rigid continental European labor market could improve employment and labor market efficiency. The paper examines to what extent introducing features of the European labor markets as temporary jobs could improve employment in the US. I consider that unemployment benefits are financed by firing costs but assume a memoryless experience rating schedule. The main contribution is to integrate labor market institutions that are in place and to investigate a second best policy response. Indeed, (Pries M. and Rogerson R. 2005) demonstrated that the labor market institutions distort hiring practices and reduce both employment and welfare with respect to a "laissez-faire" economy. Accordingly, the optimal duration of temporary jobs should be infinity as we tend to the benchmark economy with no firing costs and no unemployment benefits. However, the institutions that are in place can only be changed marginally. In order to make the analysis relevant for policy making, I integrate the unemployment benefit system and ask whether or not introducing temporary jobs while increasing firing costs on regular jobs to finance a given replacement rate increases the employment rate and is welfare-improving. I find that temporary jobs raise aggregate employment and workers' welfare when the average duration exceeds the learning process on match quality.

The paper proceeds as follows. The next section describes the model while section 3 defines the equilibrium. Section 4 examines the impact of temporary jobs and provides a numerical illustration. Lastly, section 5 attempts to evaluate the effects of temporary jobs in the US economy by integrating features of the unemployment benefits system.

## 2 The Model

### 2.1 The environment

The model is an extension of the framework proposed by (Pries M. and Rogerson R. 2005) which supports the idea that worker turnover results from the reallocation process between workers and firms who search for a suitable match. Workers and firms are forward-looking, risk-neutral and have a common exogenous discount rate of  $\beta$ . Time is discrete and the model is developed in a general equilibrium setting.

The labor market features a continuum of identical workers of measure one facing a continuum of identical firms which measure is endogenous. A worker and a firm who are matched together produce an output  $y$  which level depends on how the worker's attributes mesh the firm's attributes. Although workers and firms are homogenous, it is assumed that there are two types of worker-firm matches. Some matches are high-productive ( $y = y_h$ ) while others turn out to be low-productive ( $y = y_l$  with  $y_l < y_h$ ). The level of the output reflects the fundamental quality of the match that is persistent ; a good match remains good as long as it is not exogenously destructed and a bad match will never be productive. The search process is assumed to be imperfect and fails to weed out all matches of poor quality. Matches are assumed to be both an inspection and experience good. When a firm and a worker meet, they evaluate the potential quality of the match before deciding to engage in production. Some characteristics of the match can be ascertained during job search while others cannot be known without experience in the job. At the time of meeting, the firm and the worker receive a common signal  $\psi$  which is the probability that the match will be good if it is established. They decide whether to form the match or to continue searching. Once engaged in production, they attempt to resolve the remaining uncertainty from the observation of the output. However, the firm and the worker observe an output flow:

$$\tilde{y}_t = y + \mu_t$$

which is the sum of two unobserved components, the true match quality and a noisy component,  $\mu_t$ . This last term represents transitory factors as temporary spell, good or bad fortune that are independent of the fundamental match quality but prevent the firm and the worker from perfectly inferring it after first producing. Next, the noisy component is assumed to be a mean zero *iid* random variable, uniformly distributed on  $[-\bar{\mu}, \bar{\mu}]$ . The learning process is thus time-consuming and takes a "all-or-nothing" form, (Figure 1):

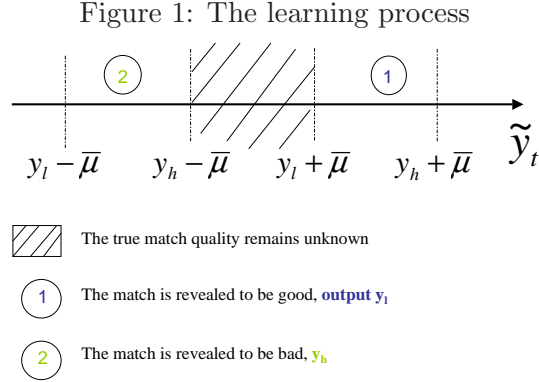
- If  $\tilde{y}_t < y_h - \bar{\mu}$ , the match is revealed to be of poor quality. If  $\tilde{y}_t > y_l + \bar{\mu}$ , the match is revealed



to be of high quality.

- If  $\tilde{y}_t \in [y_h - \bar{\mu}, y_l + \bar{\mu}]$ , firms and workers cannot determine whether the observation reflects more the match quality rather than a bad or good fortune. They will attempt to infer the true quality next period according to the new realization of  $\mu$  and regardless of the previous observations.

The match quality is revealed stochastically at rate  $\frac{y_h - y_l}{2\bar{\mu}} \equiv \alpha$ . Contrary to (Jovanovic B. 1979), the evolution of beliefs regarding the match quality is not governed by Bayes'law, which facilitates analytic solutions.



The basic environment borrows from the traditional matching model *à la* (Pissarides C. 2000). Each firm has one job that can be either filled or vacant. Creating an unfilled position requires the payment of a fixed cost<sup>2</sup>  $c_x$  while posting a vacancy to a worker imposes a cost of  $c_v$  per period. Workers are either employed specialized in production or unemployed specialized in job search. The labor market is characterized by search frictions and incomplete information so that hiring a worker and searching for a job are costly activities. Workers and firms meet each other randomly according to a standard matching function  $m(u, v)$ , where  $u$  and  $v$  denote respectively the unemployment and the vacancy rates of the economy. The probability of contact for a firm and for a worker are expressed respectively by  $q(\theta) = \frac{m(u, v)}{v}$  and  $p(\theta) = \frac{m(u, v)}{u}$ , with  $\theta = \frac{v}{u}$  the labor market tightness. Following the conventional way, the matching function is strictly increasing with respect to each of its arguments and has constant returns to scale. In consequence, for  $0 < \theta < \infty$ ,  $q'(\theta) < 0$  and  $p'(\theta) > 0$ . (Pissarides C. 2000) highlights that frictional labor markets involve search externalities and the probabilities of contact depends on the relative numbers of traders in the labor market. This implies that the unemployed workers meet a firm more easily when there are more vacancies relative to the job seekers while it is more difficult for firms to meet a worker<sup>3</sup>.

<sup>2</sup>(Pries M. and Rogerson R. 2005) assumed  $c_x > 0$  to differ between worker and job turnover. This assumption has no impact on the analytical results I derived while it allows me to make use of the calibration of the authors.

<sup>3</sup>In continuous time formulations, we have  $\lim_{\theta \rightarrow \infty} p(\theta) = \infty$  ;  $\lim_{\theta \rightarrow \infty} q(\theta) = 0$  and  $\lim_{\theta \rightarrow 0} p(\theta) = 0$  ;  $\lim_{\theta \rightarrow 0} q(\theta) = \infty$ . In discrete time models, the probabilities to find a job or to fill a vacancy  $\in [0, 1]$ .

At the time of meeting, firms and workers observe the potential of their match: the value of  $\psi$  is drawn from a general distribution of cdf  $H(\psi)$  over  $[0, 1]$  and is independent across matches. Some matches do not turn out to be potentially good enough to be formed. Firms and workers do not engage in a match with a low probability to turn out to be good. Hiring practices are defined by an endogenous threshold  $\bar{\psi}$  under which the initial joint surplus of a match has negative value.

Firms and workers can engage in both permanent and temporary contracts. Permanent jobs are standard labor contracts that require the payment of firing costs when separation occurs while temporary jobs are fixed-term contracts with no termination costs. At the time of meeting, firms and workers not only decide whether or not to proceed with the match but also in which type of contract to engage. Temporary contracts can be used as a screening device when the search process fails to weed out all matches of poor quality: once revealed, bad matches will be dissolved at no cost. However the exemption of firing costs is temporary and a fixed-term contract is assumed to end with probability  $d$ . Then, if the match quality remains unknown at the contract's expiry, firms and workers decide whether or not to continue producing on a permanent position according to the prior signal  $\psi$ . Some temporary contracts are dead-end jobs while others turn out to be stepping stones to permanent work. Next, workers engaged in matches revealed to be good will be retained in permanent employment. According to the empirical results of (Guell M. and Petrongolo B. 2007), it is assumed that the transition from temporary to permanent jobs occurs with the revelation of good quality even if the contract does not expire. This assumption is a matter of convenience and I will discuss the implications further. Besides, one can argue that the potential match quality and the learning process might depend on the type of jobs. Workers employed on a temporary or on a seasonal contract usually perform temporary tasks, which prevents firms from determining whether or not the worker's attributes mesh the firm's ones. However, this mainly occurs when temporary jobs are used as an adjustment variable to economic shocks. This paper focuses on the role of temporary jobs in providing firms experimentation with workers before offering them a permanent job. I thus assume that the distribution of the match quality signal  $\psi$  as well as the distribution of transitory factors  $\mu_t$  are common to both temporary and permanent matches.

All jobs are hit by an idiosyncratic shock at rate  $s$  and cease to exist. Next, I focus on equilibria in which bad matches are not productive enough to be formed. In consequence, matches of poor quality will be dissolved once revealed. Job destruction flows are driven not only by an exogenous process but also by an endogenous process resulting from the learning on match quality and from the termination of some temporary contracts.

Lastly, once a job is filled, the firm and the worker bargain over wages to share the expected joint surplus of the match. As is standard, the wage outcome is determined by a Nash sharing rule that gives a fraction  $\gamma$  of the match's expected joint surplus to the worker. A crucial implication of Nash bargaining is that whenever the expected joint surplus is negative, the worker and firm agree to separate.

The assumptions about timing are the following: job search occurring in  $t$  entails production in  $t+1$ . The expected joint surplus is shared at the beginning of the period. As long as the match quality remains unknown, the negotiation is based on an expected output flow:  $E(\tilde{y}_{t+1}) = E(y) + E(\mu_{t+1})$ . As  $\mu$  has mean zero, it is given by a weighted average of match qualities:  $E(\tilde{y}_{t+1}) = \psi y_h + (1 - \psi)y_l$ . At the end of the period, the firm and the worker observe the output flow  $\tilde{y}_{t+1}$  and the match quality will be revealed accordingly. Some matches turn out to be dissolved and some jobs cease to exist ; firms and workers are allowed to search next period.

## 2.2 Firms and workers behaviors

Let me first introduce a bit of notation:

- $\Pi^v$  denotes the value to a firm of an unfilled position,
- $V^u$  denotes the value to a worker of unemployment,
- $\Pi_p^o(\psi)$ ,  $V_p^o(\psi)$ ,  $\Pi_p(\psi)$  and  $V_p(\psi)$  denote respectively the expected values to a firm and to a worker of a new and a continuing permanent match with signal  $\psi$ ,
- $\Pi_t(\psi)$  and  $V_t(\psi)$  denote the expected values of a temporary match with signal  $\psi$  to respectively a firm and a worker.

