On Short-Term Contracts Regulations*

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Abstract

We present a theoretical as well as empirical analysis of the impact of employment regulations on permanent and temporary employment. We consider three different forms of such regulations, namely insider protection, fixed term contract regulations, and legislation on temporary work agencies, and we present some empirical evidence as regards total, female and young employees based on a panel of nine European countries. We show that these three types of regulations have different impacts on the employment performances of those countries. Moreover, these institutions act asymmetrically along the business cycle. The most notable findings are that lower employment protection leads to the substitution of permanent employees by temporary ones with an insignificant net effect on the total; more flexible regulations on fixed term contracts have a beneficial effect on temporary as well as permanent employment among young people; flexible regulations on temporary work agencies have a positive impact on temporary employment, while they may reduce permanent employment.

JEL codes: J21, J23, E24.

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1 Introduction

In recent decades European economies have experienced high levels of unemployment and, unlike in the USA, high degrees of persistence. Employment protection legislation has often been put forward as a possible explanation for the poor performance of European labour markets, and the flexibilization of labour relations has been one of the more debated themes in industrial relations and economic analysis in Europe.

One of the main ways in which European labour markets have pursued higher levels of flexibility is the adoption of new models of labour contracts for entrants, rather than by reducing the level of employment protection for insiders[1]. Increasingly frequent use has been made of temporary contracts in the last decade in most of the European countries, and notably in Spain (see Bentolila and Dolado (1994) and Bentolila and Saint Paul (1992)).

Nevertheless, most of the economic literature focuses on severance payments and firing costs rather than on temporary contracts. The main results of this literature are that, whereas higher firing costs reduce the variability of employment along the economic cycle, the effect on average employment is less clear (Bertola (1992)). As a matter of fact, some authors provide cases in which average employment grows with firing costs, as in Bentolila and Bertola (1990).

Temporary contracts have been recently analysed from different perspectives. On the one hand research has examined the effect on career opportunities of labour market entry via atypical jobs: the *job shopping hypotheses* as opposed to the *port of entry* one (see Booth, Francesconi and Frank (2000); Buel-Rotland and Petrongolo (2000); Santacroce (2000)). On the other hand economists have tried to understand the impact of the widespread use of temporary contracts on the unemployment rate and labour market performance (see Blanchard and Landier (2001); Veracierto (2000); Van Ours (2000) ; Adam and Canziani (1998); Cahuc and Postel-Vinay (1999); Saint-Paul, (1996)).

In this paper we analyse the effects of employment regulations on employment levels, distinguishing between permanent and temporary employment. Our question, both theoretical and empirical, is whether the labour market reforms of the last decades have differently affected these two categories of employees. In other words we want to see if recent institutional changes have affected total employment, its composition between permanent and temporary workers, or both.

We consider, at a theoretical level, several forms of employment regulations: the level of firing costs, the cost of hiring temporary labour (affected by the efficiency of public placement services and by the regulation of interim agencies), and the existence of quota constraints on the employment of temporary workers.

Our model assumes that the economy might be in a good or in a bad state. An exogenous probability of transition between the two states and the existence of firing costs leads firms to choose the optimal composition of temporary and permanent employees. These two categories of contracts are characterised by a different productivity level, which is assumed to be lower for temporary employees given their lack of firm specific skills and the need to train them. The relative cost of the two labour inputs is determined by firing costs, which do not affect temporary workers, and by the hiring framework. Finally, there exists an high but imperfect degree of substitution between the two categories of workers.

The main findings of the theoretical model are anticipated here. A decrease in the relative cost of temporary workers (due to a lower relative wage or to a more efficient placement mechanism) raises temporary employment but reduces permanent employment. The effects on total employment are generally ambiguous unless the constraint on temporary contracts is binding. In this case we

[1]This choice could be well explained by the fact that the insiders pool usually represents the majority of voters in democratic systems (Saint-Paul (1998); Cahuc and Postel-Vinay (1999))

observe a rise in total employment. A decrease in firing costs has opposite effects in good and bad states: in good states temporary employment rises and permanent employment falls, vice versa in bad states.

When the constraint on temporary contracts is binding, higher hiring costs reduce employment for both employment types in both states, whereas higher firing costs reduce both employment types in good states. If the constraint on temporary employment is relaxed, the positive effects on temporary employment are accompanied by negative effects on permanent one. The net impact on total employment is however positive in good states and negative in bad ones. Hence, employment regulations are not independent of one another. For instance, firing costs have different effects on employment according to the existence of constraints on the use of temporary workers.

The ambiguity of some of the analytical predictions of the model, suggests that the ultimate determination of the impact of these labour market institutions on employment types has to be empirical.

We test the implications of the model by means of a fixed effect GLS estimation using an unbalanced sample of nine European countries, observed from 1983 to 1995, using a set of institutional indicators provided by OECD and other researchers (see appendix C1-C3). In general, the conclusions of the model are reflected in our estimations and we are also able to shed some light on all cases for which it is not possible to derive an unambiguous analytical result. All estimates are also robust and coherent with previous empirical findings in the literature.

The structure of the paper is as follows: the theoretical model is presented in section two, while the third section presents the empirical analysis. The last section contains some concluding remarks.

2 The Model

Our objective in this section is to conduct a theoretical evaluation of the impact of different employment regulations on employment levels. We present a theoretical model that contains different sources of labour market rigidities. These are:

- firing costs: a firm that fires some of its permanent workers has to make severance payments;
- entry wages: a firm that hires a worker on a temporary basis pays him/her a wage lower than that paid to a permanent employee; this differential is the compensation for the training provided by the firm;
- hiring costs: these depend on the efficiency of the public placement system and on the existence of temporary work agencies;
- constraints on the use of temporary contracts: a firm is not allowed to maintain more than a given percentage of its workforce on temporary contracts.

In what follows, we evaluate the effects of changes in these institutional dimensions on permanent as well as temporary employment.

The first paragraph describes the optimal behaviour of firms, and introduces an explicit form for the total revenue function whose argument are permanent and temporary workers. The second paragraph analyses the effects of a reduction in firing costs, hiring costs and entry wages on the employment level. The third paragraph considers the effects of the constraints on temporary contracts usage. The fourth paragraph presents a synthesis of the main theoretical results.

2.1 The Behaviour of the Firm

We consider an economy with a homogeneous labour force and a given number of firms. This economy is hit by a productivity shock[2], Z, which assumes two values: Z_G and Z_B, with $Z_G > Z_B$. We label these two states of the world as good and bad. The productivity shock is supposed to follow a Markov chain (as in Bertola and Ichino (1995)), where p is the probability of transition from one state to the other. This means that when the firm is in a good state at time t with $Z_t = Z_G$, we have $E(Z_{t+1}) = (1-p)Z_G + pZ_B$, where E is the expectation operator. Vice versa, when $Z_t = Z_B$ we have $E(Z_{t+1}) = (1-p)Z_B + pZ_G$. Assuming the shocks are idiosyncratic to each firm it follows that, at every instant t, half of firms are in each of the two states.

We suppose that firms always hire workers on short term contracts, thereby incurring hiring costs. On expiry of each contract, firms may hire the worker on a permanent contract or they may conclude the contract without costs. It is not possible to renew temporary contracts. On the other hand, when a firm wants to break off a permanent contract, it must pay a firing cost (F).

Firms must choose the optimal number of short term and permanent contracts in each of the two states of the economy. The decision concerning short term contracts is straightforward: given n as the number of temporary workers and N as that of permanent ones, with $ZR(n, N)$ as the total revenue[3], the usual static condition of equality between marginal costs and marginal benefits defines the optimal stock of short term contracts in each of the two states:

$$Z_s R'_n(n_s, N_s) = w_s + H \qquad for \quad s = G, B \tag{1}$$

where w is the unit labour cost for a temporary contract (it include wages plus all taxes and contribution on labour), H is the unitary hiring costs, and the index s represents the two states.

As regards long term contracts, each firm maximises the expected current discounted value of future cash flows. When hit by a negative shock, it will fire workers until the expected negative value of a job is equal to the firing cost:

$$-F = Z_B R'_{N_B}(n_B, N_B) - W_B + \frac{1}{1+r} E(J_{t+1}) \tag{2}$$

where W is the cost of each permanent worker (the wage rate plus taxes and contributions), J is the intertemporal value of the job, and r is the discount rate of future cash flows. In the following period the firm will be in the bad state (where the value of the job will be $-F$), with probability $1-p$, and in the good state (where the value of the job will be zero, as we will see below), with probability p, so that: $E(J_{t+1}) = -(1-p)F$.

Each firm that has experienced a positive shock will hire workers until their expected marginal revenue is zero:

$$0 = Z_G R'_{N_G}(n_G, N_G) - W_G + \frac{1}{1+r} E(J_{t+1}) \tag{3}$$

In this case, the expected value of a job is $E(J_{t+1}) = -pF$.

Substituting $E(J_{t+1})$ in both expressions, we obtain the optimal level of employment in each state:

$$Z_B R'_{N_B}(n_B, N_B) = W_B - \frac{r+p}{1+r} F \tag{4}$$

$$Z_G R'_{N_G}(n_G, N_G) = W_G + \frac{p}{1+r} F \tag{5}$$

[2] As will be clarified later, the parameter Z may as well be considered a demand shock.

[3] The usual condition on total revenue function applies: R'_n, $R'_N > 0$, R''_n, $R''_N \leq 0$; $R(0,0) = 0$

The intuition behind these results is that the existence of firing costs reduces labour costs in bad states and raises them in good states.

In order to derive analytical expressions for the level of temporary and permanent employment in both states of the world, we must assume an analytical specification for the total revenue function. In other words, we must make assumptions about the productivity of each worker type and about the degree of substitution between them.

A short term employee has no experience of the firm, whereas a permanent employee does. It is reasonable to assume that the former has a lower productivity level than the latter[4]. Regarding the degree of substitution between the two categories of workers, the few papers that have analysed this problem[5] assume a constant marginal rate of substitution, i.e. an infinite elasticity of substitution. In our model we prefer to suppose that, although the two categories of workers are close substitutes, they are not perfect ones. The basis of this assumption is the temporary employee's need for workplace training. The productivity of a temporary worker under training will depend on the number of experienced workers that can help him/her to acquire firm specific knowledge and skills. Therefore the productivity level of a temporary employee will depend on the ratio between permanent workers (those with knowledge of firm's technological characteristics) and the temporary ones.

Summarising the above, we assume:

(i) lower productivity of temporary workers with respect to permanent ones';

(ii) a positive relation between the productivity of temporary workers and the ratio of permanent to temporary workers;

(iii) a degree of substitution between the two categories of employees that is much greater than one.

These assumptions suggest the CES specification as a natural candidate for the production function in the model[6].

Let us suppose an imperfect competitive product market, in which $y = p^{-\eta}$, where y is product demand, p product prices and η the elasticity of demand. Total revenue R is given by : $R = y^{1-\frac{1}{\eta}}$. If we set $\gamma \equiv 1 - \frac{1}{\eta}$, we have $R = y^{\gamma}$. Hence, assuming a CES specification for y, we can write:

$$R(n_s, N_s) = Z_s \left[a n_s^{\rho} + (1-a) N_s^{\rho}\right]^{\frac{\gamma}{\rho}} \qquad for \quad s = G, B \tag{6}$$

where $\rho = \frac{\sigma - 1}{\sigma}$ with $\sigma \gg 1$ the elasticity of substitution between the two categories of workers[7] and $a < \frac{1}{2}$.

[4]This is a standard assumption in the literature. See Blanchard and Landier (2001) and Arulampalam and Booth (1998) for a discussion of this point.

[5]See Saint Paul (1996).

[6]This is the same specification used by Cappariello (2000). The drawback to the CES function is that when the number of temporary workers tends to zero, the marginal rate of substitution is greater than one, as if each temporary worker could be replaced by more than one permanent worker. Our results are therefore less reliable when the number of temporary employees is almost zero. This is however a marginal case given the object of the analysis.

[7]It should now be clear that Z_s can be equally interpreted as a productivity shock or a demand shock. In fact, we could have supposed a demand function: $y_s = \left(\frac{p}{Z_s}\right)^{-\eta}$, obtaining the same results of equation 6.

2.2 The Employment Level

We can summarise equations 4 and 5 by writing:

$$Z_s R'_{N_s}(n_s, N_s) = W_s + x_s F \qquad for \quad s = G, B \tag{7}$$

where $x_s = x_B = -\frac{r+p}{1+r} < 0$ if we are in the bad states and $x_s = x_G = \frac{p}{1+r} > 0$ if we are in the good ones.

