Two-Tier Labor Markets in a Deep Recession: France vs. Spain*

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Abstract

The goal of this paper is to explain the strikingly different response of Spanish unemployment relative to other European economies, in particular France, during the ongoing recession. The Spanish unemployment rate, which fell from 22% in 1994 to 8% in 2007, when Spain was creating a large share of jobs in the EU, is expected to reach 20% by the end of 2009. Our aim in this paper is to evaluate whether this wild ride is partly due to the large gap between dismissal costs of workers with permanent and temporary contracts in Spain which lead to huge flows out of and into unemployment of temporary workers. We estimate that one-third of the increase in the unemployment rate in Spain would have been avoided if Spain had had French employment protection institutions, one fourth of which is due to firing costs.

KEYWORDS: Fixed-term contracts, unemployment, search and matching.

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1 Introduction

The goal of this paper is to explain the strikingly different response of Spanish unemployment relative to other European economies, in particular France, during the ongoing recession. We focus on a comparison with France because both countries share similar labor market institutions (employment protection legislation, unemployment benefits, wage bargaining, etc). However, while French unemployment has remained relatively subdued during the current recession, the Spanish unemployment rate, which fell from 22% in 1994 to 8% in 2007 when Spain was creating a large share of jobs in the European Union (EU), is expected to reach 20% by the end of 2009. Our basic conjecture is that this wild ride is partly due to the large gap between dismissal costs of workers with permanent and temporary contracts in Spain which lead to huge flows of temporary workers into and out of unemployment.

France and Spain allow us to tell an interesting tale of two countries. Both are among those which most decidedly promoted fixed-term contracts. Achieving labor market flexibility, which is often seen as a requirement to reduce unemployment, is always a politically difficult task, given the resistance of protected insider workers. Creating two-tier labor market is a politically viable way to achieve this goal (see Saint-Paul, 1996 and 2000). However temporary employment is much more important in Spain, reaching around one-third of employees until recently, whereas in France the share has been slightly below 15%. Therefore it is natural to ask whether the markedly different employment impact of the recession is due to this difference, controling for other potential factors. Among the latter, a key one could be the different weight in employment of the residential construction sector, which is much larger in Spain, since the financial crisis has severely affected the mortgage market.

To explore these potential causes, we use a search and matching model inspired by previous work by Blanchard and Landier (2002) and Cahuc and Postel-Vinay (2002), who extend the seminal Mortensen-Pissarides (1994) model with endogenous job destruction to allow for the distinction between temporary and permanent jobs entailing different dismissal costs. In our model, firms can create both permanent and temporary jobs and firms convert a certain share of the latter to permanent contract at their expiration, the rest being terminated at no cost. In this context, it is now well understood that facilitating the creation of more temporary jobs fosters job creation but it also triggers an increase in job destruction, the latter effect having a larger impact on unemployment when firing costs are large. The intuition for this result becomes clear if one realizes that firms transform temporary jobs into permanent jobs. The higher the firing costs, the lower the share of temporary jobs transformed into permanent jobs, because large firing costs are an incentive for employers to use temporary jobs in sequence rather than converting them into long-term contracts, which are subject to the firing costs. As stated, a policy that permits the opening of more temporary jobs fosters both job creation and destruction, the latter effect being strengthened when firing costs are large. This implies that the spread of temporary jobs is more likely to raise unemployment when it comes on a labor market already regulated by stringent permanent job security provisions.