The expected joint surplus associated with the match is defined as the sum of its expected values to the firm and to the worker net of their respective values of continued search. Firms terminating a permanent match have to pay firing costs  $F$  that are assumed for the moment to be pure waste. In consequence, the outside option of the firm in an ongoing permanent match is  $\Pi^v - F$  while it is  $\Pi^v$  for both a new permanent match and a temporary match. The corresponding expected surpluses are given by:

$$S_p^o(\psi) = \Pi_p^o(\psi) - \Pi^v + V_p^o(\psi) - V^u \quad (1)$$

$$S_p(\psi) = \Pi_p(\psi) - (\Pi^v - F) + V_p(\psi) - V^u \quad (2)$$

$$S_t(\psi) = \Pi_t(\psi) - \Pi^v + V_t(\psi) - V^u \quad (3)$$

The value of a vacant job and the expected gain from unemployment solve:

$$\Pi^v = -c_v + \beta \left\{ q(\theta) \int \max\{\Pi^v; \Pi_p^o(\psi); \Pi_t(\psi)\} dH(\psi) + [1 - q(\theta)]\Pi^v \right\} \quad (4)$$

$$V^u = z + \beta \left\{ p(\theta) \int \max\{V^u; V_p^o(\psi); V_t(\psi)\} dH(\psi) + [1 - p(\theta)]V^u \right\} \quad (5)$$

Posting a vacancy implies a per period fixed cost  $c_v$  and job seekers enjoy some real return  $z$  from leisure. At the time of meeting, the firm and the worker receive the signal  $\psi$  on match quality.

Accordingly, they decide whether or not to engage in production and which type of contract to open. The expected values of a new and of an ongoing permanent match to a firm are defined as follows:

$$\begin{aligned}\Pi_p^o(\psi) &= \psi y_h + (1 - \psi)y_l - w_p^o(\psi) - \beta s F + \beta(1 - s)[\alpha\psi\Pi_p(1) + \alpha(1 - \psi)(\Pi^v - F)] \\ &+ \beta(1 - s)(1 - \alpha)\Pi_p(\psi)\end{aligned}\quad (6)$$

$$\begin{aligned}\Pi_p(\psi) &= \psi y_h + (1 - \psi)y_l - w_p(\psi) - \beta s F + \beta(1 - s)[\alpha\psi\Pi_p(1) + \alpha(1 - \psi)(\Pi^v - F)] \\ &+ \beta(1 - s)(1 - \alpha)\Pi_p(\psi)\end{aligned}\quad (7)$$

These profits are expected ones that hold at the beginning of each period. The firm expects a per period output flow  $E(\tilde{y}_t) = \psi y_h + (1 - \psi)y_l$  and the wage is negotiated accordingly. The expected profit of a new match only differs from the expected profit of an ongoing match by the outcome of the wage negotiation process: either  $w_p^o$  or  $w_p$ . It integrates that the dissolution of an ongoing match requires the payment of firing costs. The employer separates from the worker if the match quality is revealed to be low, with probability  $\alpha(1 - \psi)$ . He has to search for a replacement worker and thus gets  $\Pi^v - F$ . When the job is hit by a shock with probability  $s$ , it does not become vacant but ceases to exist. The firm only has to pay the termination costs and the expected loss is:  $-\beta s F$ . If the employer is not able to infer the true match quality by observing the output flow, he continues producing in a match with prior signal  $\psi$  and gets expected profit  $\Pi_p(\psi)$ . The match is revealed to be of good quality with probability  $\alpha\psi$ . The information is updated and the firm gets  $\Pi_p(1)$ .

Similarly, the expected employment values to a worker satisfy:

$$V_p^o(\psi) = w_p^o(\psi) + \beta[s + (1 - s)\alpha(1 - \psi)]V^u + \beta(1 - s)[\alpha\psi V_p(1) + (1 - \alpha)V_p(\psi)]\quad (8)$$

$$V_p(\psi) = w_p(\psi) + \beta[s + (1 - s)\alpha(1 - \psi)]V^u + \beta(1 - s)[\alpha\psi V_p(1) + (1 - \alpha)V_p(\psi)]\quad (9)$$

Finally, the expected values of temporary matches with signal  $\psi$  to a firm and to a worker solve respectively:

$$\begin{aligned}\Pi_t(\psi) &= \psi y_h + (1 - \psi)y_l - w_t(\psi) + \beta(1 - s)\alpha(1 - \psi)\Pi^v + \beta(1 - s)\alpha\psi\Pi_p^o(1) \\ &+ \beta(1 - s)(1 - \alpha)\left[(1 - d)\Pi_t(\psi) + d\max\{\Pi^v; \Pi_p^o(\psi)\}\right]\end{aligned}\quad (10)$$

$$\begin{aligned}V_t(\psi) &= w_t(\psi) + \beta[s + (1 - s)\alpha(1 - \psi)]V^u + \beta(1 - s)\alpha\psi V_p^o(1) \\ &+ \beta(1 - s)(1 - \alpha)\left[(1 - d)V_t(\psi) + d\max\{V^u; V_p^o(\psi)\}\right]\end{aligned}\quad (11)$$

Temporary matches revealed to be good and remaining productive are converted directly into permanent jobs. If the negotiation fails, the firm do not have to pay any termination costs. Therefore,

the firm and the worker get respectively  $\Pi_p^o(1)$  and  $V_p^o(1)$ , the expected values of initial permanent employment. If the temporary contract expires while the quality remains unknown, the firm and the worker decide whether or not to continue producing on a permanent position according to prior signal  $\psi$ . Job continuation yields respectively  $V_p^o(\psi)$  and  $\Pi_p^o(\psi)$  to the worker and to the firm.

The expected surpluses of permanent and temporary matches are finally defined by the following expressions:

$$\begin{aligned} S_p^o(\psi) &= \psi y_h + (1 - \psi) y_l - z - \beta F - [1 - \beta(1 - s)] \Pi^v + \beta(1 - s) \alpha \psi S_p(1) \\ &\quad + \beta(1 - s)(1 - \alpha) S_p(\psi) - \beta p(\theta) \int \max\{0; V_p^o(\psi) - V^u; V_t(\psi) - V^u\} dH(\psi) \end{aligned} \quad (12)$$

$$S_p(\psi) = S_p^o(\psi) + F$$

$$\begin{aligned} S_t(\psi) &= \psi y_h + (1 - \psi) y_l - z - [1 - \beta(1 - s)] \Pi^v + \beta(1 - s) \alpha \psi S_p^o(1) \\ &\quad + \beta(1 - s)(1 - \alpha) \left[ (1 - d) S_t(\psi) + d \max\{0; S_p^o(\psi)\} \right] \\ &\quad - \beta p(\theta) \int \max\{0; V_p^o(\psi) - V^u; V_t(\psi) - V^u\} dH(\psi) \end{aligned} \quad (13)$$

### 3 Equilibrium

#### 3.1 Job creation, hiring decisions and wage bargaining

The number of firms is determined endogenously by the free entry condition,  $\Pi^v = c_x$ :

$$(1 - \beta) c_x + c_v = \beta q(\theta) \int \max\{0; \Pi_p^o(\psi) - c_x; \Pi_t(\psi) - c_x\} dH(\psi) \quad (14)$$

It states that the expected cost of creating a position and hiring a worker equals the expected average profit of a new match. Hiring decisions depend on the value of the match quality signal the firm and the worker receive at the time of meeting. Given Nash bargaining, both parties agree on match formation either on a temporary or on a permanent basis. I define two endogenous thresholds,  $\bar{\psi}_p$  and  $\bar{\psi}_t$  such that the corresponding initial surpluses have null-value:  $S_p^o(\bar{\psi}_p) = 0$  and  $S_t(\bar{\psi}_t) = 0$ . I exclude from the analysis of the equilibrium the corner solutions  $\bar{\psi}_p = \{0; 1\}$ , which will be discussed further. Let me now investigate hiring practices.

##### 3.1.1 Permanent matches

The firm and the worker engaged in a permanent match determine the contract wage through Nash bargaining. The wage functions  $w_p^o(\psi)$ ,  $w_p(\psi)$  are such that:

$$\begin{aligned} V_p^o(\psi) - V^u &= \gamma S_p^o(\psi) \\ V_p(\psi) - V^u &= \gamma S_p(\psi) \end{aligned} \quad (15)$$

Using the free entry condition 14 and the sharing rule 15, one can show that:

$$\beta p(\theta) \int \max\{0; V_p^o(\psi) - V^u; V_t(\psi) - V^u\} dH(\psi) = \frac{\gamma}{1-\gamma} [(1-\beta)c_x + c_v] \theta$$

The expected surplus of an initial permanent match is thus given by

$$\begin{aligned} S_p^o(\psi) &= \psi y_h + (1-\psi)y_l - z - \beta F + \beta(1-s) \left[ \alpha \psi S_p(1) + (1-\alpha) S_p(\psi) \right] \\ &\quad - [1 - \beta(1-s)]c_x - \frac{\gamma}{1-\gamma} \theta [(1-\beta)c_x + c_v] \end{aligned} \quad (16)$$

It yields the following wage functions:

$$\begin{aligned} w_p^o(\psi) &= \gamma \left\{ \psi y_h + (1-\psi)y_l - \beta F + [(1-\beta)c_x + c_v] \theta - [1 - \beta(1-s)]c_x \right\} \\ &\quad + (1-\gamma)z \end{aligned} \quad (17)$$

$$\begin{aligned} w_p(\psi) &= \gamma \left\{ \psi y_h + (1-\psi)y_l + (1-\beta)F + [(1-\beta)c_x + c_v] \theta - [1 - \beta(1-s)]c_x \right\} \\ &\quad + (1-\gamma)z \end{aligned} \quad (18)$$

These wage equations are familiar in the Mortensen-Pissarides context. One should notice that the wage transfer occurs at the beginning of period  $t$ , before the observation of the output flow  $\tilde{y}_t$ . As long as the match quality remains unknown, the worker get a fraction  $\gamma$  of the expected output flow. The initial wage decreases with the discounted value of firing costs that the firm will have to pay in the future if the negotiation fails. The wage of an ongoing permanent match integrates the saving of firing costs associated with job continuation and is thus increasing in  $F$ .