In order to simplify the analysis, we suppose the temporary workers' wage, w, hiring costs H and firing costs F to be a proportion of permanent workers' wage W. Analytically, we assume that $w_s + H = \mu W_s$ and $F_s = \phi W_s$. This implies that a reduction in μ describes a more efficient placement system or a reduction in the entry wage, while a lower ϕ indicates greater flexibility in employment protection legislation.

In order to determine the optimal level of employment we must calculate the marginal revenues of the two labour factors from equation 6 ($R'_{N_s}(N_s, n_s)$ and $R'_{n_s}(N_s, n_s)$) and substitute them in equations 1 and 7, obtaining the usual first order conditions:

$$Z_s \frac{R(n_s, N_s)}{a n_s^\rho + (1-a) N_s^\rho} (1-a) N^{\rho-1} = (1 + x_s \phi) W \qquad for \quad s = G, B$$

$$Z_s \frac{R(n_s, N_s)}{a n_s^\rho + (1-a) N_s^\rho} a n^{\rho-1} = \mu W \qquad for \quad s = G, B$$

Combining these two conditions, we easily determine the ratio of short term to permanent contracts ($\lambda_s = \frac{n_s}{N_s} \quad for \;\; s = G, B$) as a function of the ratio of their relative cost ($X_s(\mu, \phi)$), and their relative productivity (A):

$$\lambda_s = \left(\frac{X_s(\mu, \phi)}{A} \right)^{\frac{1}{1-\rho}} \qquad for \quad s = G, B \tag{8}$$

where:

$$X_s(\mu, \phi) \equiv \frac{1 + x_s \phi}{\mu} = \frac{W_s + x_s F}{w_s + H} \qquad for \quad s = G, B \tag{9}$$

with $A = \frac{1-a}{a}$ and $\frac{dX_G}{d\phi} > 0$, $\frac{dX_B}{d\phi} < 0$, $\frac{dX_s}{d\mu} < 0 \; \forall s$.

Given that $X_G > X_B$, the ratio of temporary to permanent employment is, as expected, higher in good states.

The optimal level of temporary employment is:

$$n_s = \left(\frac{\gamma Z_s a^{\frac{\gamma}{\rho}}}{\mu W_s} \right)^{\frac{1}{1-\gamma}} \left[\frac{1}{\left(\frac{A}{[X_s(\mu,\phi)]^\rho} \right)^{\frac{1}{1-\rho}} + 1} \right]^{\frac{\rho-\gamma}{\rho(1-\gamma)}} \qquad for \; s = G, B \tag{10}$$

and the optimal level of permanent employment is:

$$N_s = \left(\frac{\gamma Z_s (1-a)^{\frac{\gamma}{\rho}}}{(1 + x_s \phi) W_s} \right)^{\frac{1}{1-\gamma}} \left[\frac{1}{\left(\frac{A}{[X_s(\mu,\phi)]^\rho} \right)^{\frac{-1}{1-\rho}} + 1} \right]^{\frac{\rho-\gamma}{\rho(1-\gamma)}} \qquad for \; s = G, B \quad . \tag{11}$$

The two equations are composed of a first element which is traditional in the sense that it shows a negative relationship between employment and the wage and a positive relationship between

employment, productivity and the shock level. The second element describes the effect of the costs of both factors on each input.

We may now calculate the effect of firing costs (ϕ) and the relative cost of temporary workers (μ) on permanent and temporary employment levels in both states of the economy, defined in equations 10 and 11. These results depend on the difference between ρ and γ. Our theoretical framework implies[8] that $\rho > \gamma$. Therefore, it follows that:

Remark 1 *An increase in firing costs induces temporary employment to increase in good states and to decrease in bad states. Permanent employment is reduced in good states, whereas it is increased in bad states. It follows that the ratio of temporary to permanent employment is increased in good states and is decreased in bad states.*

Proof 1 *From equations 10 and 11 it follows that:* $\frac{\partial n_s}{\partial X_s} > 0$ *and* $\frac{\partial N_s}{\partial X_s} < 0$*; given the sign of the relationship between* $X_s(\mu, \phi)$ *and* ϕ *(see equation 9), we then obtain:*

$$\frac{\partial n_G}{\partial \phi} > 0 \qquad \frac{\partial n_B}{\partial \phi} < 0 \qquad \frac{\partial N_G}{\partial \phi} < 0 \qquad \frac{\partial N_B}{\partial \phi} > 0 \quad .$$

Furthermore we find, perhaps not surprisingly, that :

Remark 2 *When the relative cost of temporary employment with respect to permanent employment is increased, temporary employment falls in both states of the world while permanent employment rises.*

Proof 2 *Differentiating equations 10 and 11 with respect to* μ*, considering that* $\frac{\partial X_s(\mu,\phi)}{\partial \mu} < 0$*, we obtain:*

$$\frac{\partial n_s}{\partial \mu} < 0 \qquad \frac{\partial N_s}{\partial \mu} > 0 \qquad for \qquad s = G, B \quad .$$

Although the sign of these derivatives is well defined, the relationship between firm's total employment $L_s = N_s + n_s$ and the above parameters is not. In fact, given that permanent and temporary employment always move in opposite directions, the sign of the relationship between total employment, firing costs and the relative cost of temporary contracts depends on all parameters of the model and is ambiguous. As a consequence, the effect of employment regulations on the aggregate employment level at each moment in time is also ambiguous. The same result of ambiguity applies to the relationship between employment protection and average permanent and temporary employment, equal respectively to $N = \frac{N_G + N_B}{2}$ and $n = \frac{n_G + n_B}{2}$.

Because we consider two different categories of workers, instead of the permanent one alone, we obtain a different result from that generated by traditional models of employment determination with turnover costs (see Bentolila and Bertola (1990)). Regarding permanent employment, we derive similar conclusions to those resulting from these models: higher firing costs reduce the variability of permanent employment and they may reduce or raise the average employment level. However, our model predicts that the number of temporary contracts will increase with adjustment costs in good states and decrease in bad states. Hence, our theoretical framework does not imply that higher flexibility increases total employment variability.

[8] $\rho > \gamma$ implies: $1 - \frac{1}{\sigma} > 1 - \frac{1}{\eta}$, where σ is the elasticity of substitution between the two types of workers and η the absolute value of product demand elasticity. This implies $\sigma > \eta$. If the product market is characterized by a certain degree of monopolistic power the condition is respected, since we supposed a strong substitution between the two categories of workers.

2.3 The Regulation of Temporary Contracts

In the previous section we defined the analytical expressions for the optimal values of employment in good and bad states. In this section we assume that temporary contracts are regulated by specific rules. In fact, we suppose that there exists a limit, fixed by employment regulation legislation, on the use of short-time employment. This limit is measured by a threshold $\overline{\lambda}$ on the ratio of temporary contracts to permanent ones λ.

If the constraint is binding, with $n_s = \overline{\lambda} N_s$, the production function is:

$$R(n_s, N_s) = Z_s \left[a\overline{\lambda}^{\rho} + (1-a) \right]^{\frac{\gamma}{\rho}} N_s^{\gamma} \quad . \tag{12}$$

From this relation we can calculate the marginal revenue of permanent workers and equalize it to their marginal cost[9], obtaining respectively the "constrained" permanent employment level: $\widetilde{N}_s$:

$$\widetilde{N}_s = \left[\gamma Z_s a^{\frac{\gamma}{\rho}} \frac{\left(\overline{\lambda}^{\rho} + A\right)^{\frac{\gamma}{\rho}}}{\left(X_s(\mu,\phi) + \overline{\lambda}\right) \mu W_s} \right]^{\frac{1}{1-\gamma}} \quad ; \tag{13}$$

the "constrained" temporary employment level $\widetilde{n}_s$:

$$\widetilde{n}_s = \overline{\lambda} \widetilde{N}_s \quad ; \tag{14}$$

and the "constrained" total employment $\widetilde{L}_s$:

$$\widetilde{L}_s = (1 + \overline{\lambda}) \widetilde{N}_s \quad . \tag{15}$$

The above equations imply that:

Remark 3 *If the constraint on temporary employment is binding, lower firing costs will raise both permanent and temporary employment in good states. On the other hand, employment will be reduced in bad states.*

Proof 3 *In good states we have that* $\frac{dX}{d\phi} > 0$*, whereas in bad states* $\frac{dX}{d\phi} < 0$ *(from equation 9)). Given that both permanent and temporary employment are decreasing in* X_s *(see equations 13 and 14) the following relationships between employment and firing costs hold:*

$$\frac{dN_G}{d\phi} < 0 \qquad \frac{dn_G}{d\phi} < 0 \qquad \frac{dL_G}{d\phi} < 0 \qquad \frac{dN_B}{d\phi} > 0 \qquad \frac{dn_B}{d\phi} > 0 \qquad \frac{dL_G}{d\phi} > 0$$

Remark 4 *If the constraint on temporary employment is binding, a reduction in the relative cost of temporary workers raises both permanent and temporary employment in both states.*

Proof 4 *From equation 13, we easily obtain that*

$$sign(\frac{d\widetilde{N_s}}{d\mu}) = -sign(\frac{dX_s}{d\mu}\mu + X + \overline{\lambda}) \quad .$$

[9]The total cost is defined by $TC_s = W_s(1 + x_s\phi)N_s + (w_s + H)n_s$, with $w_s + H = \mu_s W_s$ and, given that the constraint is binding, $n_s = \overline{\lambda} N_s$. Differentiating with respect to N_s, we obtain that the marginal cost of labour is $MC_s = (1 + x_s\phi + \mu\overline{\lambda})W_s = (X_s + \overline{\lambda})\mu W_s$.

From equation 9 we can calculate $\frac{dX_s}{d\mu} = -\frac{X}{\mu}$ *and substituting this result in the equation above we obtain that* $sign(\frac{d\widetilde{N}}{d\mu}) = -sign(\overline{\lambda})$*. Permanent employment is always decreasing in the relative cost of temporary workers. Given equation 14, temporary employment is decreasing in* μ *and so is total employment. Therefore:*

$$\frac{dN_s}{d\mu} < 0 \qquad \frac{dn_s}{d\mu} < 0 \qquad \frac{dL_s}{d\mu} < 0 \qquad for \quad s = G, B \quad .$$

If the constraint on short-term contracts is binding, a reduction in the cost of temporary employees will increase both kinds of employment in both states of the world. A reduction in firing costs will increase both temporary and permanent employment in good states whereas it will decrease them in bad states.

Let us now analyse the employment effects of a reduction in the constraints on temporary labour. The main results may be summarized as follows.

Remark 5 *When the constraints on temporary contracts are relaxed, temporary employment increases in both states of the world and permanent employment decreases in both states of the world (unless the constraint* $\overline{\lambda}$ *is set at a very unrealistic low level). Total employment usually grows but, depending on the relative cost of temporary workers, it may decrease when the binding constraint is set at an high level, near the one that the firm would have chosen in a free market.*

Proof 5 *See appendix A.*

Consequently, a liberalisation of temporary employment tends to raise total employment, but if it is exceeding a certain threshold and if temporary workers cost more than permanent ones, it may reduce total employment.

This conclusion implies that a total employment maximizing constraint on temporary labour may exist. Furthermore, given that the relative cost of temporary workers is higher in bad states (so that $X_B < X_G$), the reduction in total employment is more likely to happen in bad states of the economy.

2.4 A Synthesis

More flexible labour markets can mean many things. We analyse the employment effects of:

- an increase in the relative cost of temporary workers with respect to permanent ones (μ); this can be obtained both through a reduction in entry wages and greater efficiency of the placement system;
- an increase in severance payments (ϕ);
- a liberalisation of temporary contracts ($\overline{\lambda}$).

The main results of our theoretical analysis are presented in Table 1, where we summarize the sign of derivatives of variables, listed by row, with respect to parameters, listed by column[10]. We distinguish the cases in which the limit on temporary contracts usage is not binding (columns, a and c) from the case in which this limit is stringent (columns b and d).

[10]Note that the results of columns 2 and 4 are valid under the hypothesis of a degree of substitution between temporary and permanent workers higher that the elasticity of product demand. Given the assumptions of our theoretical framework, this condition is respected (see note 8) .

Variation of:	Temporary workers cost		Firing costs		Constraints on temporary Contracts
	$\lambda_s < \overline{\lambda}$	$\lambda_s > \overline{\lambda}$	$\lambda_s < \overline{\lambda}$	$\lambda_s > \overline{\lambda}$	
	(a)	(b)	(c)	(d)	(e)
Effects on:	$d\mu > 0$	$\mathrm{d}\mu > 0$	$d\phi > 0$	$d\phi > 0$	$\mathrm{d}\overline{\lambda} > 0$
N_G	+	-	-	-	-
N_B	+	-	+	+	-
n_G	-	-	+	-	+
n_B	-	-	-	+	+
L_G	?-	-	?-	-	?+
L_B	?-	-	?+	+	?+
λ_G	-		+		+
λ_B	-		-		+
Where (?+) indicates that the sign of the derivative is not analitically determined but it is positive for realistic parameters values.					