The spread of temporary jobs, which increases labor turnover is also likely to increase labor market volatility. This phenomenon has been stressed by Boeri and Garibaldi (2007), who argue that two-tier labor market reforms have a transitional honeymoon, job creating effect which can be followed by reductions in employment. Sala *et al.* (2009) have studied the business cycle behavior of segmented labor markets with limitations in the use of fixed-term contracts. In particular they explore whether flexibility at the margin is the reason why labor markets with a relatively high degree of employment protection may display similar volatility as fully flexible ones. They find that flexibility at the margin provides an intermediate situation, in terms of unemployment volatility, between fully regulated and fully deregulated labor markets. Like Sala *et al.* (2009), our approach is focused on the interactions between aggregate productivity shocks and employment protection legislation, including the regulation of temporary jobs. However, in contrast with that paper, we focus on a specific event: a negative aggregate shock in France and Spain, rather than on simulations of a model calibrated on a representative

European labor market. We also pay particular attention to wage bargaining. Contrary to Sala *et al.* (2009) we do not assume that employers have to pay firing costs if they do not agree on the initial wage contract when they are matched with a worker. We assume that firing costs are paid when workers and employers separate only if a contract has already been signed. Such a difference is important to the extent that it has been shown by Ljungqvist (2002) that assuming that firing costs are paid by the employer if there is a separation on the initial bargaining –when the job starts– magnifies the impact of firing costs on unemployment. We think that our assumption is more in line with the institutions of France and Spain, where labor contracts are renegotiated by mutual agreement (Malcomson, 1999; Cahuc, Postel-Vinay, and Robin, 2006).

The paper is structured as follows. We start by documenting the relative performance of the French and Spanish labor markets in the crisis vis-à-vis the preceding period in Section 2. In Section 3 we present the main features of the regulation affecting the two labor markets, devoting special attention to fixed-term contracts. Then, in Section 4, we introduce a stylized search and matching model focusing on equilibrium behavior of firms and workers in an economy with both permanent and temporary contracts, where it is possible to transform the latter into the former. In Section 5 we show to what extent the model can account for the change in the performance of the French and Spanish labor markets from the boom (represented by 2005-2007) to the recession (2008-2009). We simulate of our search and matching model using stylized parameters calibrated for the French and Spanish economies, matching a set of labor market variables. We use three different versions of the model which vary in the degree of flexibility of wages allowed. We follow a difference-in-differences approach in computing the share of the increase in Spanish unemployment induced by the recession due to the type of employment protection prevailing in Spain. We estimate that one-third of the increase in the unemployment rate would have been avoided if Spain had French institutions, one fourth of which is due to firing costs. Section 6 concludes.

2 Labor market performance before and during the crisis

As depicted in Figure 1, France and Spain both had an unemployment rate of 3.8% at the end of 1976. From then on both rates rose in tandem, but the Spanish rate was always on top. The difference increased up until the end of 1994 and shrank thereafter. In the third quarter of 2005, the two rates seemed to have come full circle, reaching similar values around 9%.

Convergence was however a mirage. With the onset of the worldwide recession in mid-2007, the Spanish unemployment rate has shot up from 8% to 18%. On the other hand, French unemployment kept on falling, to 7.2%, and then has grown by two points, to 9.2%. What explains such a striking difference? Let us briefly dig deeper.

Table 1 shows a few key labor market magnitudes from 1998:1 to 2007:4, a boom period, and 2008:1-2009:2, the recession. The table makes it apparent that throughout the boom period, both labor force and employment growth rates have been much higher in Spain than in France. It is the Spanish figures that are remarkable, while the French ones are typical of the Euro area experience. In Spain the labor force received a boost from large immigration flows amounting to around 1% of the population per year –whereas the share of foreigners in the French labor force was stable– and also from an increase in the female labor participation rate –for natives that rate increased by 8.4 percentage points, against 2.9 points in France.[1] Focusing on private sector employees, the table shows that the employment surge in Spain came especially from construction and market services (8.1% and 6.8% per year, respectively). In France the figures were more moderate, with a surprising fall in manufacturing. The disparity was reinforced by the behavior of hours per employee: the implementation of the 35 hours law caused a significant drop in France, while in Spain they rose slightly.

In the downturn, France has experienced an atypical acceleration in its labor force, while in Spain the growth rate is very high by historical standards, though it has slowed

[1] See Bentolila *et al.* (2008a) for a discussion of immigration flows in Spain.

down. France has suffered a non-negligible employment fall (1.8% p.a.), which is however small compared with the Spanish free fall (6.3% p.a.). The latter stems especially from a collapse of almost one-fourth of employment in construction and a striking 10.8% drop in manufacturing.

