Temporary workers: a note on flows and stocks

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Abstract

This paper extends the model originally proposed by Berton and Garibaldi [2006] to undirected search on the side of the workers and shows that in equilibrium higher flows of workers into temporary jobs - with respect to flows into permanent jobs - are compatible with any stock of temporary employment, the latter depending crucially on the probability of a permanent adverse shock. This implication of the model may explain why in countries like Italy temporary employment did not absorb the entire workforce, despite the turnover of workers on permanent jobs and the high flows into temporary ones.

- Key words: matching models, temporary jobs

1 Introduction

During the late eighties and the early nineties reducing the employment protection legislation (EPL) became the main policy recipe for countries with a poor labor market performance [Imf 1999, Oecd 1994]; the models were the US under Reagan's government and the UK under Thatcher's. Many countries accepted this idea of flexibility, but for reasons going from the need of an agreement with the unions, to the willingness of not losing support from a large proportion of the workers or simply the preference for a milder reform strategy, they did not proceed to a sharp reduction of the EPL on incumbent workers, often employed with standard open-ended contracts. Instead, labor market reforms in the last fifteen years mainly occurred through the liberalization at the margin of temporary jobs. This fact is witnessed by a widespread reduction of the EPL index for fixed-term contracts, while the same index for standard workers remained basically unchanged (figures 1 and 2).

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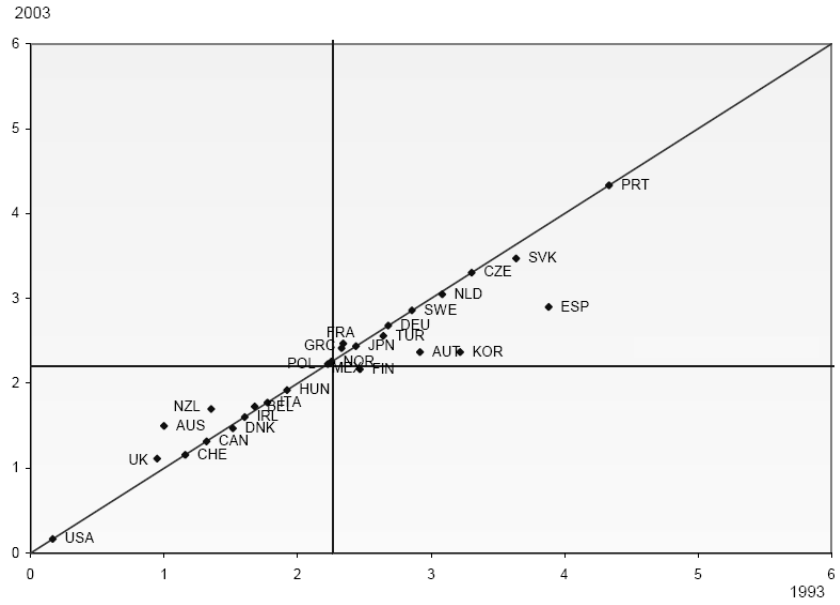

Figure 1: EPL index for standard workers [Brandt *et al.* 2005]

Policy analysts wonder whether the share of temporary workers will go on growing as the stock of open-ended contracts dies out due to natural turnover, eventually absorbing the entire workforce. This is what actually happens in the pure demand-setting model proposed by Boeri and Garibaldi [2007], where no permanent vacancy is posted in equilibrium, or, similarly, in Cahuc and Postel-Vinay [2002] and Blanchard and Landier [2002], where only *ad hoc* assumptions allow the coexistence of temporary and permanent jobs. The evidence that the share of temporary contracts is higher and growing in countries where the EPL for standard workers is stricter [Booth *et al.* 2002] seems to confirm this idea.

However, a growing share of temporary workers may be just an off-equilibrium outcome. Alonso-Borrego *et al.* [2005] as well as Berton and Garibaldi [2006], for instance, clearly show that temporary and permanent jobs may coexist in equilibrium. The aim of this paper is to go further into this topic, extending the model proposed by Berton and Garibaldi to undirected search on the side of the workers and showing that not only the coexistence of temporary and permanent workers is possible in equilibrium, but also that a higher flow of temporary vacancies - with respect to the flow of permanent ones - is compatible with a higher stock of permanent workers. Next section depicts some descriptive evidence about the Italian labor market. Section three describes the model and section four discusses the results and draws some concluding remarks.