Differentiating the initial surplus yields:

$$S_p^{\prime o} = \frac{y_h - y_l + \beta(1-s)\alpha S_p(1)}{1 - \beta(1-s)(1-\alpha)} > 0$$

The function  $S_p^o(\psi)$  is linear and increasing in  $\psi$ . In consequence, there is one threshold value  $\bar{\psi}_p$  such that the initial surplus has null value. Moreover, given that  $S_p(\psi) > S_p^o(\psi)$ , any signal that is acceptable at the time of meeting remains acceptable:  $S_p(\bar{\psi}_p) > 0$ . Next, one can write  $S_p^o(\psi) = (\psi - \bar{\psi})S_p^{\prime o}$ . Substituting  $S_p^o(1) = (1 - \bar{\psi})S_p^{\prime o}$  into the expression of the derivative and rearranging

implies that in equilibrium<sup>4</sup>:

$$S_p^{o} = \frac{y_h - y_l + \beta(1-s)\alpha F}{1 - \beta(1-s)(1 - \alpha\bar{\psi}_p)} \equiv g(\bar{\psi}_p) \quad (19)$$

The optimal match formation rule for permanent positions is derived by setting  $S_p^o(\bar{\psi}_p) = 0$ . It yields<sup>5</sup>:

$$\begin{aligned} y_l - z + \beta(1-s)(1-\alpha)F - \beta F + [1 - \beta(1-s)(1-\alpha)]\bar{\psi}_p g(\bar{\psi}_p) \\ = [1 - \beta(1-s)]c_x + \frac{\gamma}{1-\gamma}\theta[(1-\beta)c_x + c_v] \end{aligned} \quad (20)$$

### 3.1.2 Temporary matches

Given Nash bargaining, the wage function  $w_t(\psi)$  is such that:

$$V_t(\psi) - V^u = \gamma S_t(\psi) \quad (21)$$

By making use of the free entry condition 14 and the sharing rule 21, the expected joint surplus of a temporary match becomes:

$$\begin{aligned} S_t(\psi) = \psi y_h + (1-\psi)y_l - z + \beta(1-s) \left[ \alpha\psi S_p^o(1) + (1-\alpha)(1-d)S_t(\psi) \right] \\ + \beta(1-s)(1-\alpha)d \max\{0; S_p^o(\psi)\} - [1 - \beta(1-s)]c_x - \frac{\gamma}{1-\gamma}\theta[(1-\beta)c_x + c_v] \end{aligned} \quad (22)$$

When the contract ends while the match quality has not been revealed, the firm and the worker make sure that the match with signal  $\psi$  remains acceptable before continuing producing on a permanent position. I start by examining the implications on the wage bargaining. First, the worker's net return from a temporary match is:

$$\begin{aligned} V_t(\psi) - V^u = w_t(\psi) + \beta(1-s)\alpha\psi[V_p^o(1) - V^u] + \beta(1-s)(1-\alpha)(1-d)[V_t(\psi) - V^u] \\ + \beta(1-s)(1-\alpha)d \max\{0; V_p^o(\psi) - V^u\} - z - \frac{\gamma}{1-\gamma}\theta[(1-\beta)c_x + c_v] \end{aligned} \quad (23)$$

It increases with the net return from a permanent match:  $[V_p^o(\psi) - V^u]$ . Assume that a permanent match with signal  $\psi$  is acceptable:  $[V_p^o(\psi) - V^u] > 0$ . A worker engaged on a temporary basis thus might be induced to accept a lower wage in order to have a chance to access to permanent work even though the match quality remains unknown. Similarly, the firm's net return from a temporary match is:

$$\begin{aligned} \Pi_t(\psi) - \Pi^v = \psi y_h + (1-\psi)y_l - w_t(\psi) - [1 - \beta(1-s)]\Pi^v + \beta(1-s)\alpha\psi[\Pi_p^o(1) - \Pi^v] \\ + \beta(1-s)(1-\alpha) \left\{ (1-d)[\Pi_t(\psi) - \Pi^v] + d \max\{0; \Pi_p^o(\psi) - \Pi^v\} \right\} \end{aligned} \quad (24)$$

<sup>4</sup>One can notice that this equation differs from the equation (21) P826 of (Pries M. and Rogerson R. 2005). It simply results from a mistake in their paper's publication.

<sup>5</sup>One can notice that this equation differs from the equation (22) P826 of (Pries M. and Rogerson R. 2005). It simply results from a mistake in their paper's publication.

It increases with the net return from a permanent match:  $[\Pi_p^o(\psi) - \Pi^v]$ . Assume that a permanent match with  $\psi$  is acceptable:  $[\Pi_p^o(\psi) - \Pi^v] > 0$ . The firm might give up a higher wage to the worker in order to induce him to stay in a permanent position even though the match quality remains unknown. Given Nash bargaining, matches that are acceptable from the firm's point of view are also acceptable from the worker's point of view. As the incentives to continue producing on a permanent match are symmetric, the wage contract does not depend on the potential transition from temporary to permanent jobs. It results in the following wage function:

$$w_t(\psi) = \gamma \left\{ \psi y_h + (1 - \psi) y_l + [(1 - \beta)c_x + c_v] \theta - [1 - \beta(1 - s)] c_x \right\} + (1 - \gamma) z \quad (25)$$

One can notice that, as temporary matches are dissolved at no costs, the wage for a given match quality signal is lower on temporary positions:  $w_t(\psi) < w_p(\psi)$ .

A permanent match has been showed to be acceptable if  $S^o(\psi) \geq 0 \iff \psi \geq \bar{\psi}_p$ . In consequence, the surplus of a temporary match can be rewritten as follows:

$$\left\{ \begin{array}{ll} \text{For } \psi < \bar{\psi}_p & \begin{aligned} & \psi y_h + (1 - \psi) y_l - z + \beta(1 - s) \left[ \alpha \psi S_p^o(1) + (1 - \alpha)(1 - d) S_t^d(\psi) \right] \\ & - [1 - \beta(1 - s)] c_x - \frac{\gamma}{1 - \gamma} \theta [(1 - \beta)c_x + c_v] \equiv S_t^d(\psi) \end{aligned} \\ \text{For } \psi \geq \bar{\psi}_p & \begin{aligned} & \psi y_h + (1 - \psi) y_l - z + \beta(1 - s)(1 - \alpha) \left[ (1 - d) S_t^c(\psi) + d S_p^o(\psi) \right] \\ & + \beta(1 - s) \alpha \psi S_p^o(1) - [1 - \beta(1 - s)] c_x - \frac{\gamma}{1 - \gamma} \theta [(1 - \beta)c_x + c_v] \equiv S_t^c(\psi) \end{aligned} \end{array} \right.$$

The subscribes  $d$  and  $c$  stands for *job Destruction* and *job Continuation*.

**Proposition 1** *The reservation threshold is higher for a permanent match than for a temporary match:  $\bar{\psi}_p > \bar{\psi}_t$ . Some matches formed on a temporary basis are not potentially good enough to be used as a stepping stone to permanent work:*

- For  $\psi \in [\bar{\psi}_t; \bar{\psi}_p]$ , temporary matches which quality remains unknown once the contract expires will be dissolved.
- For  $\psi \geq \bar{\psi}_p$ , temporary matches which quality remains unknown once the contract expires will be converted into permanent positions.

**Proof:** Differentiating the two expressions of the surplus yields:

$$S_t^d = \frac{y_h - y_l + \beta(1 - s)\alpha(1 - \bar{\psi}_p)g(\bar{\psi}_p)}{1 - \beta(1 - s)(1 - \alpha)(1 - d)} > 0$$

$$S_t^c = \frac{y_h - y_l + \beta(1 - s)g(\bar{\psi}_p)[\alpha(1 - \bar{\psi}_p) + (1 - \alpha)d]}{1 - \beta(1 - s)(1 - \alpha)(1 - d)} > 0$$



The surplus of a temporary match is thus piecewise linear and increasing in  $\psi$ . Note that  $S_t^{tc} > S_t^{td}$ : the marginal gain of an increase in  $\psi$  is higher for temporary matches that lead to permanent employment than for temporary matches that are dead-end jobs. For  $\psi = \bar{\psi}_p$ , we have  $S_t^d(\bar{\psi}_p) = S_t^c(\bar{\psi}_p)$ . By using  $S_p^o(1) = (1 - \bar{\psi}_p)g(\bar{\psi}_p)$ , the surplus of a temporary match with signal  $\bar{\psi}_p$  solves:

$$S_t(\bar{\psi}_p) = \frac{\bar{\psi}_p y_h + (1 - \bar{\psi}_p)y_l - z + \beta(1 - s)\alpha\bar{\psi}_p(1 - \bar{\psi}_p)g(\bar{\psi}_p)}{1 - \beta(1 - s)(1 - \alpha)(1 - d)}$$

$$- \frac{[1 - \beta(1 - s)]c_x + \frac{\gamma}{1-\gamma}\theta[(1 - \beta)c_x + c_v]}{1 - \beta(1 - s)(1 - \alpha)(1 - d)}$$

Rearranging with the optimal match formation rule for a permanent match 20, and using the expression of  $g(\bar{\psi}_p)$  19 yields:

$$S_t(\bar{\psi}_p) = \left\{ 1 - (1 - s)[1 - \alpha(1 - \bar{\psi}_p)] \right\} \beta F > 0 \quad \implies \quad \bar{\psi}_t < \bar{\psi}_p$$

**Proposition 2** *The surplus of a temporary match is higher than the initial surplus of a permanent match for  $\psi \in [0, 1]$ . All hirings are made on a temporary basis whatever the value of  $\psi$ .*

**Proof:** Let us first consider values of  $\psi$  such that  $\psi \leq \bar{\psi}_p$ . The expected surplus of a temporary match is given by  $S_t^d(\psi)$ . Using the expressions of the derivative of the initial surpluses for a temporary and a permanent match yields:

$$S_t^{td} - S_p^{to} = -\beta(1 - s)(1 - \alpha)d\{y_h - y_l + \beta(1 - s)\alpha(1 - \bar{\psi}_p)g(\bar{\psi}_p)\} < 0$$

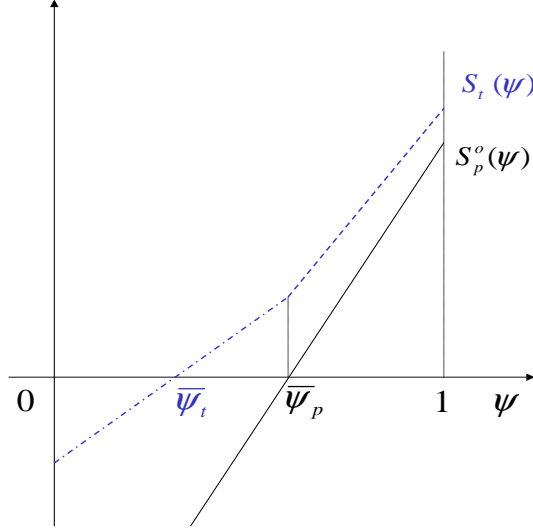
In consequence, the slope of  $S_t^d(\psi)$  is lower than the one of  $S_p^o(\psi)$  with  $\psi < \bar{\psi}_p$ . As  $S_t^d(\bar{\psi}_p) > S_p^o(\bar{\psi}_p)$ , it is straightforward that  $S_t^d(\psi) > S_p^o(\psi)$  for  $\psi \in [0; \bar{\psi}_p]$ .