Table 1: Employment effects of different forms of labour market flexibility

Let us look at the effects of an increase in the cost of temporary workers when the constraints on the use of temporary labour is not binding (column a). When the relative temporary labour cost is higher, permanent employment increases while temporary employment decreases. Not surprisingly, the optimal share of temporary contracts λ also decreases. The sign of the change in total employment (L_s) is ambiguous and depends on all the parameters in the model.

If the constraint on temporary contracts is binding (column b), an increase in the cost of temporary workers reduces both types of employment in both states.

An increase in firing costs when the constraint is not binding (column c) induces a reduction (rise) in permanent employment in good (bad) states and temporary employment in bad (good) states. The optimal share of temporary employment is positively correlated with firing costs in good states. Again, the sign of the variation in total employment is ambiguous.

If the constraint is binding (column d), a reduction of firing costs raises both types of employment in good states.

When the regulations on temporary contracts are relaxed (column e) permanent employment is likely to decrease in good states where the effects on temporary workers are always positive. For what concerns total employment, a negative effect is likely to prevail, at least in bad states.

How well does our model explain the effect of the institutional evolution of European labour markets in recent decades? To what extent can the dynamics of temporary and permanent employment be imputed to changes in short term contract regulations and the legal protection of insiders? Can empirical analysis tell us more about the cases for which our model has ambiguous results? The next section seeks to answer these questions. The first two parts concentrate on a descriptive account of the figures on temporary work and regulations in Europe. The third part presents our estimation results. The last part deals with specification and diagnostic testing.

3 The Empirical Analysis

3.1 Some Figures on Temporary Work in Europe

The temporary content of actual employment has risen in the twelve major European countries[11] from around 7.5% in 1985 to 10.5% in 1990, to almost 13% in 1999 (source: Eurostat). This means that the ratio has almost doubled in the last fifteen years. In other words temporary employment increased rapidly in the second half of the eighties and it remained stable until the mid nineties, when it started to grow again.

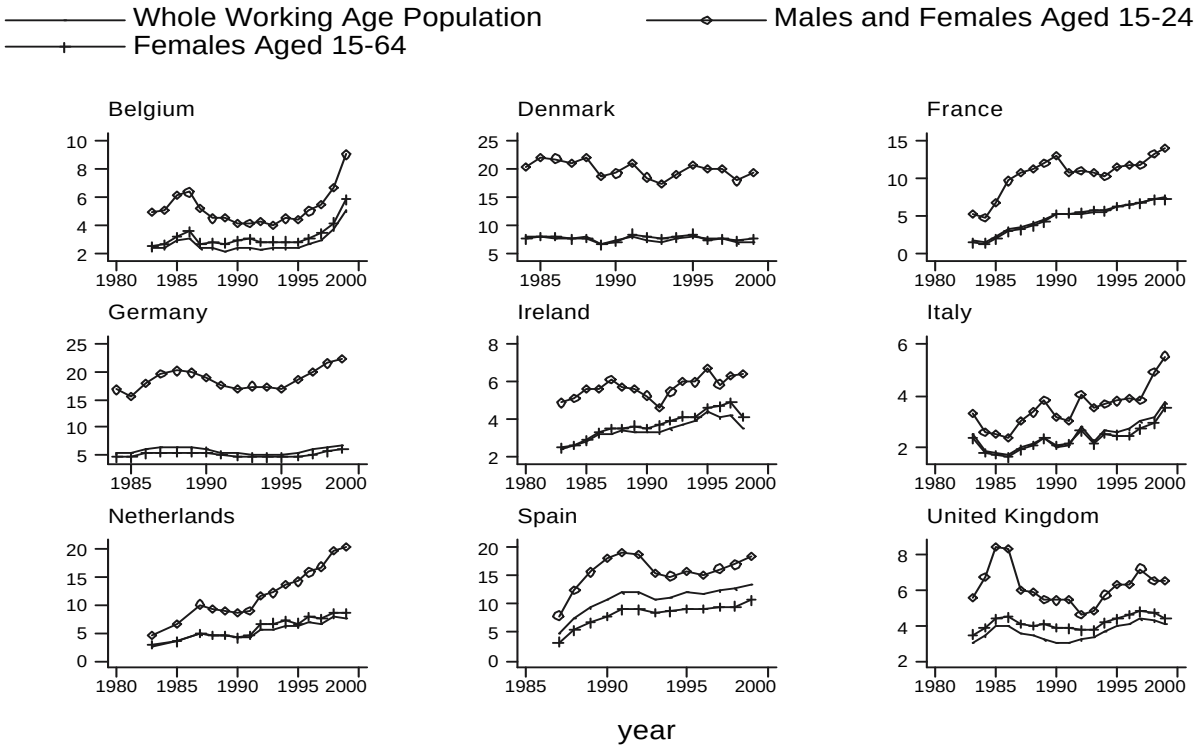

Figure 1: The percentage of temporary employment over working age population in Europe (different categories): 1983-1999

If we take a closer look at the situation of each country in the sample[12] we find that the temporary employment patterns are not homogeneous across Europe. Figure 1 shows the time pattern of temporary employment over working age population for each country from 1983 to 1999, calculated over different categories of employees[13]. It is quite clear that temporary employment is proportionally higher among young workers in all countries, while the difference between males and females does not appear to be marked except perhaps for Spain and the UK. The actual proportion of temporary employees is diverse across Europe. Countries such as Denmark, Germany, Netherlands and Spain are characterised by a higher temporary employment population ratio, with

[11] We consider West Germany only.

[12] We concentrate here on the nine major European countries, for which long series on temporary and permanent employment are available from Eurostat.

[13] Note that no information about temporary employment population ratios for young and female workers is available for Ireland.

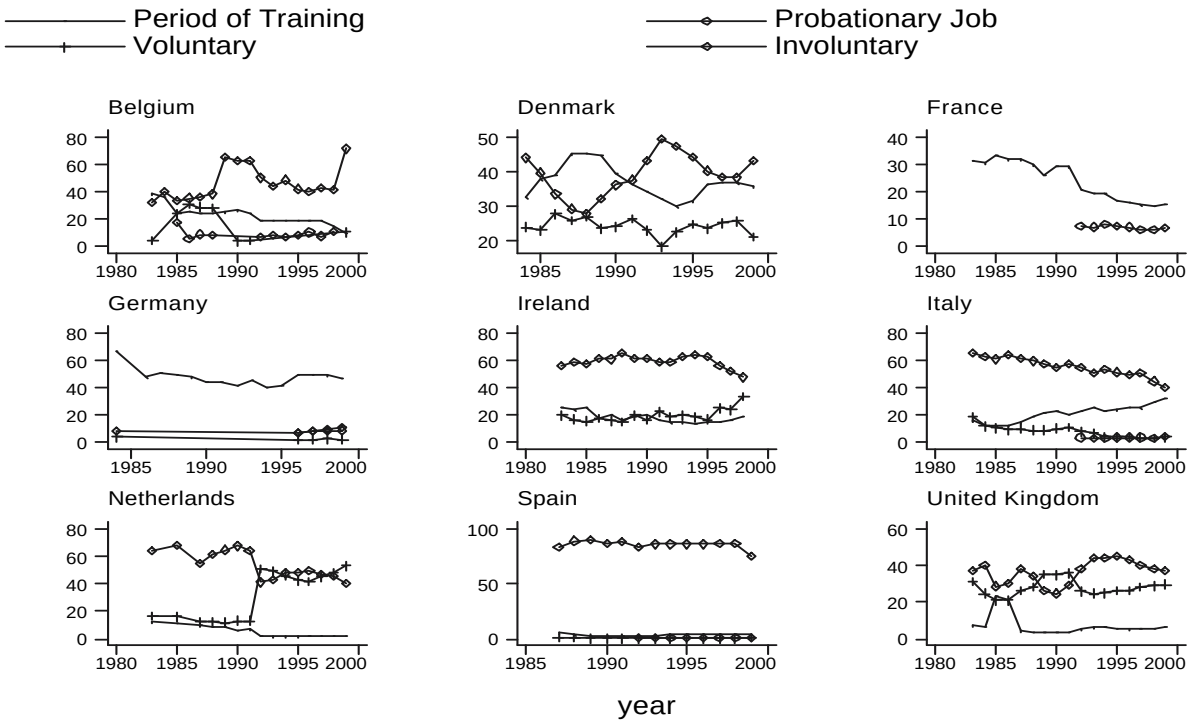

Figure 2: Voluntarity of temporary work in Europe:percentage of voluntary and involuntary temporary employees

an average magnitude of around 1/5 of the total workforce. By contrast, Ireland, Italy and the UK display a much lower percentage of temporary employment, although it has increased in recent years. Finally, countries as Belgium and France can be considered as intermediate between the two groups defined above.

As to the reasons for undertaking temporary employment, Figure 2 shows the percentage of Eurostat Labour Force Survey respondents that cited either training contents, a probationary period, the impossibility of finding a permanent job or unwillingness to do so, as the main reason for entering a temporary job. The figure shows clearly that in most of the countries the majority of temporary contracts have been accepted because of the impossibility of finding a permanent job. In three countries, however, Ireland, Netherlands and the UK, the 1999 figures on voluntary and involuntary temporary employee percentages are of the same magnitude. This could indicate a shift in employees' preferences against permanent forms of employment, especially in the first two countries. Spain has an overwhelming majority of temporary employees unable to find permanent jobs, while the training content of temporary work is particularly important in Germany, Italy and Denmark. Nothing can be said about France, where the percentage of non respondents to the question is particularly high.

3.2 The Institutional Characteristics of Employment Regulations

We concentrate on three types of employment regulations. The first is employment protection legislation (EP) which governs the procedures for firing permanent employees. In other words,

these rules determine the level of what was called firing costs ϕ in our theoretical model. The second form is represented by fixed term contract regulations (FTC). These are the rules that govern the hiring of temporary labour for a fixed term stated by law. On expiry of the term, the firm decides whether the employee stays within the firm or leaves. The last type is represented by temporary work agencies regulations (TWA). This form of legislation governs the hiring of temporary employees, usually employed on specific and time limited operations, from the agencies' placing system. It is worth noting that both FTC and TWA contribute to determine the cost of temporary employees μ in our model. However, distinguishing between the two dimensions proves useful at an empirical level in order to obtain a clearer picture of the employment impact of temporary labour regulations. We may consider the constraint on temporary contracts $\bar{\lambda}$ as an approximation of the role played by FTC.

A set of institutional indicators on the various dimensions of employment regulations have been made available by OECD and other researchers. Table 2 summarizes the values of these indicators for the nine European countries included in our sample. The indicators for FTC and TW are provided by Belot and van Ours (2000), except for the values for Spain, which were constructed by the authors using the same criteria. The indicator for EP is constructed using the series provided by Blanchard and Wolfers (2000) and OECD (1994, 1999)[14]. Increasing values of each indicator indicate stricter regulations. All indicators have been normalized in order to have the same range $\{0, 3\}$.

The table shows some selected indicator values for each country calculated at fixed intervals from 1983 to 1995 and the change in regulations over each period. It results clear that in recent decades there has been a general tendency towards the relaxation of the constraints on the three dimensions of employment regulation in Europe. However the picture is still differentiated, with some countries exhibiting marked rigidities in employment regulations and other countries characterised by high levels of flexibility.

Table 3 shows the percentage changes in summary statistics of the institutional indicators in Europe over the period 1983-1995. Fixed term contracts and temporary work agencies regulations have been characterised by a flexibilization process of the same magnitude, as can be seen from the changes in indicators'means. However the standard deviation of fixed term contract regulations has increased due to legislation changes in opposite directions in some countries, while the homogeneity of temporary work agency regulations has remained stable. Insiders protection has also decreased in Europe, showing a slow process of convergence on more flexible levels.

To summarise what has just been said about short term employment and regulations, in recent decades Europe has undergone a process of institutional change that has had a significant impact on the composition of European employment. The result is that the percentage of temporary employment has risen significantly. Are these changes set to constitute the future scenario for European employment? More importantly, have these institutional reforms been beneficial for European labour markets, or have they merely increased the percentage of insecure jobs? Needed to supplement these merely descriptive figures is a more sophisticated analysis that attempts to answer these questions. This is the subject of next section.

3.3 A Fixed Effect Estimate of the Impact of Employment Regulations on Temporary Work in Europe

The aim of this section is to investigate the role played by labour market institutions in shaping the figures of permanent and temporary employment in Europe in recent decades. We consider

[14] A full description of the criteria used to construct each indicator is provided in Appendix C.