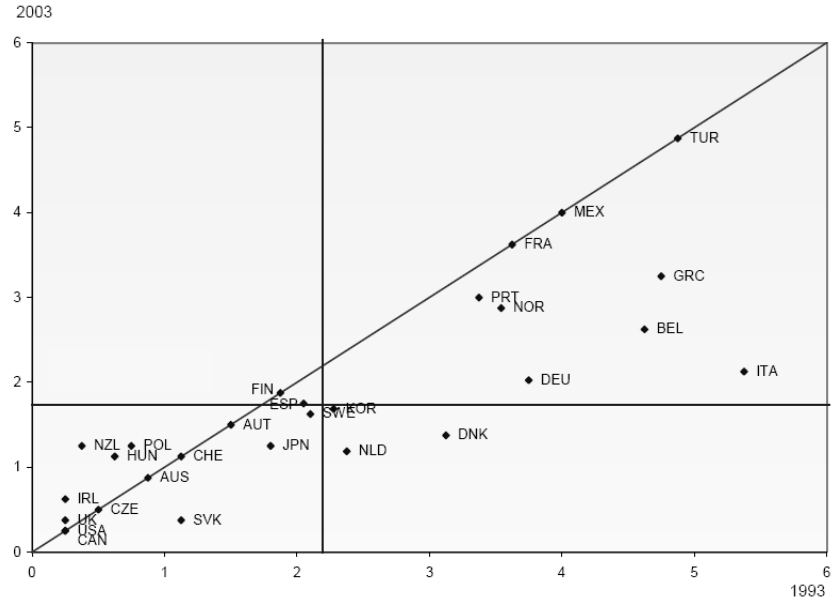

Figure 2: EPL index for temporary workers: 1993-2003 [Brandt *et al.* 2005]

2 Flows and stocks of temporary jobs in Italy

Following a pure demand setting approach, temporary jobs should step by step crowd out permanent jobs, eventually absorbing the entire workforce. The speed of substitution should be proportional to standard workers' turnover: the larger is the turnover on workers under an open-ended contract, the larger should be the flows into temporary employment.

Contrary to what is commonly known, Italy has always had quite a flexible labor market. The gross workers' turnover (figure 3) was already high during late eighties - i.e. before the main labor market reforms took place - and comparable to the one observed, for instance, in the US [Contini and Revelli 1997]. This also results in the low EPL index depicted in figure 1. One would therefore expect sizeable flows into temporary employment during and after the liberalization of temporary contracts, and this is actually the case: the ratio between the yearly flow into fixed-duration jobs and the yearly flow into open-ended ones grew from 88% to 107% in the period 1998-2003[1], i.e. immediately after a major labor market reform was introduced and right before a further liberalization of temporary contracts was enforced[2]. However, during the same period the proportion of temporary employment on total employment grew only slightly,

[1] WHIP data.

[2] Respectively, laws 196/1997 (the so-called "Pacchetto Treu") and 30/2003 (the "Legge Biagi").

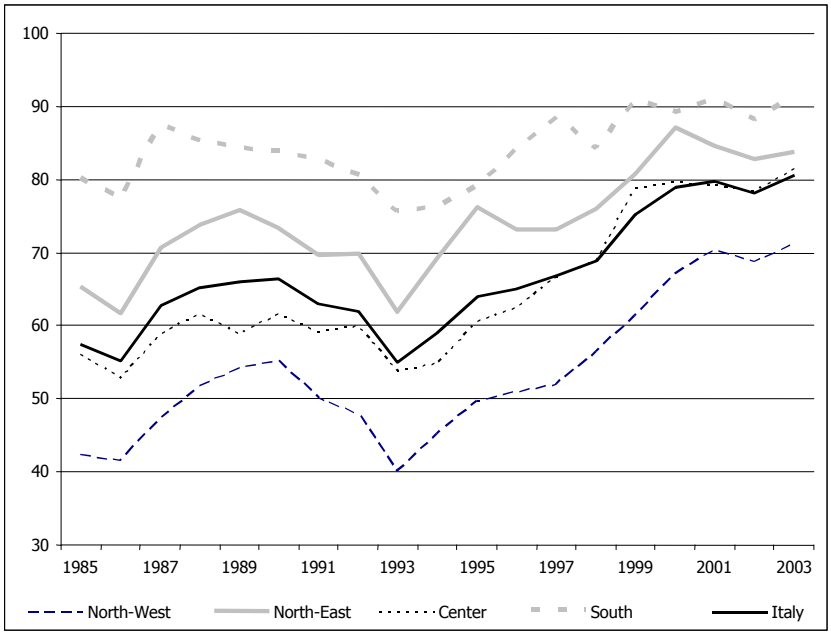

Figure 3: Gross workers' turnover in Italy: 1985-2003 [Berton *et al.* 2009]