I now derive the difference between the initial surpluses of a temporary and a permanent match for  $\psi \geq \bar{\psi}_p$ :

$$S_t^c(\psi) - S_p^o(\psi) = \frac{\beta F \left\{ 1 - (1 - s)[1 - \alpha(1 - \psi)] \right\}}{1 - \beta(1 - s)(1 - \alpha)(1 - d)} \quad (26)$$

For  $\psi < 1$ , the difference is positive, while for  $\psi > 1$  we have  $S_t^c(\psi) < S_p^o(\psi)$  under  $\psi > 1 + \frac{s}{\alpha(1-s)}$ . In consequence, the slope of  $S_t^c(\psi)$  is lower than the slope of  $S_p^o(\psi)$ : the marginal gain of an increase in the quality signal  $\psi$  is lower for temporary matches than for permanent ones. The surplus of a temporary match will fall below the initial surplus of a permanent one for a value of  $\psi > 1$ . As the parameter is the probability that the match is of good quality, we have necessarily  $\psi \in [0; 1]$ : a temporary match is always preferred to a permanent one. The initial surpluses for a temporary and a permanent match are represented in Figure 2:

Figure 2: The surpluses of a temporary and a permanent match with signal  $\psi$



The optimal match formation rule for a temporary match is finally derived by setting  $S_t^d(\bar{\psi}_t) = 0$ . It yields:

$$\begin{aligned} y_l - z - \beta(1-s)\alpha\bar{\psi}_t F + [1 - \beta(1-s)(1-\alpha)]\bar{\psi}_t g(\bar{\psi}_p) \\ = [1 - \beta(1-s)]c_x + \frac{\gamma}{1-\gamma}\theta[(1-\beta)c_x + c_v] \end{aligned} \quad (27)$$

### 3.1.3 The labor market equilibrium

**Definition 1** *The steady-state equilibrium values of  $\theta$ ,  $\bar{\psi}_p$  and  $\bar{\psi}_t$  satisfy the free entry condition and the optimal match formation rules given by:*

$$\left\{ \begin{array}{l} (1-\beta)c_x + c_v = \beta q(\theta)(1-\gamma) \left\{ \int_{\bar{\psi}_t}^{\bar{\psi}_p} S_t^d(\psi) dH(\psi) + \int_{\bar{\psi}_p}^1 S_t^c(\psi) dH(\psi) \right\} \quad (FE) \\ y_l - z + \beta(1-s)(1-\alpha)F - \beta F + [1 - \beta(1-s)(1-\alpha)]\bar{\psi}_p g(\bar{\psi}_p) \quad (OMF_p) \\ = [1 - \beta(1-s)]c_x + \frac{\gamma}{1-\gamma}\theta[(1-\beta)c_x + c_v] \\ y_l - z - \beta(1-s)\alpha\bar{\psi}_t F + [1 - \beta(1-s)(1-\alpha)]\bar{\psi}_t g(\bar{\psi}_p) \quad (OMF_t) \\ = [1 - \beta(1-s)]c_x + \frac{\gamma}{1-\gamma}\theta[(1-\beta)c_x + c_v] \end{array} \right.$$

with

$$g(\bar{\psi}_p) = \frac{y_h - y_l + \beta(1-s)\alpha F}{1 - \beta(1-s)(1 - \alpha\bar{\psi}_p)}$$

$$\begin{aligned} S_t^d(\psi) = & \psi y_h + (1 - \psi)y_l - z + \beta(1-s) \left[ \alpha\psi S_p^o(1) + (1 - \alpha)(1 - d)S_t^d(\psi) \right] \\ & - [1 - \beta(1-s)]c_x - \frac{\gamma}{1 - \gamma}\theta[(1 - \beta)c_x + c_v] \end{aligned}$$

$$\begin{aligned} S_t^c(\psi) = & \psi y_h + (1 - \psi)y_l - z + \beta(1-s)(1 - \alpha) \left[ (1 - d)S_t^c(\psi) + dS_p^o(\psi) \right] \\ & + \beta(1-s)\alpha\psi S_p^o(1) - [1 - \beta(1-s)]c_x - \frac{\gamma}{1 - \gamma}\theta[(1 - \beta)c_x + c_v] \end{aligned}$$

$$\begin{aligned} S_p^o(\psi) = & \psi y_h + (1 - \psi)y_l - z - \beta F + \beta(1-s) \left[ \alpha\psi S_p(1) + (1 - \alpha)S_p(\psi) \right] \\ & - [1 - \beta(1-s)]c_x - \frac{\gamma}{1 - \gamma}\theta[(1 - \beta)c_x + c_v] \end{aligned}$$

$$S_p(\psi) = S_p^o(\psi) + F$$

All hirings are made on a temporary basis. As the signal  $\psi$  is drawn once at the time of meeting, firms and workers engaging in production know from the time they met whether or not the match can lead to permanent employment while the quality remains unknown. Matches with signal  $\psi < \bar{\psi}_p$  can however be converted into permanent jobs if the quality is revealed to be good before the temporary contract's expiry.

The free entry condition represents a negative relationship both between  $\theta$  and  $\bar{\psi}_t$  and between  $\theta$  and  $\bar{\psi}_p$ . An increase in both reservation thresholds reduces hirings and discourage job creation. Since  $\bar{\psi}_p g(\bar{\psi}_p)$  is increasing in  $\bar{\psi}_p$ , the optimal match formation rule for permanent jobs defines an increasing relationship between  $\bar{\psi}_p$  and  $\theta$ . An increase in the tightness improves the worker's employment prospects and the negotiated wage thus increasing the threshold  $\bar{\psi}_p$ . Similarly, the optimal match formation rule for temporary jobs should define an increasing relationship between  $\bar{\psi}_t$  and  $\theta$  however negatively affected by firing costs. Besides, this equation describes a positive relationship between  $\bar{\psi}_p$  and  $\bar{\psi}_t$  for a given  $\theta$ . The surpluses  $S_t^d(\psi)$  and  $S_t^c(\psi)$  are decreasing in  $\bar{\psi}_p$ . An increase in the reservation threshold  $\bar{\psi}_p$  reduces the surplus of a temporary match by reducing the probability that the match leads to permanent employment. In consequence, the reservation threshold  $\bar{\psi}_t$  increases.

The analytical results about the existence and the uniqueness of the steady-state equilibrium are difficult to obtain. Let us consider that workers do not have any bargaining power:  $\gamma = 0$ . This

situation is similar to the case where workers are paid to a minimum wage  $\bar{w} = z$ . One can show that:

**Proposition 3** *Under  $\gamma = 0$  and if it exists, the solution in  $\theta$ ,  $\bar{\psi}_p$  and  $\bar{\psi}_t$  of the system formed by equations (FE), (OMF<sub>p</sub>) and (OMF<sub>t</sub>) is unique.*

**Proof:** For  $\gamma = 0$ , the steady-state equilibrium values of  $\theta$ ,  $\bar{\psi}_p$  and  $\bar{\psi}_t$  satisfy the free entry condition and the optimal match formation rules for respectively a permanent and a temporary match:

$$\begin{aligned} (1 - \beta)c_x + c_v &= \beta q(\theta) \left\{ \int_{\bar{\psi}_t}^{\bar{\psi}_p} S_t^d(\psi) dH(\psi) + \int_{\bar{\psi}_p}^1 S_t^c(\psi) dH(\psi) \right\} \\ y_l - z + \beta(1 - s)(1 - \alpha)F - \beta F + [1 - \beta(1 - s)(1 - \alpha)]\bar{\psi}_p g(\bar{\psi}_p) &= [1 - \beta(1 - s)]c_x \\ y_l - z - \beta(1 - s)\alpha\bar{\psi}_t F + [1 - \beta(1 - s)(1 - \alpha)]\bar{\psi}_t g(\bar{\psi}_p) &= [1 - \beta(1 - s)]c_x \end{aligned}$$

Since  $\bar{\psi}_p g(\bar{\psi}_p)$  is increasing in  $\bar{\psi}_p$ , the optimal match formation rule for a permanent match determines a unique equilibrium value for  $\bar{\psi}_p$ . The optimal match formation rule for a temporary match describes a positive relationship between  $\bar{\psi}_p$  and  $\bar{\psi}_t$ . Given the equilibrium value of  $\bar{\psi}_p$ ,  $\bar{\psi}_t$  is unique. Finally, the free entry condition determines a unique equilibrium value of  $\theta$  that negatively depends on  $\bar{\psi}_t$  and  $\bar{\psi}_p$ . It follows that, by continuity, for small values of  $\gamma$ , the equilibrium is unique if it exists. For  $\gamma > 0$  and with a low feedback effect due to the wage bargaining process<sup>6</sup>, the equilibrium is expected to be unique if it exists. We expect this case to emerge in the simulations.

If the initial surplus of a permanent match is such that  $S_p^o(0) > 0$  or  $S_p^o(1) < 0$ , the equilibrium value of  $\bar{\psi}_p$  is a corner solution: respectively  $\bar{\psi}_p = 0$  or  $\bar{\psi}_p = 1$ . Let me consider the first case. The value  $\bar{\psi}_p = 0$  implies  $\bar{\psi}_t < 0$ : firms and workers engage in production whatever the value of the quality signal and temporary matches will be systematically converted into permanent positions. The aim of the paper is to analyze how temporary jobs affect an economy by facilitating the screening process on match quality. I am thus interested in equilibria in which in the absence of temporary jobs, high firing costs prevent the reallocation process between firms and workers. In consequence, I consider equilibria such that  $\bar{\psi}_p > 0$ . One can consider the corner equilibrium in which all temporary matches are dead-end jobs,  $\bar{\psi}_p = 1$ . However, in a labor market where there are no temporary jobs, the corner equilibrium will be such that firms and workers never engage in production and the equilibrium unemployment rate reaches 100%. I do not consider this solution as the model will be calibrated following (Pries M. and Rogerson R. 2005) and will be such that in the benchmark economy with firing costs,  $\bar{\psi}_p < 1$ .

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<sup>6</sup>It depends on the elasticity of the wage with respect to the labor market conditions as the costs of creating a new position and of posting a vacancy.

### 3.2 Labor market flows

We consider an economy in which the labor force is constant and normalized to one. The model has four aggregate state variables: the mass of permanent matches known to be of high quality ( $e_p^h$ ), the mass of temporary and permanent matches of unknown quality (respectively  $e_t^n$  and  $e_p^n$ ), and the mass of unemployed workers,  $u$ . Temporary matches of unknown quality are composed by matches that will/will not be converted into permanent matches if the quality remains unknown, respectively denoted by  $e_t^c$  and  $e_t^d$ . At steady state, the following flow equations hold:

$$[s + (1-s)\alpha + (1-s)(1-\alpha)d]e_t^d = p(\theta)[H(\bar{\psi}_p) - H(\bar{\psi}_t)]u \quad (28)$$

$$[s + (1-s)\alpha + (1-s)(1-\alpha)d]e_t^c = p(\theta)[1 - H(\bar{\psi}_p)]u \quad (29)$$

$$[s + (1-s)\alpha]e_p^n = (1-s)(1-\alpha)de_t^c \quad (30)$$

$$se_p^h = (1-s)\alpha \left\{ E(\psi/\psi \geq \bar{\psi}_p)(e_p^n + e_t^c) + E(\psi/\bar{\psi}_t \leq \psi < \bar{\psi}_p)e_t^d \right\} \quad (31)$$

$$p(\theta)[1 - H(\bar{\psi}_t)]u = s(e_t^d + e_t^c + e_p^n + e_p^h) + (1-s)(1-\alpha)de_t^d \\ + (1-s)\alpha \left\{ [1 - E(\psi/\psi \geq \bar{\psi}_p)](e_t^c + e_p^n) + [1 - E(\psi/\bar{\psi}_t \leq \psi < \bar{\psi}_p)]e_t^d \right\} \quad (32)$$

The flow of entries into dead-end temporary jobs is given by unemployed workers who find a match with quality signal between  $\bar{\psi}_t$  and  $\bar{\psi}_p$ , while the flow of entries into stepping-stone temporary jobs is given by matches with signal higher than  $\bar{\psi}_p$ . Exit flows are composed by job destruction, matches' revelation and expiry of temporary contracts. Temporary matches that remain productive but of unknown quality with  $\psi \geq \bar{\psi}_p$  are converted into permanent jobs. Finally, matches that are revealed to be high-productive enter  $e_p^h$  while those that are revealed to be of poor quality are dissolved and the worker falls into the unemployment pool.