Country	Year	FTC[a,d]	ΔFTC	TWA[b,d]	ΔTWA	EP[c,d]	ΔEP
Belgium	83	2.4	.	2	.	2.32	.
	87	1.8	-0.6	2	0	2.32	0
	91	1.8	0	2	0	2.06	-0.27
	95	1.05	-0.75	2	0	1.79	-0.27 -
Denmark	83	0	.	2	.	1.65	.
	87	0	0	2	0	1.65	0
	91	0	0	0	-2	1.38	-0.27
	95	0	0	0	0	1.11	-0.27
France	83	2.4	.	1.5	.	1.95	.
	87	0.6	-1.8	0.5	-1	1.95	
	91	1.5	0.9	1.5	1	2.1	0.15
	95	1.5	0	1.5	0	2.25	0.15
Germany	83	3	.	1.5	.	2.47	.
	87	1.95	-1.05	1.38	-0.12	2.47	0
	91	1.8	-0.15	1.38	0	2.3	-0.18
	95	1.65	-0.15	1.38	0	2.12	-0.18
Ireland	83	0	.	0	.	0.75	.
	87	0	0	0	0	0.75	0
	91	0	0	0	0	0.78	0.03
	95	0	0	0	0	0.81	0.03
Italy	83	2.4	.	3	.	3	.
	87	1.65	-0.75	3	0	3	0
	91	1.65	0	3	0	2.88	-0.12
	95	1.65	0	3	0	2.67	-0.21
Netherl.	83	0.6	.	1.5	.	2.03	.
	87	0.6	0	1.38	-0.12	2.03	0
	91	0.6	0	1.38	0	1.93	-0.09
	95	0.45	-0.15	1.38	0	1.85	-0.09
Spain	83	0.6	.	3	.	2.85	.
	87	0.6	0	3	0	2.85	0
	91	0.6	0	3	0	2.64	-0.21
	95	1.8	1.2	1.5	-1.5	2.43	-0.21
U. K.	83	0.6	.	0.13	.	0.52	.
	87	0.6	0	0.13	0	0.52	0
	91	0.6	0	0.13	0	0.52	0
	95	0.6	0	0.13	0	0.52	0

[a]FTC: index of strictness in Fixed Term Contracts regulation {0-3}, original data from Belot and van Ours (2000) updated for Spain by the authors.

[b]WTA: index of strictness in Temporary Work Agencies regulation {0-3}, original data from Belot and van Ours (2000).

[c]EP: index of strictness in Firing Costs {0-3}, original data from Blanchard and Wolfers (2000) and OECD (1994, 1999).

[d]Increasing values indicate stricter regulations.

Table 2: The regulation of fixed term contracts, temporary work agencies and employment protection in Europe: 1983-1995

	FTC	TWA	EP
Percentage change in standard deviation	+39%	−5%	−13%
Percentage change in mean	−28%	−26%	−11%

Table 3: Employment regulation in Europe: percentage changes in summary statistics over the period 1983-1995

an unbalanced panel of nine European countries, namely Belgium, Denmark, France, Germany, Ireland, Italy, Netherlands, Spain and United Kingdom, observed at most from 1983 to 1995. The data on temporary and permanent employment are provided by Eurostat Labour Force Survey, while the data on institutions are those described above, plus a set of additional indicators provided by Nickell and Nunziata (2001)[15].

The starting point for the empirical analysis is the theoretical model depicted above, which can be summarised in two synthetic equations. As regards temporary employment we have that:

$$n_t = n(\underset{+}{Z_t},\ \underset{-?}{W(\cdot)},\ \underset{-}{\mu},\ \underset{-}{h_t},\ \underset{-?}{\phi_t},\ \underset{+}{\overline{\lambda}_t},\ \underset{+}{Z_t\phi_t},\ \underset{-}{Z_t\lambda_t}) \tag{16}$$

Temporary employment is increasing in the shock level, the threshold on the ratio of temporary to permanent contracts, and the product between the shock and firing costs. It is decreasing in the cost of labour, the relative cost of temporary employment, hiring and firing costs and the interaction between the shock and the threshold $\bar{\lambda}$.

As regards the level of permanent employment, we have that:

$$N_t = N(\underset{+}{Z_t},\ \underset{-}{W(\cdot)},\ \underset{+}{\mu},\ \underset{-}{h_t},\ \underset{+?}{\phi_t},\ \underset{-}{\overline{\lambda}_t},\ \underset{-}{Z_t\phi_t},\ \underset{+}{h_t\lambda_t}) \tag{17}$$

Permanent employment is increasing in the shock level, the relative cost of temporary employment, firing costs, and the product between hiring costs and temporary workers adoption. It is decreasing in the cost of labour (and therefore in wage pressure variables), hiring costs, the constraint on temporary labour usage, and the interaction between the shock level and firing costs.

Our econometric specification follows the framework suggested by Nickell et al. (2001) and Nunziata (2001), i.e. we include the regressors suggested by the theoretical model as well as a set of controls for wage pressure institutions. These are the tax wedge, the degree of coordination in wage bargaining, union density, and unemployment benefit replacement rate and duration[16].

Rewriting equations 16 and 17 in linear form, allowing for a partial adjustment specification, we obtain the following model:

$$y_{it} = \beta_0 + \beta_1 y_{it-1} + \gamma_1' \mathbf{z_1} + \gamma_2' \mathbf{z_2} + \lambda' \mathbf{h} + \theta' \mathbf{x} + \phi_i t_i + \mu_i + v_t + \varepsilon_{it} \tag{18}$$

where $y_{it} = n_{it}, N_{it}$ is the employment population ratio, (temporary or permanent), $\mathbf{z_1}$ is a vector of employment regulating institutions $\mathbf{z_2}$ is a vector of wage pressure institutions, $\mathbf{h}$ is a vector of interactions among institutions, $\mathbf{x}$ is a vector of controls for macroeconomic shocks, t_i is a country specific time trend, μ_i is a fixed country effect, v_t is a year dummy, and ε_{it} is the stochastic error.

The vector of employment regulations is composed of the three dimensions discussed above:

$$\gamma_1' \mathbf{z_1} = \gamma_1 FTC_{it} + \gamma_2 TWA_{it} + \gamma_3 EP_{it} \tag{19}$$

[15] See Nickell and Nunziata (2001) for a complete account of data definitions and construction methods.

[16] For a full description of each institution, with definitions and data sources see Nickell et al. (2001) and Nickell and Nunziata (2001).

where FTC_{it} is fixed term contract legislation, TWA_{it} is temporary work agencies regulation and EP_{it} is permanent employment protection. The vector of wage pressure institutions contains a set of regulations assumed to affect the employment population ratio through labour market adjustments[17]. These are the unemployment benefit replacement rate BRR_{it} , the unemployment benefit duration BD_{it}, the net union density UD_{it} , the level of bargaining coordination CO_{it} and the tax wedge TW_{it} . Moreover, we include a set of interactions among institutions to take account of possible complementarity effects. The vector of institutional interactions takes the following form (with obvious notation):

$$\lambda'\mathbf{h} = \lambda_1 EPCO_{it} + \lambda_2 BRRBD_{it} + \lambda_3 UDCO_{it} + \lambda_4 TWCO_{it} \tag{20}$$

where each interaction is calculated as the product of deviations from each variable's world average, in order to read the coefficient of each institution in level as the coefficient of the average country. Finally, the vector of macroeconomic shock controls contains the following elements:

$$\theta'\mathbf{x} = \theta_1 LDS_{it} + \theta_2 TFPS_{it} + \theta_3 AMS_{it} + \theta_4 RIRL_{it} + \theta_5 TTS_{it} \tag{21}$$

where LDS_{it} is a labour demand shock, $TFPS_{it}$ is a total factor productivity shock, AMS_{it} is money supply shock, $RIRL_{it}$ is long term interest rate, and TTS_{it} terms of trade shock.

The definition of each mean zero shock is the following: the labour demand shock consists of the residuals of the labour demand model estimated by Nickell and Nunziata (2000)[18]; the total factor productivity shock is the HP cyclical component of TFP calculated for each country; the money supply shock is the acceleration in money supply; and the term of trade shock is defined as $(imp_{it}/GDP_{it})\,\Delta \ln(p_{imp}/p_{GDP})_{it}$, where imp is the level of nominal imports, GDP is GDP at market prices, p_{imp} is the imports deflator and p_{GDP} is the GDP deflator.

Following the theoretical implications of our model, the estimation analysis is constructed on the assumption that equilibrium employment population ratios depend on the institutional configuration of the labour market, where this relationship is also subject to macroeconomic conditions represented by the shocks. We are particularly interested in the impact of fixed term contracts, temporary work agencies regulation and permanent employment protection legislation on permament and temporary employment population ratios.

In this section we present the results of our empirical analysis, while the next section is more technical and contains a detailed account of diagnostic and specification tests. Tables 4, 5 and 6 present some estimation results using a fixed effect GLS estimator, correcting for by country heteroskedasticity and country specific first order autoregressive serial correlation. Each table presents the estimation results of the same six models applied to different data, i.e. employment population ratios calculated over different age and gender categories. Table 4 deals with total employment, Table 5 with female employment, and Table 6 with employees aged 15 to 24. The characteristics of each model are the following:

- Model A: permanent employment population ratio ($EPOPperm$) equation;
- Model B: temporary employment population ratio ($EPOPtemp$) equation;

[17] For a more detailed account of the role played by wage pressure institutions, see Nickell et al. (2001) and Nunziata (2001).

[18] There are at least two other ways of dealing with the labour demand shock. An alternative measure is represented by the residuals of the by country regressions of employment on its three lags, log real wage and log real output. Another strategy is to use the ratio of temporary (permanent) employment to the total as dependent variable, in order to control for shocks in labour demand. In both cases, the regression output using these alternative methodologies does not show any appreciable divergence from what is reported in this paper.

- Model C: temporary - permanent employment ratio (λ) equation;
- Model D: total employment population ratio ($EPOP$) equation;
- Model E: $EPOPperm$ equation including interactions with state dummy;
- Model F: $EPOPtemp$ equation including interactions with state dummy;
- Model G: $EPOP$ equation including interactions with state dummy.

Models A and B are therefore the simple estimations of equation 18 for the two cases of permanent and temporary employment. Model C is a regression of the ratio λ of the two workers types, while Model D estimates the effects of institutions on total employment population ratio, where $EPOP = EPOPperm + EPOPtemp$. Finally Model E, F and G are modifications of A, B and D respectively, where a dummy variable equal to 1 in contraction periods is interacted with the three employment regulation regressors in order to test the asymmetric implications of the model for good and bad states of the economy[19].

3.3.1 Table 4: Total Employment Population Ratios

Table 4 sets out the estimation results calculated for permanent and temporary employment over all age and gender categories. As regards the effect of employment protection EP (firing costs in section two) on permanent employment, it will be recalled that our model predicts that stricter regulations have a negative impact in good states and a positive impact in bad states (columns (c) and (d) of Table 1). The effect on permanent employment when averaged across states is therefore an empirical matter. Model 4.A shows clearly that stricter insider employment protection EP (firing costs in the model) has a highly significant positive impact on permanent employment. When EP is stricter, permanent jobs are more appealing and dismissals are more costly. The gain in $EPOPperm$ generated by the latter effect seems to predominate over the disincentive in hirings. Regarding the effect on temporary employment, the estimates confirm an effect of opposite sign, as predicted by the theoretical model. Moreover, we are again able to discriminate between the alternative theoretical scenarios depicted in Table 1, obtaining a significant negative coefficient of EP in the temporary employment equation.

These two results combined are reflected by the significant negative effect of stricter EP on λ: an increase in the protection of insiders will increase permanent employment while reducing temporary employment.

A very interesting result concerns the impact of fixed term contracts and temporary work agencies regulation. As we can see from the table, FTC has a weak effect on $EPOPtemp$, while TWA has a significant impact of expected sign on both $EPOPperm$ and $EPOPtemp$. This means that an increase in the strictness of temporary work agencies regulations reduces temporary employment while increasing permanent employment. This is a clear substitution effect, with firms adopting more permanent labour when the agencies' placement system is more strictly regulated.

Regarding the net effect of employment regulations on total employment ($EPOP$), it will be seen from column 4.D that there are weak signs of significance of FTC and EP, with respectively negative and positive coefficients (the $P - value$ is 0.14 in both cases). One notes, however, that the effect of EP on $EPOP$ is reinforced when bargaining coordination is high, as indicated by the coefficient of the interaction term.