It is very hard to explain the extreme volatility in the Spanish labor market without recourse to the type of contracts prevailing in it. As shown in Table 1, in 1998 fixed-term contracts reached almost 14% of employees in France and one-third in Spain. In both countries the vast majority of (quarterly) flows from unemployment to salaried employments are under these contracts: 78.4% in France and 87.2% in Spain. Correspondingly, they also represent the majority of employment outflows, in particular 88% in France and 80.1% in Spain. In the two countries more than the full brunt of job losses since the end of 2007 has been borne by temporary jobs: in France 182.000 net jobs where destroyed, but actually 362.000 temporary jobs disappeared, while the respective figures for Spain were 1.14 million and 1.25 million. In Section 5 we compute the extent to which a model centered on fixed-term contracts can explain this extreme behavior.

3 Labor institutions in France and Spain

In this section we briefly review the institutional setting of the French and Spanish labor markets. We focus on employment protection legislation (EPL), although we also describe institutions like unemployment benefits and wage bargaining.

3.1 Employment protection

As we have seen, France and Spain are among the countries where governments have, through their regulations, promoted more strongly fixed-term contracts to increase labor market flexibility, with the aim of reducing unemployment. Table A1 in the Appendix presents the key features of regulations concerning firing in the two countries.

Permanent contracts are subject to notice periods and severance pay.[2] It may seem

[2]In France, this includes the regular permanent contract or *contrat à durée indeterminée* (CDI) and the new employment contract (*contrat nouvelles embauches*, CNE, which has different severance pay and

from the table that firing permanent employees is much cheaper in France than in Spain, but this is wrong, since there are additional important components of firing costs beside severance pay. For example, in France as soon as a worker reaches a 2-year seniority the notice period doubles and the firm must propose a personalized plan to help the employee find another job, with a maximum duration of 12 months. On the other hand, in Spain administrative approval is required for collective dismissals (roughly those involving 10% of an establishment's staff), which is much more easily granted if workers' representatives have agreed to the dismissal in advance.

Computing overall measures of firing costs is not easy. The OECD (2004) provides an index of the strictness of employment protection legislation (EPL) for 2003, with a range going from 0 to 6, with higher scores indicating stricter regulation. This indicator gives a score of 2.5 for France and 2.6 for Spain regarding protection of regular employment, 3.6 for France and 3.5 to Spain for regulation of temporary employment, and 2.1 for France and 3.1 for Spain with respect to regulation of collective dismissals. The overall EPL score is 3.0 for France and 3.1 for Spain (where the US has the lowest value, 0.7, and Portugal and Turkey the highest, 4.3). So both France and Spain are in the middle-high range according to this measure, with Spain looking slightly more regulated than France.

Moreover, economic theory tells us that what matters for employment is not severance pay per se, which is a transfer from the firm to the worker and may therefore be compensated for in the wage bargain. Rather, since the probability that workers will contest dismissals is very high, what matter are other costs which are not appropriated by firms and workers but are generated by third agents, such as labor courts and labor authorities. In France severance pay offered by firms in exchange for a quick resolution of dismissals is typically much higher than statutory severance or that agreed in collective bargains. In Spain, since firms that go to court lose in 3 out of 4 cases on average, even if entrepreneurs think a dismissal to be justified on economic grounds they typically prefer

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other conditions) introduced in 2005 for small firms (see Cahuc and Carcillo, 2006). In Spain it includes both regular permanent contracts and the subsidized *contrato permanente de fomento del empleo* In principle, the latter has lower severance pay, but in fact most dismissals incur the ordinary one.

to claim disciplinary reasons (e.g. worker misconduct). Proceeding in this way they do not need to satisfy the notice period and, upon immediately acknowledging the dismissal to be unfair, they avoid going to court by paying upfront the correspondingly higher severance pay.[3] In applying our theoretical model to the two countries we will use estimated red-tape costs.