The two thresholds  $\bar{\psi}_p$  and  $\bar{\psi}_t$  determine worker turnover. When firms are more selective in whom they hire, both hirings and firings are reduced. For high values of  $\bar{\psi}_t$ , employment is composed by a higher proportion of good matches, thus leading to less separations in the labor market. It also results in a lower fraction of dead-end jobs among temporary employment. When firms are more selective in whom they promote to permanent jobs, a higher fraction of temporary jobs are dead-end ones. On one hand, the separation rate of temporary jobs increases, while on the other hand permanent employment is composed by a lower proportion of bad matches, which reduces destruction flows. One should notice that following a job loss, a worker have to search for a new suitable match and may experience several temporary jobs before accessing to permanent work.

## 4 Temporary jobs as a screening device

This section analyzes the effects of a two-tier reform of the Employment Protection Legislation (EPL) that increases flexibility at the margin by allowing firms to hire workers on temporary positions. The studies that considered the role of temporary jobs in employers adjustment to economic shocks argued that although it may foster job creations, the introduction of fixed duration contracts has ambiguous effects on overall unemployment as it increases job destruction flows. (Cahuc P. and Postel-Vinay F. 2002) and (Blanchard O. and Landier A. 2002) provided simulation results showing that in an economy with high firing costs, temporary jobs are dead-end jobs and the overall impact is an increase in unemployment. This paper provides new insights by considering the role of temporary jobs in facilitating the screening process on match quality in an economy where firms and workers are searching for a suitable match. (Pries M. and Rogerson R. 2005) demonstrated that in such an economy, firing costs, as labor market institutions in general, distort hiring practices. The computation of the model suggests that both worker turnover and employment are reduced. I start by presenting those results before analyzing the impact of temporary jobs.

### 4.1 The EPL on regular contracts

In the absence of temporary jobs, the labor market equilibrium, if it exists, is the one described by (Pries M. and Rogerson R. 2005). It is unique and defined as follows:

**Definition 2** *The steady-state equilibrium values of  $\theta$  and  $\bar{\psi}_p$  satisfy the free entry condition and the optimal match formation rule given by:*

$$\left\{ \begin{array}{l} (1 - \beta)c_x + c_v = \beta q(\theta)(1 - \gamma)g(\bar{\psi}_p) \int_{\bar{\psi}_p}^1 (\psi - \bar{\psi}_p) dH(\psi) \quad (FEPR) \\ y_l - z + \beta(1 - s)(1 - \alpha)F - \beta F + [1 - \beta(1 - s)(1 - \alpha)]\bar{\psi}_p g(\bar{\psi}_p) \quad (OMFPR) \\ = [1 - \beta(1 - s)]c_x + \frac{\gamma}{1 - \gamma}\theta[(1 - \beta)c_x + c_v] \end{array} \right.$$

According to the optimal match formation rule for permanent jobs, firing costs have ambiguous effects on the reservation threshold  $\bar{\psi}_p$ . On one hand, dismissal costs reduce the initial surplus,  $S_p^o(\psi)$ , and increase  $\bar{\psi}_p$ . Firms take into account that they will have to pay firing costs in the future. This effect appears via  $-\beta F$ . On the other hand, dismissal costs increase the surplus of ongoing matches,  $S_p(\psi)$  and  $S_p(1)$ , and reduce  $\bar{\psi}_p$ . Employers take into account that the success of future bargaining will allow them to save firing costs. The saving resulting from the wage bargaining for unknown and good matches appears respectively via  $\beta(1 - s)(1 - \alpha)F$  and  $g(\bar{\psi}_p)$ .

**Proposition 4**

- (i) *Firing costs shift the  $OMF_{PR}$  curve down and increase the hiring threshold  $\bar{\psi}_p$ . Firms are induced to be more selective in whom they hire.*
- (ii) *Firing costs shift the  $FE_{PR}$  curve down and reduce the equilibrium value of  $\theta$ . Firms are induced to post less vacancies on the labor market.*

**Proof:**

The differentiation the  $OMF_{PR}$  equation w.r.t.  $F$  gives:

$$OMF'_{PR} = \beta\{f(\alpha) - 1\} \quad \text{with} \quad f(\alpha) = \frac{\beta(1-s)[1 - \beta(1-s)(1-\alpha) - \alpha(1-\bar{\psi})]}{[1 - \beta(1-s)(1-\alpha\bar{\psi})]} \quad (33)$$

Then, dismissal costs shift the  $OMF_{PR}$  curve down if  $f(\alpha) < 1$ . The function  $f$  is strictly decreasing convex on parameter  $\alpha$ :

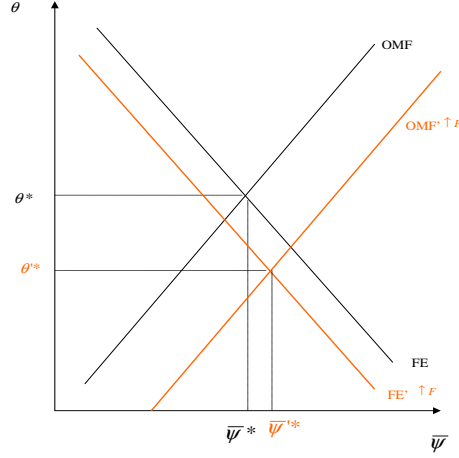
$$\frac{\partial f}{\partial \alpha} = \frac{-(1-s)(1-\bar{\psi}_p)[1 - \beta(1-s)]^2}{[1 - \beta(1-s)(1-\alpha\bar{\psi}_p)]^2} < 0$$

$$\frac{\partial^2 f}{\partial^2 \alpha} = \frac{2\beta\bar{\psi}_p(1-s)^2(1-\bar{\psi})[1 - \beta(1-s)(1-\alpha\bar{\psi}_p)]}{[1 - \beta(1-s)(1-\alpha\bar{\psi}_p)]^7} > 0$$

The properties are the following:  $f(0) = (1-s) < 1$  and  $f(1) = \frac{\bar{\psi}_p(1-s)}{[1 - \beta(1-s)(1-\bar{\psi}_p)]}$ , which is decreasing in  $\beta$ . Then:

$$\lim_{\beta \rightarrow 1} f(1) = \frac{\bar{\psi}_p(1-s)}{1 - (1-s)(1-\bar{\psi}_p)} < 1 \quad \text{and} \quad \lim_{\beta \rightarrow 0} f(1) = \bar{\psi}_p(1-s) < 1$$

Figure 3: The impact of dismissal costs on the benchmark labor market equilibrium



The free entry condition can be rewritten as follows:

$$(1 - \beta)c_x + c_v = \beta q(\theta)(1 - \gamma) \int_{\bar{\psi}_p}^1 S_p^o(\psi) dH(\psi) \Big\}$$

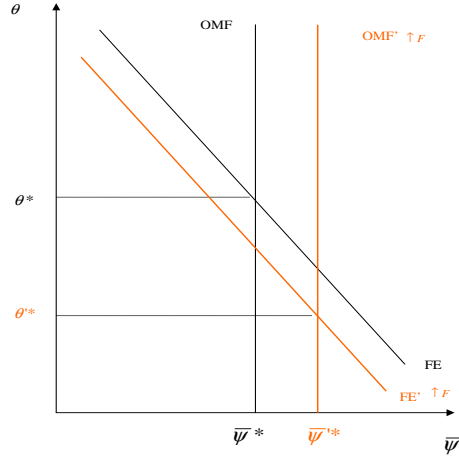
with  $S_p^o(\psi)$  the initial surplus of a permanent match which is decreasing in both  $F$  and  $\theta$ . I follow (Pries M. and Rogerson R. 2005) and consider the case where an increase in firing costs leads to an increase in the equilibrium value of  $\theta$ . As the initial surplus is reduced, the value of the integral term would decrease. It implies that  $q(\theta)$  must increase which, according to the properties of the matching function, is only possible with a decrease in the value of  $\theta$ . It contradicts the initial assumption that  $\theta$  increases. In consequence, firing costs shift the curve  $FE_{PR}$  down.

On one hand, firing costs induce firms to be more selective in whom they hire which makes less profitable the opening of new vacancies, (shift of the  $OMF_{PR}$  curve). On the other hand, firing costs induce firms to post less vacancies by reducing the initial surplus of a match, (shift of the  $OMF_{FE}$  curve). As the probability for worker a worker to find a job offer is reduced, they accept a lower wage which reduces the value of  $\bar{\psi}_p$ . According to the simulation results of (Pries M. and Rogerson R. 2005), I expect firing costs to induce firms to be less selective in whom they hire and to post less vacancies on the labor market, as shown in Figure 3. Indeed, one can easily show that for  $\gamma = 0$ , firing costs unambiguously increase the equilibrium value of  $\bar{\psi}_p$  and reduces the one of  $\theta$ , as shown in 4. The reduction of  $p(\theta)$  does not affect the wage according which workers are remunerated: the optimal match formation rule does not depend anymore on the value of  $\theta$ .

A greater employment protection legislation should prevent the reallocation process between employers and workers who search for a suitable match. In such an economy, allowing for the use of temporary contracts enables firms and workers to weed out matches of poor quality at no cost and would thus contribute to reduce the negative effects of firing costs on hiring practices.



Figure 4: The impact of dismissal costs on the benchmark labor market equilibrium with  $\gamma = 0$



## 4.2 Two-tier reforms of the EPL: allowing for the use of temporary jobs

Allowing for the use of fixed-term contracts implies that all hiring are now made on a temporary basis. Let us first examines the partial equilibrium effects : the value of  $\theta$  is given, thus so as the value of  $\bar{\psi}_p$ .

**Proposition 5** *For a given value of  $\bar{\psi}_p$  and  $\theta$ , matches with signal  $\psi \in [\bar{\psi}_t; \bar{\psi}_p]$  correspond to new hirings. Temporary jobs induce firms to be less selective in whom they hire and employment will be composed by a higher proportion of bad matches that will be dissolved once revealed.*

Those matches were not formed previously because of high termination costs and relatively high probability to be revealed as bad matches. Firms and workers now engage in production even with a low quality signal as employers benefit from an exemption of firing costs. Temporary jobs facilitate the reallocation process between firms and workers who search for a suitable match. However, this exemption is temporary. For a signal  $\psi \in [\bar{\psi}_t; \bar{\psi}_p]$ , matches are dead-end jobs. Workers and firms take a chance to reveal the match quality but separate once the contract ends if the quality remains unknown.