[19]This dummy variable is calculated as equal to 1 when the by country cyclical component of Hodrick - Prescott filtered real GDP is lower than zero. It is zero otherwise. The filtration of the GDP data has been performed on country annual series from 1960 to 1995.

A useful exercise is to introduce interactions of the contraction dummy with the employment regulation regressors, in order to test for asymmetric effects in good and bad states of the economy. Following this procedure, the coefficient of each variable gives us the impact of the institution in good states only. The difference between the institution's coefficient and the interaction's coefficient instead provides the effect in bad states. Column 4.E yields insights into the way FTC constrains the adoption of temporary labour. The negative impact of FTC on temporary employment is actually only present in good states, with its coefficient almost equal to zero in bad states. This could explain the weak effect of FTC in columns 4.B and 4.D, and it provides useful insights into how fixed term contracts regulation works.

As regards TWA, the variable is not significant in the $EPOP$ model of Column 4.D. However, when the interaction of the state dummy is introduced, in columns 4.E, 4.F and 4.G, it becomes significant with expected sign in bad states. This result seems to indicate an asymmetric effect of TWA, with stricter regulations having a detrimental effect on temporary employment mainly in bad states.

If we combine the impact of FTC and TWA, we find that the predictions of the model in column (a) of Table 1 are confirmed. The interesting aspect is that FTC is significant in shaping the cost of temporary work in good states, while TWA is relevant in bad states. This could be related to the fact that when firms hire temporary labour they prefer to use fixed term contracts in good states when the business perspective is better, while in bad states, when the conversion of temporary employees into permanent ones is less likely to occur, they prefer agencies. Fixed term contracts in this sense could be considered a superior form of temporary employment, embedding higher chances of switching into a permanent contract and therefore preferred by firms during expansions. This implies that a strict regulation of fixed term contracts is only effective in good states, when firms' hirings are at their peak, while bad states are characterised by lower hiring rates, so that FTC is not relevant in shaping employment population ratios[20]. Both kinds of regulations have a significant negative impact on $EPOPtemp$ as well as on $EPOP$, with no particular effect on permanent employment. This finding therefore suggests that greater flexibility in temporary work agencies regulations tends to increase total employment during contractions, and higher flexibility in fixed term contracts tends to increase total employment during expansions, mainly through an increase of temporary employment in the two states, leaving permanent employment unaffected.

Regarding the other institutional regressors, we found a negative coefficient on benefit replacement ratios BRR. A negative coefficient of benefit duration BD is also present, with a significant effect on temporary employment and total employment only. The effect of the two benefit variables is reinforced by their interaction, which is significant and negatively signed in the same columns as BD. In other words, higher benefit replacement rates induce a reduction in employment population ratios, calculated for total, permanent and temporary employees, although the t-ratio is lower for the latter category. Moreover, higher benefit durations have a negative impact on total employment. This effect is greater the higher are the replacement rates, mainly through a reduction in temporary employment.

The tax wedge TW and coordination in the bargaining process CO have a respectively negative and positive significant impact on permanent and total employment only. This result is in line with what we would expect from these institutions. Coordination, in fact, mainly refers to the bargaining of permanent employees' wages. The tax wedge variable also primarily relates to permanent employees, given that it is calculated using total employers' contributions, wages, salaries and social security contributions, households' current receipts, and direct and indirect taxes.

[20]Using the symbols of the theoretical model, this result could imply that $\lambda_B < \bar{\lambda} < \lambda_G$, i.e. that the constraint on the adoption of temporary employees is only binding in good states.

Union density has an ambiguous impact on permanent and total employment, while we have clear signs of union aversion against temporary employment, at least over the time span covered by our data. The impact of coordination on temporary employment is present through the interaction term $UDCO$, with higher coordination reducing union aversion towards temporary employment.

Concerning the controls for macroeconomic shocks, the labour demand and terms of trade shocks have expected sign, but are significant only in the $EPOPperm$ and $EPOP$ models. Regarding $TFPS$, AMS and $RIRL$ the evidence is that they are all insignificant.

These latter findings, from those regarding unemployment benefits to those on macroeconomic controls, are coherent with the results of other analyses that use the same methodology, such as Nickell et al. (2001), where the same institutional data are used to estimate a set of regressions of unemployment and total employment population ratio on a sample of 20 OECD countries, observed from 1960 to 1995.

3.3.2 Table 5: Female Employment Population Ratios

If we compare Table 5 with Table 4 no substantial changes in the estimation results are apparent. The estimates are in line with what shown by Figure 1, i.e. with the fact that temporary employment population ratios display a similar pattern for total and female employees.

However, some comments are in order. Firstly, the effect of insider regulations EP seems to be more relevant with respect to Table 4. Stricter regulations are correlated with higher permanent female employment and lower temporary employment, with an ambiguous net effect on total employment. The effect of FTC and TWA is weaker, since there is no significant effect on total employment. On the other hand, we still have some detrimental effects on temporary employment, with confirmation of the asymmetric impact of FTC and TWA in different states of the economy.

It is interesting to note that union density has a significant impact on permanent female employment and a still negative impact on temporary employment, with an ambiguous net effect on the total. Moreover, coordination shows some signs of significance with a positive coefficient on temporary female employment as well, even if the effect is present in column 5.F only. Another striking result is that the labour demand shock is now significant on both permanent and temporary employees, suggesting that, while temporary male employment may be uncorrelated with the status of the labour market, female willingness to take up temporary jobs may instead be affected by it[21]. The money supply and total factor productivity shocks are now significant. Money supply acceleration has a positive impact on both permanent and total female employment, while TFP acceleration has a negative impact on permanent employment. This latter results is surprising since the acceleration in productivity should have a positive impact on employment in presence of sticky wages. However, it may be the case that the acceleration in productivity mainly affects prime age males, with a negative substitution effect on female employees.

3.3.3 Table 6: Young Employment Population Ratios

Table 6 presents the same seven models estimated on the employment population ratios of young workers aged 15 to 24. These estimates are particularly interesting, because temporary employment is concentrated mainly among young employees as shown by Figure 1.

[21] If we are ready to assume some kind of discrimination in the labour market between male and female employees, this finding may also be interpreted as an increase in temporary female hirings when the economy is subject to a positive labour demand shock and firms are short of labour. This explanation may well account for the higher EP coefficients in the case of female employment with respect to the total (M+F), meaning that less stringent protection legislation is in fact correlated with more female than male dismissals.

To be noted first is that the positive impact of employment protection on permanent employment is still present. We also find that the impact of EP on total young employees is positive in bad states of the economy. In other words, the employment protection nature of insider regulations is effective in reducing dismissals of young employees during bad states.

Focusing on the impact of fixed term contracts regulations FTC, we find that stricter FTC causes a reduction in young temporary employment, as expected. Moreover, this is associated with a reduction in young permanent employment as well. This piece of evidence confirms that, for young employees, temporary employment on fixed term contracts may be an effective means to obtain a permanent job[22]. It follows that less stringent regulations produce an increase in permanent as well as temporary young employment which is reflected in the increase of total young employment population ratios. The asymmetric impact of FTC in different states of the economy is confirmed, although the FTC coefficient is lower but still negative in bad states.

The temporary work agencies regulations' coefficient is also significant, with stricter TWA increasing young permanent employment while reducing young temporary employment. The net effect on young total employment is given by column 6.G, where higher TWA flexibility induces an increase in young total employment. Unlike in previous tables, the effect is still present in good states, but weaker. These results imply that, contrary to what was found for FTC, less stringent TWA have a positive impact on young total employment at the expense of young permanent employment. In other words, the role played by fixed term contracts in creating the conditions for young employees to switch to permanent jobs is doubtful with regard to TWA[23]. The implications of these two alternative ways of using short term contracts with young employees therefore seem to be different, and they should be investigated further at a micro level.

As regards the other institutional regressors, the output of Table 6 is not particularly dissimilar from that of previous tables. Perhaps the only points worth making are that union density is positively correlated with young permanent employment and negatively with young temporary employment, with an ambiguous net effect on the total. Coordination has a positive effect on both types of employment, similarly to that found for female employees, i.e. in column 6.F. The interaction term $UDCO$'s coefficient is also significant, which shows that higher coordination reduces union aversion towards temporary employment among the young.

3.4 Specification and Diagnostic Tests

3.4.1 Poolability Tests

The estimation of a pooled model may yield more efficient estimates at the expenses of biaseness. We performed a battery of tests based on weak mean square errors (MSE) criteria which do not test the falsity of the poolability hypothesis but permit one to choose between the constrained and the unconstrained estimator on a pragmatic basis, i.e. on the basis of the trade-off between bias and efficiency. We adopted the general version of the tests suggested by Baltagi (1995), under the general assumption $\mathbf{u} \backsim \mathbf{N}(\mathbf{0}, \mathbf{\Sigma})$, i.e. allowing heteroskedasticity and serial correlation across countries.

The tests were calculated for a simplified version of our model, because we needed enough degrees of freedom to estimate all the set of by country regressions. However we tested for poolability on alternative simplified specifications in order to check the robustness of these results. We present

[22] This result is in line with the previous findings of Booth et al. (2000).

[23] In this respect, Blanchard and Landier (2001), although they do not differentiate between these two types of regulations, provide an interesting analysis of the perverse implications of flexible temporary employment standards, with especial regard to France.

	A	B	C	D	E	F	G
	EPOPperm	EPOPtemp	λ	EPOP	EPOPperm	EPOPtemp	EPOP
LDV	0.747	0.791	0.744	0.728	0.714	0.792	0.76
	[12.59]	[10.86]	[10.98]	[11.09]	[11.61]	[13.10]	[11.41]
EP	5.399	-3.797	-9.769	3.921	4.645	-2.768	3.759
	[1.88]	[2.54]	[2.67]	[1.47]	[1.56]	[2.06]	[1.37]
FTC	-0.271	-0.035	0.008	-0.313	-0.214	-0.442	-0.59
	[1.14]	[0.25]	[0.02]	[1.45]	[0.80]	[2.96]	[2.40]
TWA	0.548	-0.356	-0.727	0.09	0.318	-0.075	0.257
	[2.87]	[2.52]	[2.40]	[0.46]	[1.05]	[0.43]	[1.05]
EP·BAD					-0.188	0.111	0.058
					[0.76]	[0.90]	[0.29]
FTC·BAD					0.036	0.522	0.437
					[0.15]	[4.40]	[1.96]
TWA·BAD					0.352	-0.637	-0.432
					[1.43]	[4.75]	[1.96]
BRR	-12.524	-2.776	-2.969	-14.302	-12.467	-3.354	-14.461
	[4.49]	[1.75]	[0.75]	[4.99]	[4.28]	[1.99]	[4.86]
BD	-0.083	-2.019	-3.891	-1.849	0.937	-3.565	-2.752
	[0.07]	[2.39]	[2.22]	[1.38]	[0.68]	[4.48]	[1.92]
UD	6.519	-17.435	-34.479	-0.711	0.941	-10.086	0.071
	[0.97]	[4.68]	[3.78]	[0.11]	[0.12]	[2.67]	[0.01]
CO	2.572	-0.522	-1.832	2.731	1.736	0.794	3.4
	[2.88]	[1.01]	[1.41]	[3.28]	[1.68]	[1.40]	[3.61]
TW	-12.074	0.588	3.836	-9.017	-10.092	-1.552	-10.975
	[3.01]	[0.20]	[0.57]	[1.86]	[2.40]	[0.57]	[2.24]
EPCO	1.898	-0.215	-1.04	3.78	1.638	1.384	4.717
	[1.08]	[0.22]	[0.43]	[2.36]	[0.93]	[1.53]	[2.92]
BRRBD	-3.94	-9.23	-17.572	-9.579	-4.69	-10.314	-11.005
	[0.95]	[4.02]	[3.33]	[2.41]	[1.07]	[4.65]	[2.59]
UDCO	5.173	11.537	18.851	15.662	7.667	10.034	18.657
	[0.58]	[2.53]	[1.68]	[2.06]	[0.84]	[2.29]	[2.31]
TWCO	3.156	4.062	7.919	-4.602	2.535	-0.398	-5.989
	[0.36]	[0.98]	[0.76]	[0.57]	[0.29]	[0.11]	[0.74]
LDS	27.973	0.401	-1.243	28.824	26.247	1.529	28.018
	[3.53]	[0.09]	[0.12]	[4.02]	[3.16]	[0.42]	[3.89]
TFPS	2.317	2.027	2.869	2.548	4.336	2.828	6.546
	[0.44]	[0.71]	[0.41]	[0.51]	[0.66]	[0.88]	[1.07]
AMS	0.528	-0.687	-1.781	-0.496	0.403	-0.116	0.163
	[0.48]	[0.99]	[1.07]	[0.42]	[0.32]	[0.19]	[0.13]
RIRL	6.298	2.562	3.976	-1.513	2.674	-1.588	-4.855
	[1.00]	[0.72]	[0.45]	[0.23]	[0.35]	[0.43]	[0.69]
TTS	-13.552	-2.682	-2.323	-15.023	-13.803	-1.962	-14.093
	[2.74]	[1.13]	[0.39]	[3.42]	[2.57]	[0.94]	[3.00]
Observations	98	98	98	98	98	98	98
Number of countries	9	9	9	9	9	9	9
Avg T	11.12	11.12	11.12	11.12	11.12	11.12	11.12
Wald Test coeff=0	3490636	141690.3	116534	4096579	3569457	206818.4	4340367
χ^2 d.o.f.	45	45	45	45	48	48	48
P-value	0	0	0	0	0	0	0
Wald Test f.e.=0	32.38	79.28	56.05	18.06	33.19	70.63	18.74
χ^2 d.o.f.	8	8	8	8	8	8	8
P-value	0	0	0	0	0	0	0
Absolute value of t statistics in brackets							