passing from 8,6% to 9,9% and reaching 13,2% in 2007[3]. In other words, firms still post open-ended vacancies and temporary employment will almost surely not absorb the entire workforce[4].

In what follows I extend the model proposed by Berton and Garibaldi [2006] to indirect search on the side of the workers and show that the basic results (i.e. the trade-off between the waiting time and the profitability of a labor market position, and the coexistence of open-ended and temporary contracts) still hold; in addition, I prove that higher flows into temporary employment - with respect to standard employment - are compatible with lower stocks.

3 The model

3.1 The matching framework

The model goes as follows:

[3] Eurostat data.

[4] This fact is even more evident when looking at Spanish data: during the nineties 90% of new hires have been signed under temporary contracts [Dolado *et al.* 2002] but the share of temporary employment on total employment is around 33% at least since 1996 (Eurostat data).

- The labor market consists of a mass one of homogeneous risk neutral workers. Workers are either employed or unemployed: employed workers are subject to natural turnover and separate from their job at rate s; unemployed workers search for a new job and receive the unemployment benefit b.

- Firms post either *temporary* or *permanent* vacancies (respectively denoted by subscripts t and p) whose flow cost is c, and produce with a constant returns to scale technology with labor productivity y_h. Temporary workers can be laid off at will, while firms that hire workers on permanent arrangements must rely on natural turnover to downsize.

- Conditional on a permanent adverse technological shock, labor productivity falls to y_l; shocks occur at rate λ.

- Both temporary and permanent workers receive an exogenous wage w. In order to make things interesting, I assume that $y_h > w > y_l$; this assumption is aimed to mimic what happens in the countries where the dismissal of permanent workers cannot occur at will: upon the arrival of a negative shock, firms are forced to inefficiently retain them and to rely on temporary workers in order to adjust the employed workforce. In addition, I assume that $w > b$ so that any job (temporary or permanent) is viable for each worker.

- Unemployed workers search both for permanent and for temporary jobs. The meeting of unemployed workers and unfilled vacancies is described by the matching functions $m(u, v_i)$ where u is the measure of unemplyed workers and v_i is the measure of vacancies of type $i \in \{p, t\}$. Following standard assumptions, $m(.)$ is concave and homogeneous of degree one in (u, v_i) with continuous derivatives.

- The transition rate from unemployment to a job of type i is defined by $h_i = m(u, v_i)/u = m(1, \theta_i) = h(\theta_i)$ and the job filling rate for a vacancy of type i is defined by $q_i = m(u, v_i)/v_i = m(1/\theta_i, 1) = q(\theta_i)$; the arrival rate of job offers and the job filling rate satisfy the following conditions:

$$\begin{aligned} \lim_{\theta_i \to 0} h(\theta_i) &= \lim_{\theta_i \to \infty} q(\theta_i) = 0 \\ \lim_{\theta_i \to \infty} h(\theta_i) &= \lim_{\theta_i \to 0} q(\theta_i) = \infty \end{aligned}$$

- Upon their meeting, unemployed workers and vacant firms fix the wage for the entire working relationship. In the spirit of Hall [2005], any wage in the parties' bargaining set at the time of the meeting can be supported as an equilibrium.