Next, matches with signal  $\psi > \bar{\psi}_p$  are stepping-stones to permanent work as they will be converted following the temporary contract's expiry. Firms and workers engage on a temporary basis to benefit from the temporary exemption of termination costs. For given values of  $\theta$  and  $\bar{\psi}_p$ , I show that:

**Proposition 6** *As  $S_t^c(\psi) > S_p^o(\psi)$ , allowing for temporary jobs increases the surplus of matches with  $\psi > \bar{\psi}_p$ .*

Temporary jobs induce firms to be less selective thus facilitating the reallocation process between firms and workers. Job creations will be fostered, both due to the use of dead-end jobs and to the

temporary exemption of termination costs from which firms benefit while offering permanent jobs to workers. The increase in  $\theta$  reduces both equilibrium values of  $\bar{\psi}_p$  and  $\bar{\psi}_t$  through the wage bargaining process. We expect however temporary jobs to increase worker turnover. Separation flows increase in the labor market both due to higher revelations of bad qualities and to the termination of temporary dead-end jobs:

**Proposition 7** *The destruction rate of a temporary job is higher than the destruction rate of a permanent job:*

$$s + (1 - s)\alpha[1 - E(\psi/\psi \geq \bar{\psi}_t)] + (1 - s)(1 - \alpha)dH(\bar{\psi}_p) > s + (1 - s)\alpha[1 - E(\psi/\psi \geq \bar{\psi}_p)]$$

Then, if  $\bar{\psi}_p$  is definitively reduced, permanent employment will be composed by a higher proportion of good matches. Therefore, the destruction rate of permanent jobs decreases. Introducing temporary jobs should increase separation flows on the labor market that will mainly be composed by the dissolutions of temporary matches. The net impact of temporary jobs on worker turnover and employment will be investigated by the simulation of the model. However, for  $\gamma = 0$ , the theoretical analysis suggests that temporary jobs unambiguously induce firms to be less selective in whom they hire and foster job creations.

Let me now investigate how a greater level of the EPL on regular contracts affects an economy with temporary jobs. The analysis of firing costs in the (Pries M. and Rogerson R. 2005) economy suggests that as, in (Cahuc P. and Postel-Vinay F. 2002), firing costs reduce the probability to convert a temporary job into a permanent one : firing costs reduce the reservation threshold  $\bar{\psi}_p$  for a given value of  $\theta$ . However firms and workers could be induced to continue producing on a permanent match even with high firing costs. Indeed, as the fundamental quality of a match is persistent, taking a chance with a new match is not profitable if firms and workers are engaged in a match with a high quality signal  $\psi$ .

According to the optimal match formation rule for temporary jobs, equation  $OMF_t$ , firing costs have ambiguous effects on the reservation threshold  $\bar{\psi}_t$ . On one hand, firms take into account that they may have to pay firing costs in the future. However, they only consider termination costs that will apply to the dissolution of permanent good matches. Indeed, recall that the threshold  $\bar{\psi}_t$  is derived by setting  $s_t^d(\bar{\psi}_t) = 0$ : firms and workers examine whether or not a temporary dead-end match is acceptable. The temporary position will not be converted into a permanent job if the match quality remains unknown. In consequence, the firm may have to pay firing costs in the future only if the match quality is revealed to be good. This effect appears via  $-\beta(1 - s)\alpha\bar{\psi}_t F$ . On the other hand, dismissal costs increase the surplus of an ongoing permanent good match and reduce  $\bar{\psi}_t$ . This effect appears via  $g(\bar{\psi}_p)$ . As permanent good matches have a relatively low probability to be dissolved, the effect associated with the saving of firing costs overcomes the effect associated with the payment of firing costs. The analysis shows that:

**Proposition 8** For a given value of  $\theta$ , firing costs reduce the hiring threshold  $\bar{\psi}_t$ . Firms are induced to be less selective in whom they hire.

**Proof:** The differentiation the  $OMF_t$  equation w.r.t.  $F$  gives:

$$OMF'_t = \beta(1-s)\alpha\bar{\psi}_t \left\{ \frac{1 - \beta(1-s)(1-\alpha)}{1 - \beta(1-s)(1-\alpha\bar{\psi}_p)} - 1 \right\} > 0 \quad (34)$$

The analysis suggests that the level of firing costs reduces the surplus of temporary jobs that will be converted into permanent positions,  $S_t^c(\psi)$ , while it increases the surplus of temporary dead-end jobs,  $S_t^d(\psi)$ . A greater level of the EPL on regular contracts induces firms and workers to be less selective in temporary matches they form. They take a chance with the match to reveal the fundamental quality of their employment relationship. Nevertheless, they are more selective in job continuation decisions. The transition rate from temporary to permanent work is reduced. More stringent firing restrictions have ambiguous effects on job creations, even in the case where workers do not have any bargaining power :  $\gamma = 0$ . However, one can expect the separation flows to increase in a higher proportion than hiring flows so that the employment rate gets reduced.

#### 4.2.1 Quantitative analysis

In order to illustrate the impact of a two-tier reform of the EPL on employment and welfare, I propose to compute the model of (Pries M. and Rogerson R. 2005) with firing costs and to simulate the introduction of temporary jobs.

(Pries M. and Rogerson R. 2005) computed the economy with no policies in order to match salient features of the worker and job turnover for the US economy. The matching function is given by the following Cobb-Douglas specification:  $m(u, v) = mu^\varphi v^{1-\varphi}$ . (Pries M. and Rogerson R. 2005) targeted an unemployment duration of 3.33 months and a value of  $\bar{\psi}_p$  implying  $E(\psi/\psi \geq \bar{\psi}_p) = 0.4$  in order to match the empirical tenure profile of US separation rates. The probability that a match is formed conditional on a meeting ( $\psi \geq \bar{\psi}_p$ ) is assumed to be 0.5 implying an equilibrium value of  $p(\theta) = 0.6$ . The choice of the distribution of  $\psi$  requires that  $H(\bar{\psi}_p) = 0.5$  and  $E(\psi/\psi \geq \bar{\psi}_p) = 0.4$ . (Pries M. and Rogerson R. 2005) take the density for a mean-zero normal distribution with standard deviation  $\sigma_\psi = 0.32$ , restrict it to the interval  $[0, 1]$  and scale it proportionally so that it integrates to one. (Heckman J. and Pages C. 2000), dismissal costs are introduced and fixed to three months'worth the lowest wage observed in the "laissez-faire" equilibrium:  $F = 3 * w(\bar{\psi}_p)_{LF}$ . I introduce fixed-term contracts. The average temporary job duration is set arbitrarily to 10 months ( $d = 1/10$ ) while the effects of a variation in  $d$  will be investigated later. The calibration is summed up in Table 1 while the results figure in Table 2.

Table 1: Calibration

Parameters	Values	Targets
Annual discount factor	$\beta$ 0.9966	$r = 4\%$
Elasticity of the matching function with respect to u	$\varphi$ 0.5	(Petrongolo B. and Pissarides C. 2001)
Matching efficiency	$m$ 0.6	
Worker's bargaining power	$\gamma$ 0.5	(Hosios A. 1990)
High level of match's quality	$y_h$ 1.9	(Topel R. and Ward M. 1992), $w(1) = 1.25w(\bar{\psi}_p)$
Low level of match's quality	$y_l$ 1	Normalization
Unemployment income	$z$ 1	Equilibrium condition: bad matches are dissolved
Exogenous destruction rate	$s$ 0.0085	(Davis S., Haltiwanger J. and Schuh S. 1996), Annual job destruction: 11.3%
Probability of revelation	$\alpha$ 0.13	(Pries M. 2004)
Cost of posting a vacancy	$c_v$ 0.6284	Unemployment duration: 3.33 months
Cost of creating a job	$c_x$ 3.9013	Annual job destruction rate: 11.3%

I compute the welfare of the economy. The steady state utilitarian welfare function is expressed as the weighted sum of individual utilities:

$$\begin{aligned}
W = & \Pi^v * v + V^u u + \left\{ \Pi_p(1) + V_p(1) \right\} e_p^h + \left\{ \Pi_p[E(\psi/\psi \geq \bar{\psi}_p)] + V_p[E(\psi/\psi \geq \bar{\psi}_p)] \right\} e_p^n \\
& + \left\{ \Pi_t^d[E(\psi/\bar{\psi}_t \leq \psi < \bar{\psi}_p)] + V_t^d[E(\psi/\bar{\psi}_t \leq \psi < \bar{\psi}_p)] \right\} e_t^d \\
& + \left\{ \Pi_t^c[E(\psi/\psi \geq \bar{\psi}_p)] + V_t^c[E(\psi/\psi \geq \bar{\psi}_p)] \right\} e_t^c
\end{aligned} \tag{35}$$

The expected values of permanent employment are given by equations 7 and 9. The value of  $\psi$  is replaced by its expected average value in employment according to hiring practices. The expected values of temporary employment to a firm and to a worker are derived from equations 10 and 11. I distinguish between dead-end temporary jobs and stepping stones to permanent work. It yields:

$$\begin{aligned}
\Pi_t^d[E(\psi/\bar{\psi}_t \leq \psi < \bar{\psi}_p)] = & [E(\psi/\bar{\psi}_t \leq \psi < \bar{\psi}_p)](y_h - y_l) + y_l - w_t[E(\psi/\bar{\psi}_t \leq \psi < \bar{\psi}_p)] \\
& - \beta s F + \beta \left\{ (1 - s)\alpha[1 - E(\psi/\bar{\psi}_t \leq \psi < \bar{\psi}_p)] \right\} (\Pi^v - F) \\
& + \beta(1 - s)\alpha[E(\psi/\bar{\psi}_t \leq \psi < \bar{\psi}_p)]\Pi_p^o(1) \\
& + \beta(1 - s)(1 - \alpha)(1 - d)\Pi_t^d[E(\psi/\bar{\psi}_t \leq \psi < \bar{\psi}_p)]
\end{aligned}$$

$$\begin{aligned}
\Pi_t^c[E(\psi/\psi \geq \bar{\psi}_p)] &= [E(\psi/\psi \geq \bar{\psi}_p)](y_h - y_l) + y_l - w_t[E(\psi/\psi \geq \bar{\psi}_p)] \\
&\quad - \beta s F + \beta \left\{ (1-s)\alpha[1 - E(\psi/\psi \geq \bar{\psi}_p)] \right\} (\Pi^v - F) \\
&\quad + \beta(1-s)\alpha[E(\psi/\psi \geq \bar{\psi}_p)]\Pi_p^o(1) \\
&\quad + \beta(1-s)(1-\alpha) \left\{ (1-d)\Pi_t^d[E(\psi/\psi \geq \bar{\psi}_p)] + d\Pi_p^o[E(\psi/\psi \geq \bar{\psi}_p)] \right\}
\end{aligned}$$

$$\begin{aligned}
V_t^d[E(\psi/\bar{\psi}_t \leq \psi < \bar{\psi}_p)] &= w_t[E(\psi/\bar{\psi}_t \leq \psi < \bar{\psi}_p)] \\
&\quad + \beta \left\{ s + (1-s)\alpha[1 - E(\psi/\bar{\psi}_t \leq \psi < \bar{\psi}_p)] \right\} V^u \\
&\quad + \beta(1-s)\alpha[E(\psi/\bar{\psi}_t \leq \psi < \bar{\psi}_p)]V_p^o(1) \\
&\quad + \beta(1-s)(1-\alpha)(1-d)V_t^d[E(\psi/\bar{\psi}_t \leq \psi < \bar{\psi}_p)]
\end{aligned}$$

$$\begin{aligned}
V_t^c[E(\psi/\psi \geq \bar{\psi}_p)] &= w_t[E(\psi/\psi \geq \bar{\psi}_p)] + \beta \left\{ s + (1-s)\alpha[1 - E(\psi/\psi \geq \bar{\psi}_p)] \right\} V^u \\
&\quad + \beta(1-s)\alpha[E(\psi/\psi \geq \bar{\psi}_p)]V_p^o(1) \\
&\quad + \beta(1-s)(1-\alpha) \left\{ (1-d)V_t^c[E(\psi/\psi \geq \bar{\psi}_p)] + dV_p^o[E(\psi/\psi \geq \bar{\psi}_p)] \right\}
\end{aligned}$$