Table 4: GLS fixed effects estimates of the impact of employment regulations on total employment population ratios

	A	B	C	D	E	F	G
	EPOPperm	EPOPtemp	λ	EPOP	EPOPperm	EPOPtemp	EPOP
LDV	0.793	0.849	0.76	0.733	0.773	0.832	0.741
	[13.99]	[8.55]	[9.29]	[13.21]	[13.41]	[9.33]	[12.96]
EP	7.995	-2.869	-11.369	5.873	7.736	-2.638	5.558
	[2.66]	[1.79]	[2.12]	[2.27]	[2.52]	[1.77]	[2.02]
FTC	0.015	-0.158	-0.19	-0.063	0.246	-0.422	-0.122
	[0.06]	[1.16]	[0.39]	[0.33]	[0.90]	[2.81]	[0.54]
TWA	0.267	-0.326	-0.841	-0.218	-0.095	0.156	-0.015
	[1.39]	[2.10]	[2.19]	[1.32]	[0.32]	[0.83]	[0.07]
EP·BAD					-0.287	0.375	0.198
					[1.21]	[2.87]	[0.97]
FTC·BAD					-0.26	0.202	0.035
					[1.03]	[1.57]	[0.17]
TWA·BAD					0.501	-0.648	-0.261
					[2.14]	[4.66]	[1.31]
BRR	-10.304	-2.64	-0.67	-11.493	-9.014	-4.498	-12.354
	[4.05]	[1.48]	[0.12]	[4.56]	[3.38]	[2.48]	[4.46]
BD	-1.28	-2.4	-4.631	-2.685	-0.602	-3.377	-3.326
	[1.24]	[2.38]	[1.96]	[2.25]	[0.49]	[3.52]	[2.51]
UD	19.662	-12.702	-35.025	10.682	15.328	-5.667	12.166
	[2.92]	[3.32]	[2.76]	[1.87]	[2.16]	[1.38]	[1.87]
CO	1.953	-0.254	-2.578	1.481	1.247	0.922	1.804
	[2.33]	[0.45]	[1.39]	[2.00]	[1.30]	[1.53]	[2.09]
TW	-3.778	0.999	4.354	0.127	-2.775	0.442	-1.149
	[0.97]	[0.29]	[0.42]	[0.03]	[0.67]	[0.13]	[0.23]
EPCO	0.961	-0.399	-3.749	1.157	0.156	0.721	1.324
	[0.54]	[0.39]	[1.12]	[0.76]	[0.09]	[0.73]	[0.84]
BRRBD	-0.066	-5.855	-11.471	-4.979	1.701	-6.903	-6.54
	[0.02]	[2.19]	[1.57]	[1.44]	[0.42]	[2.64]	[1.65]
UDCO	-0.663	8.735	11.08	9.26	-1.852	6.067	9.507
	[0.08]	[1.85]	[0.70]	[1.25]	[0.21]	[1.29]	[1.19]
TWCO	9.126	6.151	21	11.851	9.393	4.502	12.829
	[1.01]	[1.39]	[1.50]	[1.54]	[1.08]	[1.08]	[1.59]
LDS	32.408	8.74	14.32	33.404	31.186	10.334	34.232
	[3.92]	[1.94]	[0.98]	[4.49]	[3.68]	[2.48]	[4.58]
TFPS	-10.946	1.124	6.045	-8.514	-14.618	1.33	-6.544
	[2.04]	[0.38]	[0.61]	[1.74]	[2.24]	[0.38]	[1.06]
AMS	3.811	-0.457	-3.212	2.441	3.025	-0.182	2.4
	[2.99]	[0.60]	[1.38]	[2.09]	[2.17]	[0.26]	[1.89]
RIRL	0.068	2.444	10.144	-6.059	1.358	3.076	-4.36
	[0.01]	[0.63]	[0.81]	[0.98]	[0.19]	[0.77]	[0.66]
TTS	-5.355	0.369	2.563	-5.132	-5.939	-1.109	-6.017
	[1.03]	[0.15]	[0.31]	[1.18]	[1.10]	[0.45]	[1.26]
Observations	98	98	98	98	98	98	98
Number of countries	9	9	9	9	9	9	9
Avg T	11.12	11.12	11.12	11.12	11.12	11.12	11.12
Wald Test coeff=0	2265729	120888.2	110082.7	3275737	2243837	173599.2	3256086
χ^2 d.o.f.	45	45	45	45	48	48	48
P-value	0	0	0	0	0	0	0
Wald Test f.e.=0	55.6	51.73	54.35	36.21	57.64	41.41	30.34
χ^2 d.o.f.	8	8	8	8	8	8	8
P-value	0	0	0	0	0	0	0
Absolute value of t statistics in brackets							

Table 5: GLS fixed effects estimates of the impact of employment regulations on female employment population ratios

	A	B	C	D	E	F	G
	EPOPperm	EPOPtemp	λ	EPOP	EPOPperm	EPOPtemp	EPOP
LDV	0.853	0.709	0.645	0.755	0.853	0.744	0.808
	[19.72]	[8.64]	[6.07]	[12.15]	[19.25]	[11.62]	[12.83]
EP	8.59	-3.991	-12.014	7.521	9.825	-4.43	7.174
	[2.11]	[0.90]	[0.63]	[1.47]	[2.40]	[1.18]	[1.48]
FTC	-0.687	-1.096	-4.127	-1.166	-0.477	-1.789	-1.715
	[2.43]	[2.98]	[2.35]	[3.04]	[1.48]	[4.68]	[4.23]
TWA	1.533	-0.653	-1.885	0.46	1.297	0.038	1.334
	[6.23]	[1.72]	[1.14]	[1.24]	[3.54]	[0.09]	[3.20]
EP·BAD					-0.183	0.408	0.763
					[0.61]	[1.26]	[2.26]
FTC·BAD					-0.3	1.151	0.689
					[0.98]	[3.63]	[1.83]
TWA·BAD					0.251	-1.625	-1.733
					[0.78]	[4.86]	[4.67]
BRR	-16.288	-4.131	6.446	-25.15	-15.638	-7.782	-27.12
	[4.04]	[0.95]	[0.36]	[4.94]	[3.83]	[1.77]	[5.43]
BD	4.623	-5.184	-15.631	-2.485	4.214	-9.452	-6.284
	[2.77]	[2.24]	[1.83]	[0.96]	[2.21]	[4.10]	[2.28]
UD	14.109	-34.169	-30.887	-9.587	15.175	-21.661	0.131
	[1.57]	[3.20]	[0.63]	[0.73]	[1.58]	[2.11]	[0.01]
CO	2.837	-0.392	-2.803	4.027	3.11	2.922	6.952
	[2.25]	[0.28]	[0.44]	[2.65]	[2.19]	[2.05]	[4.44]
TW	-28.846	6.688	29.232	-23.546	-29.959	-0.34	-29.467
	[5.24]	[0.87]	[1.08]	[2.80]	[5.11]	[0.05]	[3.73]
EPCO	-1.641	-0.385	-0.956	2.017	-1.638	3.909	4.762
	[0.67]	[0.13]	[0.07]	[0.70]	[0.67]	[1.50]	[1.78]
BRRBD	-6.399	-13.58	-19.204	-23.837	-4.551	-17.508	-27.876
	[1.17]	[2.18]	[0.73]	[3.22]	[0.81]	[2.93]	[3.79]
UDCO	-8.232	25.307	18.496	2.479	-10.433	27.79	7.356
	[0.72]	[2.04]	[0.32]	[0.18]	[0.92]	[2.41]	[0.49]
TWCO	13.501	12.909	1.297	-1.621	11.16	2.311	-3.35
	[1.10]	[0.91]	[0.02]	[0.11]	[0.92]	[0.19]	[0.26]
LDS	34.436	10.547	15.132	48.795	34.895	9.604	45.163
	[3.46]	[0.89]	[0.30]	[3.81]	[3.53]	[0.92]	[3.67]
TFPS	6.473	1.228	-18.638	7.98	-0.525	4.643	15.079
	[0.94]	[0.15]	[0.54]	[0.89]	[0.06]	[0.52]	[1.45]
AMS	1.221	-0.488	2.103	-1.839	0.608	0.324	-0.066
	[0.69]	[0.23]	[0.23]	[0.83]	[0.32]	[0.17]	[0.03]
RIRL	16.629	3.921	-24.082	12.244	18.059	-3.763	10.817
	[1.82]	[0.38]	[0.51]	[1.07]	[1.83]	[0.39]	[0.93]
TTS	-32.259	-6.28	19.372	-40.896	-32.435	-8.204	-42.526
	[4.88]	[0.87]	[0.59]	[5.09]	[4.78]	[1.36]	[5.47]
Observations	98	98	98	98	98	98	98
Number of countries	9	9	9	9	9	9	9
Avg T	11.12	11.12	11.12	11.12	11.12	11.12	11.12
Wald Test coeff=0	1016440	53793.9	41955.83	947201.7	1008896	102564.1	1183741
χ^2 d.o.f.	45	45	45	45	48	48	48
P-value	0	0	0	0	0	0	0
Wald Test f.e.=0	99.98	43.96	10.32	25.4	94.87	43.26	26.94
χ^2 d.o.f.	8	8	8	8	8	8	8
P-value	0	0	0	0	0	0	0
Absolute value of t statistics in brackets							

Table 6: GLS fixed effects estimates of the impact of employment regulations on the 15-24 years old employment population ratios

	λ_{NT}	$(N-1)\,K'/2$	**Pooled Specification is best** according to 2nd weak MSE criterion ($\lambda_{NT} \leq (N-1)\,K'/2$)
Model 4.A	1.54	28	yes
Model 4.B	0.77	28	yes
Model 4.C	0.79	28	yes
Model 4.D	1.62	28	yes
Model 5.A	1.33	28	yes
Model 5.B	0.19	28	yes
Model 5.C	0.69	28	yes
Model 5.D	1.28	28	yes
Model 6.A	-12	28	yes
Model 6.B	0.73	28	yes
Model 6.C	0.96	28	yes
Model 6.D	1.51	28	yes

Table 7: Poolability tests based on second weak MSE criterion

here, in Table 7, the second weak MSE criterion statistics λ_{NT} calculated for a simplified version of our models A, B, C and D, with lagged dependent variable, benefit replacement ratios, union density, tax wedge, LD shock and TFP shock as regressors. We found that under the first as well as the second weak MSE criterion the pooled estimator is better than the unconstrained estimator in all cases. In other words the pooled model yields more efficient estimates than the by country regressions.

Pesaran and Smith (1995) argue, however, that a pooled estimator is potentially inconsistent when the model is dynamic and parameter heterogeneity is not taken into account. Indeed, our estimations were derived from a set of semi-pooled equations, where we allowed for some heterogeneity in the parameters, through country specific coefficients and interactions among institutions. This is an important feature of the model which makes it robust to the potential inconsistency described above.

3.4.2 Estimation of the Small T Bias in Dynamic Panels

The short time dimension of our panel of countries and the partial adjustment specification of our model suggest that the estimated coefficients could be affected by the Nickell bias for dynamic panels. Nickell (1981) shows that in the AR(1) case the bias of a dynamic fixed effect model is $O\,(1/T)$ and therefore becomes less important as T grows. Our dataset is characterised by an average number of country observations equal to 11.25, therefore the issue deserves some investigation.

Kiviet (1995) addresses the problem by measuring the performance of a set of alternative estimators on panels with fixed N and T dimensions, with $N > T$. His Monte Carlo analysis shows that in this context, although biased, the fixed effect estimator (henceforth LSDV) has the lowest small sample variance compared with alternative consistent estimators like Anderson Hsiao IV, and Arellano Bond GMM. This result suggests that correcting the LDSV estimate for the bias would result in a more efficient finite sample estimator (LSDVc) with respect to IV and GMM alternatives, on a mean square error criterion basis.