The use of fixed-term contracts is more limited in France than in Spain.[4] In France they can only be used in nine specific cases: for replacing an employee who is absent or temporarily working part time, to transitorily replace an employee whose job is either going to be suppressed or filled by another permanent worker, and for temporary increases in the firm's activity, seasonal activities, and jobs in certain sectors (forestry, naval, entertainment, teaching, survey-making, professional sports, etc.). It is apparent, however, that the alleged reasons for hiring on a temporary basis are often misrepresented. On the other hand, there are no specific restrictions on the use of temporary contracts in Spain (though different reasons lead to different fixed-term contract types). In both countries the maximum duration of fixed-term contracts is 24 months, although in Spain there is little monitoring by authorities and uncertain-completion jobs may lawfully last for an indeterminate period (e.g. construction jobs).

In sum, the overall impression is that EPL for permanent contracts is somewhat more stringent in Spain than in France. For more details on the level and structure of firing costs in France see Cahuc and Postel-Vinay (2002) and Cahuc and Carcillo (2006), and Bentolila and Jimeno (2006) and Bentolila *et al.* (2008b) for Spain.

[3] This option has been available to firms in Spain since 2002.

[4] We use the terms fixed-term and temporary interchangeably. We focus on the former, captured by the *contrat a duration determinée* (CDD) in France and the *contrato temporal* in Spain. There are several types of fixed-term contracts in Spain. And other non-permanent jobs exist in France, such as temporary jobs (*emploi interimaire* or *emploi temporaire*). Moreover, in both countries there are jobs intermediated by temporary work agencies and most apprenticeship contracts are also temporary. Empirically we shall consider all of these as fixed-term contracts.

3.2 Unemployment benefits

Unemployment insurance in France features a gross replacement ratio of 57.4% of the preceding year's wage.[5] In Spain the replacement ratio decreases over time: it is 70% for the first 6 months and drops to 60% thereafter. Thus, at least at the beginning of unemployment spells, the Spanish system looks more generous than the French one. In comparing benefits it is however crucial both to take into account personal characteristics and to consider replacement rates net of taxes. Thus, according to the OECD Benefits and Wages database (March 2006 update), in 2004 the net replacement rate for an average production worker who was married, whose partner did not work, and had no children was equal to 69% in both countries. At the same time, if the same worker was married with a working partner and had two children the replacement rate was 84% in France and 87% in Spain.

In France, the length of benefits is the same as the worker's contribution period, with a maximum duration of 23 months (and higher for workers older than 50 years old). In Spain benefit length increases in steps that imply durations going from 22% to one-third of the contribution period, which has to be of at least 12 months, and the maximum duration is 24 months. In computing a measure of unemployment benefits for our simulations we take into account statutory benefits and coverage, which is affected by duration rules.

Workers who exhaust unemployment insurance or are not eligible for it, are entitled to so-called "minimum integration income" (*Revenu Minimum d'Insertion*, RMI), amounting to €454.63 (which represents about 16% of average gross earnings) and €681.9 for a couple (plus child benefits).[6] In Spain the assistance benefit is equal to 80% of the so-called "Multi-Purpose Public Income Indicator", which in 2008 amounted to €413.5 (around 23% of gross earnings in the private non-agricultural sector), with higher benefits for workers with family responsibilities. It is means-tested at the level of the benefit. In

[5] Or, if it is higher, 40.4% of the wage plus a fixed amount (currently around 330 euros per month).

[6] There is also another scheme equivalent to the RMI (open to those above 25 years old who never worked) for those who have worked before and are not eligible anymore: the *Allocation de Solidarité Specifique* (ASS), with an amount equivalent to the RMI.

Spain additional welfare benefits are available in some regions (for example in Madrid they amounts to €370) but coverage is typically low.