3.2 Value functions

3.2.1 Workers

Unemployed workers search at the same time for both permanent and temporary jobs. The Bellman equation of being unemployed therefore reads

$$rU = b + h(\theta_p)[E_p - U] + h(\theta_t)[E_t - U] \tag{1}$$

On the contrary, the flow value of being employed with a permanent or a temporary job differ insofar as the latter implies a higher job destruction rate

$$rE_p = w + s[U - E_p] \tag{2}$$

$$rE_t = w + (s + \lambda)[U - E_t] \tag{3}$$

Using (2) and (3) eventually combined with (1) and after a few steps of algebra, one can easily prove that

$$E_p = \frac{w + sU}{r + s} \text{ and that } E_t = \frac{w + (s + \lambda)U}{r + s + \lambda}$$

where

$$U = \frac{b(r + s + \lambda) + w[h(\theta_p)\lambda + h(\theta_t)]}{r[(r + s + \lambda) + h(\theta_p)\lambda + h(\theta_t)]}$$

3.2.2 Firms

Firms may post either permanent or temporary vacancies. When a vacancy is filled with a permanent contract, the firm enjoys an operational profit equal to $y_h - w$ as long as the labor productivity is high; conditional on a technological shock, the firm has to inefficiently retain the worker until her position quits due to natural turnover and runs a loss equal to $y_l - w$. Thus, the flow values for a firm of a permanent job when the productivity is high (y_h) or low (y) respectively read

$$rJ_p^h = y_h - w + s[V_p - J_p^h] + \lambda[J_p^l - J_p^h] \tag{4}$$

$$rJ_p^l = y_l - w + s[V_p - J_p^l] \tag{5}$$

Keeping open a permanent vacancy implies a flow cost c and its Bellman equation is

$$rV_p = -c + q(\theta_p)[J_p^h - V_p]$$

Assuming free entry in the labor market, the equilibrium value of a permanent vacancy V_p is equal to zero, so that

$$c = q(\theta_p)J_p^h$$

which means that the flow cost of keeping open a permanent vacancy is equal, in equilibrium, to its expected benefit. Using $V_p = 0$ with (4) and (5) one gets the expressions for J_p^h and J_p^l:

$$J_p^h = \frac{y_h - w}{r + s + \lambda} + \frac{\lambda(y_l - w)}{(r + s)(r + s + \lambda)}$$

$$J_p^l = \frac{y_l - w}{r + s} < 0$$

On the other hand when a vacancy is filled with a temporary worker the firm maximizes the profit and does not run any operational loss, since upon the occurrance of a productivity shock temporary jobs are quitted; their flow value for a firm thus reads

$$rJ_t^h = y_h - w + (s + \lambda)[V_t - J_t^h] \tag{6}$$

Similarly, the Bellman equation for a temporary vacancy is

$$rV_t = -c + q(\theta_t)[J_t^h - V_t]$$

and since free entry drives also V_t to zero, one easily gets another equilibrium condition

$$c = q(\theta_t)J_t^h$$

Using $V_t = 0$ with (6) also the expression for J_t^h is done

$$J_t^h = \frac{y_h - w}{r + s + \lambda} > J_p^h$$

3.3 Equilibrium

The equilibrium is given by the couple $\{\theta_p, \theta_t\}$, the exogenous wage w and a distribution of workers across the three labor market states (unemployment, employment with a temporary job, employment with a permanent job). The equilibrium values for θ_p and θ_t are completely determined by the behaviour of the firms through optimal vacancy posting; indeed, free entry drives the value of any vacancy to zero

$$V_p = V_t = 0$$

which in turn implies

$$c = q(\theta_p)J_p^h = q(\theta_t)J_t^h$$

i.e. the expected benefit of keeping open a vacancy is in equilibrium equal for both permanent and temporary positions. Now, since $J_p^h < J_t^h$ it must be that $q(\theta_p) > q(\theta_t)$ and that $\theta_p < \theta_t$. As in Berton and Garibaldi [2006] the labor market tightness for temporary jobs is thus higher; from the firms' standpoint this means that

Claim 1 *Once a vacancy is filled, temporary jobs allow to make higher profits; however, since the job filling rate for temporary vacancies is lower, temporary vacancies need to be kept open longer, which implies a higher cost.*

Analogously, from the workers' point of view

Claim 2 *A permanent job is ex-post strictly better, since it prevents a worker to be dismissed in case of a productivity shock. However, since the finding rate is higher for temporary job than for permanent ones, a worker looking for a permanent position has to stay unemployed longer.*

Thus, allowing unemployed workers to search for both temporary and permanent jobs at the same time does not affect these two main features of Berton's and Garibaldi's model. In addition, it leads to a brand new result; indeed, $\theta_p < \theta_t$ implies that

$$\frac{v_p}{u} < \frac{v_t}{u} \Rightarrow v_p < v_t$$

i.e. in equilibrium

Claim 3 *The flow of temporary vacancies is higher than the flow of permanent vacancies.*