Judson and Owen (1996) test the performance of the Kiviet LDSVc estimator and the alternatives by means of Monte Carlo simulations, concentrating on panels with typical macroeconomic dimensions, i.e. small N and T, with $N \simeq T$. Their analysis confirms the well known fact that the lagged dependent variable coefficient bias is more severe than the bias of the explanatory variables'

coefficients for all alternative estimators in the case of panel dimensions comparable with ours. This result gives us some confidence in the interpretation of the estimated impact of institutions on the dependent variable. They suggest moreover that the LSDVc estimator outperforms alternative estimators, when $T < 30$, while the LSDV estimator performs as well as or better than many alternatives when $T = 30$.

However, application of the LDSVc technique to our data is not free from problems. First, this estimator requires the data to be balanced across panels and an analogous methodology for unbalanced panels has not yet been derived. Our database is unbalanced with $T_{\max} = 13$ and $T_{\min} = 9$, so that dropping the year observations unavailable for some of the countries would result in a dramatic loss of information. Moreover, the testing procedure of this section confirms that by country heteroskedasticity and serial correlation is likely to occur and the LDSVc estimator is not as efficient as the fixed effects GLS estimator (LSDVGLS) in correcting for this. The reason for this deficiency is that although a White robust version of the estimator can be derived, this does not incorporate the information on the nature of the heteroskedasticity in the data, that is likely to be of an "across groups" type, as the tests show.

Given the limitations on application of the LDSVc estimator, Judson and Owen suggest the adoption of a one step Arellano Bond procedure for small samples with $T \leq 10$. However, the Arellano Bond estimator is constructed for applications to datasets with fixed T and large N, and its adoption on a panel like ours is not advisable.

We decided to follow an approach similar to Kiviet's. We present a set of LSDVGLS estimations, correcting for by country heteroskedasticity and serial correlation, and at the same time we produce an approximate boundary for the bias using Kiviet's formula on the analogous *balanced* LDSV estimates. The calculated Kiviet bias is strictly greater than our model's bias for two reasons. First, the bias is calculated for a balanced country panel with $T = T_{\min}$ of our actual unbalanced panel. This means that the bias in our estimates should be consistently lower than this estimated upper boundary, since we dropped one third of the available observations in order to balance the panel. In other words our estimations were calculated on a dataset with longer time series for most of the countries, and 50% more observations than the data used for the calculations of the Kiviet bias. Secondly, the LSDVc bias estimate is White robust but not corrected for by country heteroskedasticity and serial correlation.

Table 8 presents the estimated Kiviet bias[24] for models A and B calculated for total, female, and young employment population ratios. The estimated bias is expressed in percentage terms, i.e. it is calculated as

$$\overset{\wedge}{Kbias}(\beta) = \mid \frac{\hat{\beta}_{LSDV} - \hat{\beta}_{LSDVc}}{\hat{\beta}_{LSDV}} \mid \tag{22}$$

where $\hat{\beta}_{LSDV}$ is the usual LSDV or fixed effect estimate on the balanced model, and $\hat{\beta}_{LSDVc}$ is the Kiviet corrected estimate, LSDVc. A positive value of $\overset{\wedge}{Kbias}(\beta)$ indicates that the true parameter is likely to be larger in absolute terms than the LSDV estimate, and vice versa for a negative value. For the reasons mentioned above, the potential bias in the estimated coefficients of Tables 4, 5 and 6, $bias\left(\hat{\beta}_{LSDVGLS}\right)$, is such that

$$0 < bias\left(\hat{\beta}_{LSDVGLS}\right) < \overset{\wedge}{Kbias}\left(\hat{\beta}_{LSDV}\right).$$

[24]The calculation of the Kiviet correction for the bias involves an estimate of the equation error vector and its variance. We follow Judson and Owen and choose Anderson Hsiao IV among all possible consistent estimators in order to generate it.

Percent Approximate Kiviet Bias $\hat{Kbias}\left(\hat{\beta}_{LSDV}\right)$: $0 < bias\left(\hat{\beta}_{LSDVGLS}\right) < \hat{Kbias}\left(\hat{\beta}_{LSDV}\right)$						
	4.A	4.B	5.A	5.B	6.A	6.B
	Total		Female		Young	
	EPOPperm	EPOPtemp	EPOPperm	EPOPtemp	EPOPperm	EPOPtemp
LDV	722.5	-18.6	-212.7	-26.8	-66.9	-25.6
EP	-16.8	12.1	-83.7	-65.5	-8.3	-13.6
FTC	-21.6	20.2	-37.9	48.5	-23.6	14.7
TWA	11.3	15.2	-8.4	20.9	-28.1	18.3
BRR	14.8	-54.8	34.7	-14.6	10.1	-53.7
BD	30.2	2.1	332.8	1.4	-13.3	1.8
UD	9.1	-21.8	85.9	-11.4	20.7	-6
CO	-13.3	44.2	-2.6	-8.3	1.5	18.9
TW	27.4	0.5	77.4	-6.2	0.7	-0.3
LDS	38.1	-10.6	55.5	-22.7	0.3	-17
TFPS	2.5	19.2	-47.3	7.6	-11.2	15.2
AMS	-32.2	9.8	-28.5	15.2	-19.3	22.7
RIRL	2.8	-7.9	-36.1	-13.4	-21	-25.5
TTS	2.5	226.8	-31.3	95.9	-18.5	235.5

Table 8: Estimated Kiviet bias: direction and percent value

		Model						
		A	B	C	D	E	F	G
Table 4	$\chi^2_{(8)} =$	181.5 $Pval\simeq 0$	283.0 $Pval\simeq 0$	117.1 $Pval\simeq 0$	196.5 $Pval\simeq 0$	189.9 $Pval\simeq 0$	307.6 $Pval\simeq 0$	200.5 $Pval\simeq 0$
Table 5	$\chi^2_{(8)} =$	178.9 $Pval\simeq 0$	276.6 $Pval\simeq 0$	54.4 $Pval\simeq 0$	201.6 $Pval\simeq 0$	191.3 $Pval\simeq 0$	292.7 $Pval\simeq 0$	202.3 $Pval\simeq 0$
Table 6	$\chi^2_{(8)} =$	107.9 $Pval\simeq 0$	102.6 $Pval\simeq 0$	167.3 $Pval\simeq 0$	81.6 $Pval\simeq 0$	110.5 $Pval\simeq 0$	126.1 $Pval\simeq 0$	90.6 $Pval\simeq 0$

Table 9: Groupwise heteroskedasticity LR tests

Bearing this in mind and referring to the estimated percent bias of Table 8, we can conclude that our estimations are unlikely to be largely affected by the Nickell bias. The only estimated coefficient to be at risk is the lag dependent variable, and this is exactly what the econometric theory predicts in these cases.

3.4.3 Heteroskedasticity

The fixed effect specification assumes homoskedasticity of the stochastic component in the regression error across countries and time. If the assumption is not met, then the estimates will still be consistent but inefficient. We therefore test for groupwise likelihood ratio heteroskedasticity in the LSDV version of our equations. The test is chi-squared distributed with $G-1$ degrees of freedom, where G is the number of groups in the sample, 9 countries in our case. Table 9 presents the Likelihood Ratio test statistics for our LSDV estimated models. The null hypothesis of homoskedasticity across countries is rejected in all cases. This suggests the adoption of a feasible LSDVGLS estimator, with a general variance covariance matrix that incorporates heteroskedasticity across countries.

		Model						
		A	B	C	D	E	F	G
Table 4	$\chi^2_{(18)} =$	333.9 $Pval\simeq 0$	452.72 $Pval\simeq 0$	334.06 $Pval\simeq 0$	421.26 $Pval\simeq 0$	301.39 $Pval\simeq 0$	413.99 $Pval\simeq 0$	310.7 $Pval\simeq 0$
Table 5	$\chi^2_{(18)} =$	304.41 $Pval\simeq 0$	258.13 $Pval\simeq 0$	244.82 $Pval\simeq 0$	281.77 $Pval\simeq 0$	178.02 $Pval\simeq 0$	328.09 $Pval\simeq 0$	320.26 $Pval\simeq 0$
Table 6	$\chi^2_{(18)} =$	165.79 $Pval\simeq 0$	414.82 $Pval\simeq 0$	260.35 $Pval\simeq 0$	273.62 $Pval\simeq 0$	239.73 $Pval\simeq 0$	458.79 $Pval\simeq 0$	409.43 $Pval\simeq 0$

Table 10: Maddala and Wu panel cointegration tests

3.4.4 Residuals Serial Correlation

In order to test for serial correlation in fixed effects models, Baltagi and Li (1995) suggest an LM test whose asymptotic distribution is calculated for T large. The null hypothesis is no serial correlation, assuming the residuals are either AR(1) or MA(1). The evidence for both versions of the test on every LSDV estimated model is mixed. However, given the relatively short T dimension of our sample, and the asymptotic nature of the test, we preferred to implement a general form of our fixed effect GLS estimator, allowing for possible serial correlation as well as groupwise heteroskedasticity.

3.4.5 Panel Cointegration

We tested for panel cointegration using the procedure suggested by Maddala and Wu (1999) using previous findings by Fisher (1932). Their test is a combination of by country unit roots tests, each with P-value P_i , into the statistic $-2\sum \log P_i$. The latter has an exact χ^2 distribution with $2N$ degrees of freedom, since in our models we control for cross country correlation by means of time dummies. Using an augmented Dickey Fuller test with trend as by country test, and MacKinnon approximate P-values, the null hypothesis of no cointegration is rejected in all cases. Although the validity of these tests can be questioned given the short dimension of each country's time series, they are in line with previous findings in the literature such as Nickell et al. (2001), where the same test was performed with very similar results, on twenty OECD countries, each observed for a much longer period ($T \simeq 31$).

4 Concluding Remarks

We have presented a theoretical as well as empirical analysis of the impact of employment regulations on permanent and temporary employment. We have considered three different types of regulations, namely insiders protection, fixed term contract regulations, and temporary work agencies legislation. The predicted effect of these institutions on the level of the two types of employment and on the total are not always unambiguous. Increased labour market flexibility based on relaxation of the constraints governing these three institutions has different effects according to worker types and the state of the economy. Besides, the results depend also on whether the constraint on temporary work is binding or not. These results are summarised in Table 1 where we show that permanent and temporary employment may well move in opposite directions, suggesting that the net effects of less stringent employment regulations should be determined at the empirical level.

We tested the implications of the theoretical model in the second section of the paper, performing a fixed effect GLS estimation on employment population ratios calculated for total, permanent and temporary employment as well as for different employees' types, namely total (M + F), female and young (15 - 24). The main results of the analysis, summarised in Table 11, are the following:

Total employment population ratios (M+F)

		EP	FTC	TWA
All	N	+ (*)		+ (**)
	n	- (**)		- (**)
	L			
Female	N	+ (**)		
	n	- (*)		- (**)
	L	+ (**)		
Young	N	+ (**)	-(**)	+ (**)
	n		-(**)	- (*)
	L		-(**)	
Sign of coefficients and significance (* 10%; ** 5%)				

Table 11: Empirical predictions of the effects of labour market institutions on employment

1. Less stringent employment protection regulations have a significant negative impact on permanent employment population ratios. However, they have a significant positive impact on temporary employment population ratios, with a resulting insignificant effect on total employment.

2. Less stringent fixed term contracts regulations have a significant positive impact on temporary and total employment in good states of the economy, with no effects on permanent employment.

3. Less stringent temporary work agencies regulations have an incremental effect on temporary and total employment in bad states. When the model does not control for asymmetric effects in good and bad states, the impact on permanent employment is negative.

4. Higher unemployment benefit replacement rates reduce both permanent and temporary employment. This effect is reinforced when benefit durations are longer.

5. The tax wedge and bargaining coordination have a significant impact on permanent employment only, with respectively negative and positive coefficients.

6. Unions seem to be averse to temporary employment, at least over the time span observed here. The negative impact of stronger unions on temporary employment is, however, mitigated by closer coordination.

Female employment population ratios

7. Less stringent employment protection legislation is correlated with a reduction in female permanent and total employment and an increase in temporary employment. The negative impact on permanent employment seems to be stronger in the case of females, suggesting that employment protection legislation may play a major role in maintaining women at work on a permanent basis.

8. Greater union density has a positive significant impact on female permanent employment, maintaining a negative effect on female temporary employment.

9. A positive labour demand shock induces an increase in total permanent employees (M+F). However, the effect is also significant on temporary employees when only females are taken into account.