3.3 Wage bargaining

Collective wage bargaining is similar in the two countries. It can be argued that this is the result of Spain copying French regulations in the early 1980s, when the post-dictatorship Spanish system of collective bargaining was established. In both countries, most workers are covered by collective bargaining (in Spain above firm-level agreements cover around 80% of employees and firm-level agreements only around 10%). Bargaining takes place mostly at the industry level and there is geographical fragmentation (i.e. through industry-department agreements in France and industry-province agreements in Spain). In Spain, conditions set in above firm-level agreements are automatically extended by law to all firms and workers in the relevant industry or geographical area, and firm-level agreements cannot overrule broader ones.

In Spain, workers are represented by worker delegates in firms with less than 50 employees and by worker committees in firms with more than 50 employees, reflecting French practice. Unions obtain representation from firm-level elections, where voters need not be unionized. Thus, there is little incentive for workers to unionize, so that union density is very low but largely irrelevant. Both countries have among the highest gaps between the coverage of collective bargaining and union density.[7] One difference, though, is that in France there is a multiplicity of unions (8) whereas in Spain there are only two nationally representative unions.

In sum, we believe that the two countries are not too different in their wage setting institutions (and therefore we do not explore any potential differences in wage setting across countries in the simulations below).

[7] For more details regarding Spain see Bentolila and Jimeno (2006).

4 Model

This section presents our search and matching model, which is inspired by previous work by Blanchard and Landier (2002) and Cahuc and Postel-Vinay (2002), who extend the seminal Mortensen-Pissarides (1994) model with endogenous job destruction to allow for the distinction between temporary and permanent jobs entailing different dismissal costs.

4.1 Characteristics of the model

The main features of the model are as follows. First, there is a continuum of infinitely-lived risk-neutral workers and firms, with a common discount rate $r > 0$. The measure of workers is normalized to 1.

Job matches have an idiosyncratic productivity distribution $F(\varepsilon)$, drawn over the support $[\underline{\varepsilon}, \overline{\varepsilon}]$. The idiosyncratic productivity shocks follow a Poisson distribution with incidence rate μ. All new jobs start with productivity $\overline{\varepsilon}$.

There are two types of jobs: temporary and permanent (open-ended) jobs, both endowed with the same productivity distribution. Unemployed workers may have access to temporary jobs with probability p, exogenously set as EPL policy, or to initial permanent jobs with probability $(1-p)$. Temporary jobs are terminated with per unit of time probability λ, at which point firms can either convert them to permanent jobs or destroy them at no cost. A new value of productivity is drawn when the temporary job is transformed into a permanent job. The latter have red-tape firing costs f. Unemployment benefits are denoted by b.

There is a matching function $m(u, v)$ à la Pissarides (2000), with matching rates $q(\theta)$ for vacancies and $\theta q(\theta)$ for the unemployed, where labor market tightness is given by $\theta = v/u$, with v denoting vacancies and u denoting unemployment. There is a cost of keeping jobs vacant equal to $h > 0$ per unit of time.

In terms of notation, subindices are as follows: t for a temporary job, 0 for the beginning of a permanent job, and p for a continuing permanent job.

Asset values at steady state are denoted J and V for employers, and W and U for employees. They are as follows:

- V: Value to the firm of a vacant job,
- $J_t(\varepsilon)$: Value to the firm of a temporary job with productivity ε,
- $J_0(\varepsilon)$: Value to the firm of a new permanent job with productivity ε, not yet subject to firing costs,
- $J_p(\varepsilon)$: Value to the firm of a continuing permanent job with productivity ε, subject to firing cost f,
- U: Value to the worker of unemployment,
- $W_t(\varepsilon)$: Value to the worker of a temporary job with productivity parameter ε,
- $W_0(\varepsilon)$: Value to the worker of a new permanent with productivity ε subject to firing costs f (remember that a new permanent job can previously be a temporary job),
- $W_p(\varepsilon)$: Value to the worker of a continuing permanent job with productivity parameter ε, subject to firing costs f.