The description of the steady state is completed by the distribution of workers across labor market states. In equilibrium the flows in and out each of them must be zero

$$\dot{u} = sn_p + (s+\lambda)n_t - h(\theta_p)u - h(\theta_t)u = 0$$

where the dotted variables stand for their time-derivatives and n_p and n_t are the stocks of workers respectively employed with a permanent and a temporary contract. Rearranging terms and using $u + n_p + n_t = 1$ one gets

$$u = \frac{s + \lambda n_t}{s + h(\theta_p) + h(\theta_t)} \tag{7}$$

The expression for the flow of workers in and out permanent and temporary jobs in turn read

$$\dot{n}_p = h(\theta_p)u - sn_p = 0 \Rightarrow n_p = \frac{h(\theta_p)u}{s} \tag{8}$$

$$\dot{n}_t = h(\theta_t)u - (s+\lambda)n_t = 0 \Rightarrow n_t = \frac{h(\theta_t)u}{s+\lambda} \tag{9}$$

Combining equations (7) and (9) and after a few steps of algebra one gets the expression for the stock of unemployed workers

$$u = \frac{s(s+\lambda)}{(s+\lambda)[s + h(\theta_p)] + sh(\theta_t)} \tag{10}$$

Substituting (10) into (8) and (9) also the expressions for the stocks of permanent and temporary employed workers can be obtained

$$n_p = \frac{(s+\lambda)h(\theta_p)}{(s+\lambda)[s + h(\theta_p)] + sh(\theta_t)} \tag{11}$$

$$n_t = \frac{sh(\theta_t)}{(s+\lambda)[s+h(\theta_p)]+sh(\theta_t)} \tag{12}$$

The comparison between (11) and (12) leads to a second major result of this paper

Claim 4 *Even if firms post a higher number of temporary vacancies, the equilibrium stock of temporary jobs may be above as well as below the equilibrium stock of permanent jobs.*

Their proportion crucially depends on the relative strength of the job finding rates $h(\theta_i)$ and of the probability of a negative productivity shock. The higher is λ, the higher is the destruction rate of temporary jobs and - in a framework where firms are forward-looking - the lower is their share on total employment.

4 Discussion and conclusions

This paper extends the model originally proposed by Berton and Garibaldi [2006] by allowing the workers to search for both permanent and temporary jobs at the same time when unemployed. The basic results of the original model still hold and temporary and pemanent jobs coexisit in the view of a trade-off between the waiting time needed to fill a vacancy (or to find a job) of the desired type and the profitability of that position. In addition, this paper shows that a higher flow of new temporary vacancies - with respect to the flow of permanent ones - is compatible in equilibrium with any stock of permanent jobs: in a forward-looking setting the equilibrium proportion of temporary workers crucially depends on the probability of a permanent adverse shock; the more likely is the shock, the lower is the share of temporary jobs. Such implication may possibly explain why in countries like Italy and Spain the share of temporary workers remained stable despite the extremely high flows of workers into temporary employment.

Three issues need some further comment. First of all, the model I propose here does not explain how the workers sort into the different types of jobs; given the shorter unemployment duration for workers who accept a temporary job offer, the introduction of heterogeneity in terms of off-the-job options would drive the workers with lower assets into temporary employment, as in Alonso-Borrego *et al.* [2005] and Berton and Garibaldi [2006]. Second, in the model I propose here the wage is exogenous; this simplifying assumption is nonetheless consistent with what happens in countries like Italy, where the wage is almost completely determined by collective bargaining. Finally, in my view the fact that high flows of workers into temporary jobs will not necessarily absorb the whole workforce does not mean that the issue is somehow less relevant. Temporary employment is often associated with job insecurity [Clark and Postel-Vinay 2005] and poor human capital investments [Bassanini *et al.* 2005], and in many cases also with lower wages and low transition rates into more stable jobs [De Graaf-Zijl 2005]. In Italy - but also in deeply different countries like the US

[Mishel *et al.* 2007] - these facts are exacerbated by a lower access to income-maintenance schemes [Berton *et al.* 2009]. The individual sustainability of the "cost of flexibilization" thus depends on temporary workers' careers dynamics and on the social protection they are eligible to, which has little to do with the overall proportion of temporary employment.

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