Young employment population ratios (15 - 24)

10. Less stringent employment protection has a negative impact on permanent employment. When a distinction is drawn between good and bad states, this effect is confirmed in good states only. The effect on total employment among young people is also negative, only in bad states.

11. Less stringent fixed term contract regulations cause an increase in both young temporary and permanent employment, confirming that a fixed term contract may be an effective means to obtain a permanent job for young people.

12. The effect of temporary work agency regulations is different. In this case, less stringent regulations induce an increase in young temporary employment together with a reduction in young permanent employment. In other words the role played by fixed term contracts in creating the conditions for young employees to switch to a permanent job is doubtful with regard to temporary work agencies.

Flexibility in European labour markets has been attained more by deregulating the hiring mechanism than by reducing permanent employment protection (see Table 3). In our terms, FTC and TWA have been the main forms of intervention in recent decades. According to our analysis, this strategy has contradictory consequences: on the one hand fixed term contracts may represent a viable access channel to a permanent job, especially for young employees; on the other hand, temporary work agencies may indeed increase temporary employment, but only at the expenses of permanent employment. As regards employment protection legislation, this seems to effectively induce an increase in permanent employment. Its counterpart is a reduction in temporary employment with an insignificant effect on the total.

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Appendix

A The Derivatives with Respect to $\overline{\lambda}$

In order to analyse the consequences of looser temporary contracts constraints, we can differentiate equation 13 with respect to $\overline{\lambda}$, obtaining:

$$\frac{dN_s}{d\overline{\lambda}} = N_s \frac{1}{1-\gamma} Q_s(\overline{\lambda}) \tag{a}$$

where:

$$Q(\overline{\lambda}) = \frac{\gamma X_s \overline{\lambda}^{\rho-1} - (1-\gamma)\overline{\lambda}^{\rho} - A}{(\overline{\lambda}^{\rho} + A)(\overline{\lambda} + X_s)} \tag{b}$$

where we wrote X_s for $X_s(\phi, \mu)$. If $Q_s(\overline{\lambda}) > 0$, then permanent employment increases.

The sign of this variable is not defined if $0 < \overline{\lambda} < \left(\frac{X_s}{A}\right)^{\frac{1}{1-\rho}}$. We analyse the sign of $\frac{dN_s}{d\overline{\lambda}}$ in equation a for two particular values of $\overline{\lambda}$: when it is equal to zero (no temporary contracts allowed), and when it is equal to the value that the firm would have chosen in a flexible labour market $\overline{\lambda} = \left(\frac{X_s}{A}\right)^{\frac{1}{1-\rho}}$, see equation 8.

When $\overline{\lambda}$ tends to zero, from equation b we can easily obtain that $Q(\overline{\lambda}) > 0$, given that the limit of the first term in the numerator tends to infinity. It follows that $\frac{dN}{d(\overline{\lambda})} > 0$.

When $\overline{\lambda}$ tends to its maximum value (see equation 8), we obtain the following expression:

$$sign\left(\frac{dN}{d\overline{\lambda}}\right) = sign\left(-(1-\gamma)\left[\left(\frac{A}{X_s}\right)^{\frac{\rho}{\rho-1}} + A\right]\right)$$

which is unambiguously negative.

We may conclude that there should exist a $\overline{\lambda}^*$ that maximizes permanent employment. For realistic parameter values this must be very close to zero. For instance, with $A = 1.2$, $X = 1.1$, $\rho = 0.93$, $\gamma = 0.75$, permanent employment is at its maximum level for $\overline{\lambda}^* = 0.001$. Other simulations carried out for $\rho > 0.9$ show that this level is always below 0.005. It follows that permanent employment should decrease when $\overline{\lambda}$ grows[25].

The derivative of temporary employment with respect to $\overline{\lambda}$ may be written (see equation 14) as:

$$\frac{dn}{d\overline{\lambda}} = \overline{\lambda}\frac{dN}{d\overline{\lambda}} + N(\overline{\lambda})$$

which, given the definition of $\frac{dN}{d\overline{\lambda}}$, can be simplified as:

$$\frac{dn}{d\overline{\lambda}} = N(\overline{\lambda})\frac{X_s\overline{\lambda}^{\rho} + (1-\gamma)X_s A - \gamma A\overline{\lambda}}{(1-\gamma)(\overline{\lambda} + X_s)(\overline{\lambda}^{\rho} + A)} \quad .$$

Let us analyse the numerator of the latter expression. $X_s\overline{\lambda}^{\rho} - \gamma A\overline{\lambda} > 0$ is a sufficient condition to have a positive sign for the above derivatives. Solving for $\overline{\lambda}$, we obtain $\overline{\lambda} < \left(\frac{X_s}{\gamma A}\right)^{\frac{1}{1-\rho}}$, which is higher than the optimum value of $\bar{\lambda}$ defined in equation 8. Hence, when the binding constraint is relaxed, temporary employment grows.

[25] Only if γ is very near to ρ the employment maximizing value of the constraint on temporary contract ($\overline{\lambda}^*$) becomes higher. For instance, for $\gamma = 0.92$ and $\rho = .93$, we obtain $\overline{\lambda}^* = 0.08$.

The derivative of total employment with respect to $\overline{\lambda}$ is given by:

$$\frac{dL}{d\overline{\lambda}} = (1+\overline{\lambda})\frac{dN}{d\overline{\lambda}} + N(\overline{\lambda}) = \frac{dN}{d\overline{\lambda}} + \frac{dn}{d\overline{\lambda}}$$

which, after the substitution of $\frac{dN}{d\overline{\lambda}}$, can be written as:

$$\frac{dL}{d\overline{\lambda}} = N(\overline{\lambda})\frac{X_s\overline{\lambda}^{\rho} + (1-\gamma)X_sA - \gamma A\overline{\lambda} + \gamma X_s\overline{\lambda}^{\rho-1} - (1-\gamma)\overline{\lambda}^{\rho} - A}{(1-\gamma)(\overline{\lambda}+X_s)(\overline{\lambda}^{\rho}+A)} \quad .$$

The sign of this expression is positive for $\overline{\lambda} \to 0$, since $\underset{\overline{\lambda}\to 0}{lim}\ \gamma X_s\overline{\lambda}^{\rho-1} = \infty$.

Let us evaluate the derivative in a neighbourhood of the value of $\bar{\lambda}$ that firms would have chosen in absence of regulations. Substituting this value (see equation 8) in the latter expression and rearranging, we obtain:

$$sign\left(\frac{dL}{d\overline{\lambda}}\right) = sign\left((1-\gamma)(X_s-1)\left[\left(\frac{X_s}{A}\right)^{\frac{1}{1-\rho}} + X_s\right]\right) \quad .$$

The sign of this condition depends on X_s, i.e. on the relative labour cost ratio of permanent workers with respect to temporary ones. Assuming that the permanent workers' wage is almost equal to the temporary workers' wage plus their hiring cost (i.e. assuming $\mu \simeq 1$), then the variable X_s is greater than one in good states and lower than one in bad states. If this is the case, we can conclude that when the constraints on temporary contracts are relaxed, total employment will rise in good states ($X_G > 1$) and decrease in bad states ($X_B < 1$). If temporary workers always cost more than permanent ones, then an excessive liberalisation of temporary contracts will induce a reduction in total employment. In this case, there exists a binding limit on the adoption of temporary contracts that maximize total employment. We then have that:

$$\frac{dL_s}{d\overline{\lambda}} > 0 \qquad for\ \ \overline{\lambda} \to 0 \quad for \quad s = G, B$$

$$\frac{dL_s}{d\overline{\lambda}} < 0 \qquad for\ \ \overline{\lambda} \to \lambda_s\ \ if\ \ X_s < 1 \quad for \quad s = G, B$$

As regards temporary workers,less stringent restrictions on the adoption of temporary contracts imply an increase in temporary employment, i.e.:

$$\frac{dn_s}{d\overline{\lambda}} > 0 \qquad for \quad s = G, B \quad .$$

Permanent employment is negatively affected by an higher $\overline{\lambda}$. There exists a $\overline{\lambda}$ that maximizes permanent employment, and this value, as shown above, is very close to zero. In analytical terms we have:

$$\frac{dN_s}{d\overline{\lambda}} > 0\ \ for\ \ \overline{\lambda} \to 0 \qquad \frac{dN_s}{d\overline{\lambda}} < 0\ \ for\ \ \overline{\lambda} \to \lambda_s\ \ for\ \ s = G, B$$

B Data on Employment Regulations

B.1 Fixed Term Contract Regulation

Source: Belot and van Ours (2000) and authors.

Purpose:

0 - No limit
1 - Specific restrictions (some jobs ore sectors are excluded)
2 - Particular circumstances (increase in the amount of work, temporary replacement of a worker)
2 - Wide restrictions (limited to some jobs or sectors)
3 - Objective reasons (task temporary in nature)
4 - Not allowed
-1 - If can be used for unemployed and apprentices (if restrictions exist otherwise)

Duration:

0 - No limit
1 - Limited to 1 year, only few renewals possible
2 - No renewal possible

B.2 Temporary Work Agencies Regulation

Source: Belot and van Ours (2000) and authors.

Purpose:

0 - No limit
1 - Specific restrictions (some jobs ore sectors are excluded)
2 - Particular circumstances (increase in the amount of work, temporary replacement of a worker)
2 - Wide restrictions (limited to some jobs or sectors)
3 - Objective reasons (task temporary in nature)
4 - Not allowed
-1 - If can be used for unemployed and apprentices (if restrictions exist otherwise)

Duration:

0 - No limit
1 - Limited to 1 year, only few renewals possible
2 - No renewal possible

B.3 Employment Protection

Source: Blanchard and Wolfers (2000) and OECD (1994, 1999)

0-3: Regular procedural inconveniences: procedures
Days: Regular procedural inconveniences: delay to start of notice
Months: Notice period for no-fault individual dismissals
Months: Severance pay for no-fault individual dismissals
0-3: Difficulty of dismissal: definition of unfair dismissal
Months: Difficulty of dismissal: trial period[26]
Months: Difficulty of dismissal: compensation after 20 years of work with the employer
0-3: Difficulty of dismissal: reinstatement

[26]Note that by "Trial period" is meant "the max lenght of the period after hiring during which an appeal against dismissal on grounds of unfairness cannot be made", from OECD (1994).

	Year	Change
Fixed Term Contracts	1984	liberalization
	1994	restriction
Temporary Work Agencies	1994	introduction

Table 12: Major Institutional Changes in Spain: Fixed Term Contracts and Temporary Work Agencies Regulation

Year	Temporary Contracts over Total Contracts	Change
1987	15.65%	
1995	35.11%	+19.46%
1999	32.79%	−2.32%

Table 13: Evolution of Temporary Contracts in Spain: 1983-1999

C Fixed Term Contracts and Temporary Work Agencies Indicators for Spain

Belot and van Ours (2000) data on Fixed Term Contracts and Temporary Work Agencies Regulation do not provide information on Spain. However, given the peculiarities of the labour market reforms implemented in Spain in the last twenty years, excluding this country from our sample would entail losing a significant part of the information on temporary work in Europe. We therefore constructed a Fixed Term Contracts and a Temporary Work Agencies indicator for Spain using the same criteria as Belot and Van Ours.

Garcia-Serrano and Jimeno (1998) provide detailed information on the evolution of Spanish labour market institutions over the estimation period; information which is summarised in Table 12.

Since approval of the Workers' Statute in 1980, some flexibility features have been introduced into Spain's rigid labour market institutional framework. Fixed term contracts were liberalised in 1984, which caused a boom in this form of employment (see Table 13) and forced the Spanish government to take action to promote the diffusion of permanent jobs. In 1994, the government introduced measures to restrict the use of temporary contracts, obtaining some partial success given that the ratio of temporary contracts to the total decreased by 2.3% in 1999. Another step towards flexibility has been the introduction of Temporary Work Agencies in 1994, by legislation with an intermediate degree of flexibility[27]. According to current legislation, firms may use temporary labour for stated reasons, and they must resolve the temporary contract within a predetermined period of time[28]. The values of the resulting indicators for Spain are summarised in Table 2.

[27]Del Boca and Zaniboni (1999) provide a descriptive account of different degrees of rigidity in the legal framework regulating temporary work agencies in Europe. The OECD Job Study Part II (1994) sets out indicators and country rankings relative to fixed term contracts and temporary work agencies regulation, calculated for the institutional framework of the late 1980s.

[28]These reasons are: (i) probationary period before permanent hiring (maximum six months), (ii) extraordinary operation (with a temporary contract expiring at the end of the operation), (iii) market related needs (six months' maximum duration), (iv) substitution during leave (with a maximum duration corresponding to the period of leave).