Table 2: Effects of labor market policies

	The "laissez-faire" economy	Economy with $F$	Economy with temporary jobs
$p(\theta)$	0.6	0.56	0.579
$\bar{\psi}_p$	0.2154	0.278	0.3176
$\bar{\psi}_t$			0.1954
Unemployment duration, (months)	3.33	4.66	3.19
Employment rate %	93.96	92.46	93.32
Proportion of dead-end temporary jobs %			40.85
Monthly separation flows %	1.928	1.75	2.24
Annual job destruction flows %	10.92	11.25	10.55
Annual worker turnover %	46.27	42.01	53.75
Welfare,	100	95.857	97.49

The first column of Table 2 characterized the "laissez-faire" economy where matches revealed to be bad are dissolved at no costs. The employment rate reaches 94%. The economy with firing costs and no temporary jobs stands for the benchmark economy. The employment rate reaches 92.4%. The third column summarizes the results for the economy in which temporary jobs are introduced. As expected, introducing temporary jobs in an economy where regular jobs are subject to dismissal costs increases aggregate employment by almost 1 point and reduces the welfare loss w.r.t the "laissez-faire" economy. One should notice that annual worker turnover is much more higher than in the "laissez-faire" economy: 53.75% vs 46.3%. Temporary jobs foster hirings so that the average unemployment duration falls to 3 months and a higher proportion of bad matches are revealed at the first stages of employment. Matches that are dead-end jobs contribute to raise monthly separation flows. Nevertheless, we observe that more than 60% of temporary matches lead to permanent employment. This confirms that firms and workers are induced to convert temporary positions into permanent ones even with high firing costs. As temporary jobs improve employment prospects, the workers negotiate their wage up. In consequence, the reservation threshold  $\bar{\psi}_p$  increases, thereby reducing the proportion of bad matches in permanent employment. It results in lower annual job destructions<sup>7</sup>.

<sup>7</sup>(Pries M. and Rogerson R. 2005) considered matches that are terminated and still vacant to measure annual job destruction.

I now investigate how a variation in the EPL on regular contracts affects an economy with temporary jobs. (Pries M. and Rogerson R. 2005) considered a dismissal cost of three months' worth the lowest wage observed in the "laissez-faire" economy. I simulate a variation of this proportion:  $F = a * w(\bar{\psi}_p)_{LF}$ . The effects on employment, worker turnover, welfare, and hiring practices are reported in Figure 5 and 6.

In accordance with the findings of (Pries M. and Rogerson R. 2005), increasing firing costs reduces employment and welfare of the economy. The striking result is that more stringent firing restrictions induce firms to be less selective in whom they hire on a temporary job: as demonstrated above, the hiring threshold  $\bar{\psi}_t$  is reduced. They take a chance with a worker as long as they are exempted from paying any termination costs. Then, firms are more selective in whom they promote to permanent jobs ; the reservation thresholds  $\bar{\psi}_p$  increases thereby resulting in a higher proportion of dead-end jobs. Worker turnover increases both due to higher revelations of bad match qualities and to higher terminations of temporary contracts. The reduction in  $S_t^c(\psi)$  is found to overcome the increase in the joint surplus of a temporary dead-end job  $S_t^d(\psi)$ . It suggests that firing costs discourage job creations. Figure 6 shows that the labor market tightness is reduced. Given that firms are less selective in whom they hire, a rise in firing costs first improves the employment prospects of unemployed workers. Workers experience more frequently unemployment spells that are of shorter duration. The average unemployment duration starts increasing from a threshold value of firing costs that equals  $F = 7 * w(\bar{\psi})_{LF}$ .

Figure 5: Economy with temporary jobs, increase in firing costs

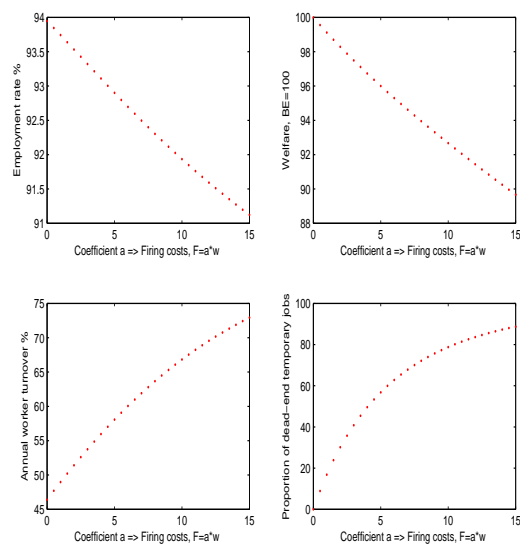
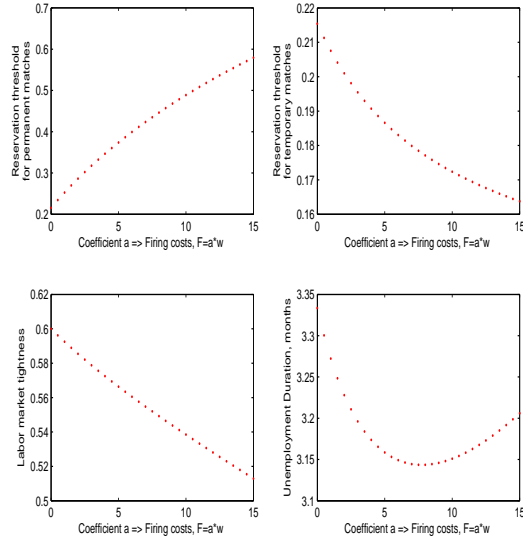


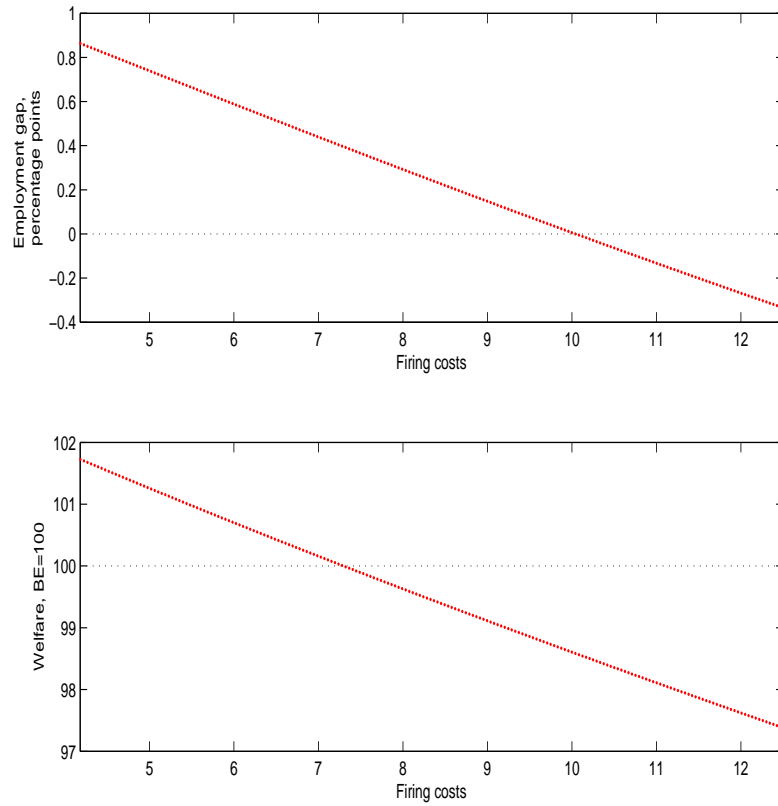
Figure 6: Economy with temporary jobs, increase in firing costs (2)



Besides, the quantitative analysis suggests that increasing firing costs on regular jobs while allowing hirings in temporary jobs could improve up to a point the welfare and the employment rate of the economy. To illustrate this point, I consider the benchmark economy à la (Pries M. and Rogerson R. 2005) with dismissal costs,  $F = 3 * w(\bar{\psi}_p)_{LF}$ . It yields the value  $F = 4.18$ . Then, temporary jobs are introduced while firing costs increases w.r.t their benchmark value. The employment and the welfare gaps between the two economies are reported in Figure 7. The welfare starts to be lower than in the benchmark economy when the rise in firing costs exceeds 75%: for  $F > 7.32$ . The employment rate falls behind its benchmark value when firing costs are more than two times higher: for  $F > 10.04$ , the employment is negative.

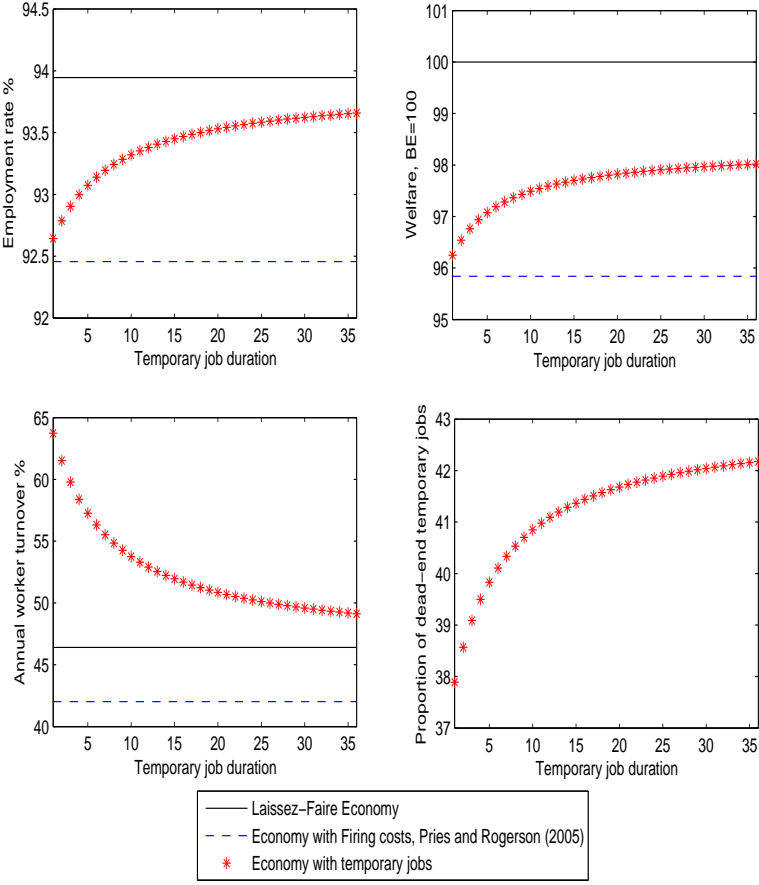


Figure 7: Introducing temporary jobs while increasing firing costs



Finally, Figure 8 illustrates the trends of the employment rate, the welfare and worker turnover when the temporary job duration varies from 1 to 36 months. Given that firing costs are pure waste and increase employment by distorting hiring practices, temporary jobs improve employment and welfare whatever the job duration. The main result is that employment, welfare and worker turnover are affected in a non linear way. As temporary jobs allow firms and workers to sort bad matches, the way the job duration affects hiring practices and employment depends on the probability that the match quality is revealed,  $\alpha$ . The marginal gain of an increase in temporary job duration is decreasing and highly reduced when the job duration exceeds the time necessary for the match quality revelation. (Pries M. 2004) estimated an average learning process of 8 months in the US.

Figure 8: Economy with temporary jobs, duration from 1 to 36 months



### 4.3 Temporary jobs in the US economy

The aim of this section is twofold. First, I propose to investigate design issues of temporary jobs by adopting a second best approach. Deriving policies as first-best responses will not be the more useful to the decisions that policy makers commonly face in practice. The labor market is characterized by institutions that underlie imperfections but that cannot be completely abolished. I propose to integrate labor market institutions as features of the unemployment benefit system and to examine design issues of temporary jobs. Secondly, the paper of (Pries M. and Rogerson R. 2005) is particularly well suited for analyzing the US labor market efficiency. Rather than evaluating the effects of a two tier reform of the EPL in European countries, I propose to examine how temporary employment would affect the US economy. The United States does not display a strict EPL. However, an original feature of the labor market institutions is that firing costs are used to finance unemployment insurance to dismissed workers. Firing costs are fixed in proportions of firms' separations to finance unemployment benefits instead of payrolls taxes and social contributions as in European countries. I ask whether or not for a given replacement rate, an economy with temporary jobs but high firing costs on regular contracts that finance the UB system is preferred to an economy without temporary employment but lower firing costs.

I follow (Cahuc P. and Malherbet F. 2002) and assume for simplicity a memoryless experience rating schedule. The unemployment income is now the sum of two components  $z = a + b$  with  $a$  the leisure's utility and  $b$  the unemployment benefits financed by the tax paid when regular jobs are dissolved,  $F$ . The budget constraint is thus given by:

$$ub = F \left\{ s(e_p^h + e_p^n) + (1 - s)\alpha[1 - E(\psi/\psi \geq \bar{\psi}_p)]e_p^n \right\} \quad (36)$$

Firing costs are paid when permanent jobs are destructed at rate  $s$ , whatever the knowledge on match quality, and when permanent matches are revealed to be of bad quality.

I make use of the calibration of (Pries M. and Rogerson R. 2005). The value of firing costs is now determined endogenously to finance an average replacement rate of 27%, (Martin J. 1996). The economy without temporary jobs stands for the benchmark economy. The simulation results are reported in Table 3.

Firing costs are initially set to 4.2 which is 2.76 times the average wage of the economy. The aggregate employment rate reaches 86%. We first introduce temporary jobs of average duration of 10 months, as observed in France. As suggested by the theoretical analysis, introducing temporary jobs induces firms to be less selective in whom they hire. The average unemployment duration falls from 10 to 7 months. The employment rate increases by less than 1 point. Nevertheless, more than 10% of the jobs are temporary matches and the mass of permanent jobs is reduced. In consequence, firing costs have to increase in order to maintain a a replacement rate of 27%. The level reaches 7.72 which is 4.92 times the average wage of the economy. The rise in firing costs involved by the introduction of temporary jobs discourages job creation and induces firms to be more selective in whom they promote:

the threshold  $\bar{\psi}_p$  raises so that 67% of the temporary contracts are dead-end jobs. In consequence, monthly separation flows increase while annual job destruction flows are reduced. As the employment prospects of a job seeker are improved, the workers' welfare gets better. However, the increase in firing costs reduces the expected profit the firm gets in a higher proportion. We observe that the total output of the economy is reduced by less than 1%.

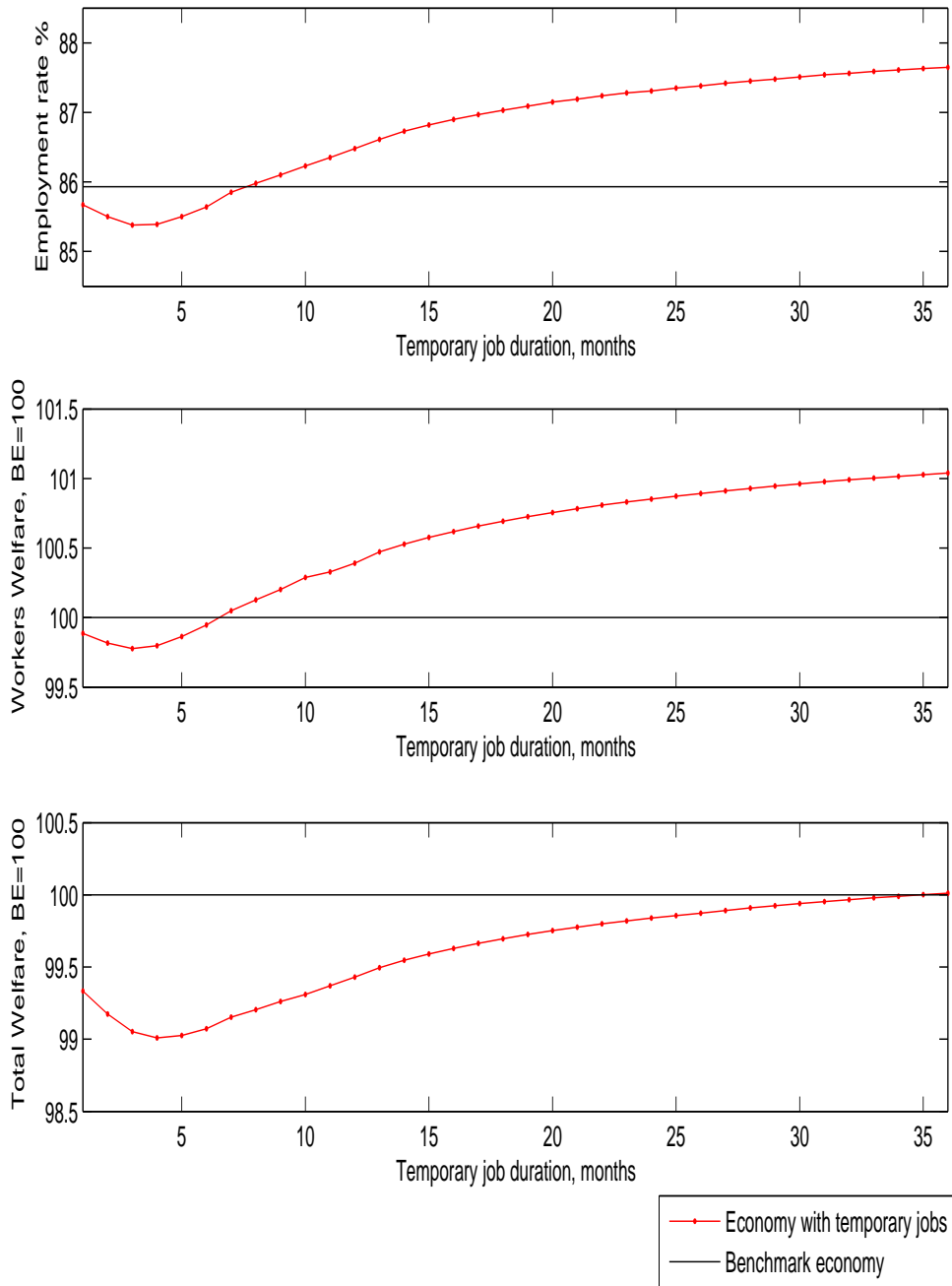
Table 3: Effects of temporary jobs in an economy where firing costs finance unemployment benefits

	The benchmark economy	Economy with temporary jobs $d = 1/10$
$p(\theta)$	0.338	0.33
$\bar{\psi}_p$	0.3381	0.4625
$\bar{\psi}_t$		0.2433
Unemployment duration, (months)	10.2	6.78
Replacement Rate %	27	27
Employment rate %	85.93	86.28
Proportion of dead-end temporary jobs %		67.07
Monthly separation flows %	1.60	2.34
Annual job destruction flows %	12.28	11.72
Annual worker turnover %	38.49	56.25
Workers' Welfare,	100	100.29
Total Welfare,	100	99.34

Lastly, I investigate how the temporary job duration should affect aggregate employment and welfare in the US economy. The higher is the job duration, the higher should be firing costs that finance unemployment benefits. (Pries M. 2004) estimated that the learning process takes in average 8 months in the US. Accordingly, Figure 9 suggests that temporary jobs which duration is lower than 8 months reduces both welfare and employment. Temporary jobs cannot be used as a screening device as the duration is not high enough to infer the match quality. In consequence, firms have to convert temporary jobs in permanent matches. The exemption from paying any termination costs if separation occurs during the first periods of employment should raise the initial surplus of a match. However, as a fraction of jobs are temporary, firing costs have to increase to finance the unemployed compensations thereby reducing employment and welfare. From a job duration of 8 months, temporary jobs are used as a screening device and improve employment and workers' welfare. However, the total welfare of the economy remains lower than in the benchmark economy due to the profit loss until an average duration of 35 months.

One should ask whether or not there is a threshold temporary job duration from which employment and welfare get reduced. Indeed, if the exemption of firing costs tends to infinity, ( $d = 0$ ), unemployment benefits cannot be financed anymore by firing costs. The framework I developed does not allow me to derive this threshold duration if it exists. I assumed that a match that is revealed to be good is converted directly into a regular contract whatever the value of  $d$ . Thus, when I simulate an increase in the temporary job duration, matches revealed to be good remain permanent jobs subject to firing costs so that unemployment benefits will be always financed. The model needs to be modified in order to deepen the optimal design analysis.

Figure 9: Economy with unemployment benefits and temporary jobs, duration from 1 to 36 months



## 5 Conclusion

This paper attempted to analyze the impact of a two-tier reform of the employment protection legislation that allows firms to hire workers on temporary positions while leaving unchanged termination costs that apply to regular contracts. The main contribution is to investigate the role of temporary jobs in facilitating the screening process on match quality. I extended the framework developed by (Pries M. and Rogerson R. 2005) that supports the idea that worker turnover results from the re-allocation process between workers and firms searching for a suitable match rather than recurrent shocks to job productivity. The analysis suggested that temporary jobs can serve as stepping stones to permanency even with high firing costs on regular jobs. By facilitating hiring practices, two-tier reforms of the EPL are employment and welfare improving.

A greater EPL on regular contracts reduces employment in a economy with temporary jobs. However, the analysis pointed out that firing costs induce firms to be less selective in whom they hire on temporary contracts and to be more selective in whom they promote on permanent jobs. In consequence, the worker's employment prospects can be improved for values of firing costs that remain low, while the unemployment rate unambiguously increases.

Lastly, the paper argued that the impact of temporary employment depends on the learning process on match quality. I considered an economy close to the US economy where firing costs are used to finance unemployment benefits. A given replacement rate can be financed either by low firing costs on every jobs or by high firing costs applying to permanent jobs in an economy where temporary jobs are introduced. In such an economy, a two-tier reform of the EPL cannot be employment and welfare improving if the temporary job duration is not high enough to enable screening. The paper asked whether or not introducing features of the European labor markets could improve the labor market efficiency of the United-States and contributed to answer the question. However, the framework needs to be extended in order to deepen the analysis. First, firing costs should be fixed in proportions of firms' separations in order to match features of the US experience rating schedule. Next, to investigate the second best temporary job duration (the first best being infinity), firms should be allowed to benefit from the maximum duration of temporary contracts even if the quality is revealed to be good.

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