4.2 Bellman equations

The Bellman equations for the above asset values from the point of view of firms are the following:

$$rV = -h + q(\theta)\left[p\left(J_t(\overline{\varepsilon}) - V\right) + (1-p)\left(J_0(\overline{\varepsilon}) - V\right)\right] \tag{1}$$

$$rJ_t(\varepsilon) = \varepsilon - w_t + \mu \int_{\underline{\varepsilon}}^{\overline{\varepsilon}} [J_t(x) - J_t(\varepsilon)]\, \mathrm{d}F(x) + \lambda \int_{\underline{\varepsilon}}^{\overline{\varepsilon}} \max[J_0(x) - J_t(\varepsilon), V - J_t(\varepsilon)]\, \mathrm{d}F(x) \tag{2}$$

$$rJ_0(\varepsilon) = \varepsilon - w_0(\varepsilon) + \mu \int_{\underline{\varepsilon}}^{\overline{\varepsilon}} \max[J_p(x) - J_0(\varepsilon), V - J_0(\varepsilon) - f]\mathrm{d}F(x) \tag{3}$$

$$rJ_p(\varepsilon) = \varepsilon - w_p(\varepsilon) + \mu \int_{\underline{\varepsilon}}^{\overline{\varepsilon}} \max[J_p(x) - J_p(\varepsilon), V - J_p(\varepsilon) - f]\mathrm{d}F(x) \tag{4}$$

According to (1), keeping a vacant job implies a flow cost of h and returns a contact with probability $q(\theta)$ in each period. Once the contact takes place the employer-employee pair sign a temporary contract with probability p or a new permanent contract with probability $1-p$, both created at the maximal productivity level, $\overline{\varepsilon}$. If a temporary contract is signed, equation (2) implies that the employer obtains a flow profit of $\varepsilon - w_t$, and after the productivity shock takes place with probability μ, this type of job –which yields an asset value to the employer of $J_t(\varepsilon)$– can continue or be converted into a new permanent contract with probability λ, at which time a new productivity shock takes place. In the latter case, the asset value to the employer is $J_0(\varepsilon)$, which according to (3) yields a flow profit of $\varepsilon - w_0(\varepsilon)$. Once the new value of ε is observed, either the permanent contract becomes a continuing one, with an asset value to the firm of $J_p(\varepsilon)$, or the match is dissolved which will cost the employer the firing cost f. If the employer-worker pair stay together, (4) indicates that the employer obtains a flow profit of $\varepsilon - w_p(\varepsilon)$, such that the only difference with (3) is that the worker now can use the firing cost incurred by the firm as an additional threat in the wage bargain.

Turning now to workers, their Bellman equations are given by:

$$rU = b + \theta q(\theta)[p(W_t(\overline{\varepsilon}) - U) + (1-p)(W_0(\overline{\varepsilon}) - U)] \tag{5}$$

$$rW_t(\varepsilon) = w_t + \mu \int_{\underline{\varepsilon}}^{\overline{\varepsilon}} [W_t(x) - W_t(\varepsilon)]\, \mathrm{d}F(x) + \lambda \int_{\underline{\varepsilon}}^{\overline{\varepsilon}} \max[W_0(x) - W_t(\varepsilon), U - W_t(\varepsilon)]\, \mathrm{d}F(x) \tag{6}$$

$$rW_0(\varepsilon) = w_0(\varepsilon) + \mu \int_{\underline{\varepsilon}}^{\overline{\varepsilon}} \max[W_p(x) - W_0(\varepsilon), U - W_0(\varepsilon)]\mathrm{d}F(x) \tag{7}$$

$$rW_p(\varepsilon) = w_p(\varepsilon) + \mu \int_{\underline{\varepsilon}}^{\overline{\varepsilon}} \max[W_p(x) - W_p(\varepsilon), U - W_p(\varepsilon)]\mathrm{d}F(x) \tag{8}$$

Equation (5) points out that an unemployed worker enjoys a flow earning b net of a lump-sum tax τ and comes in contact with a vacancy at rate $\theta q(\theta)$, either of temporary job or of a new permanent job, with probabilities p and $1-p$, respectively. Expressions (6) to (8) represent the asset values to the worker of the different jobs, and their interpretation is similar to those in (2) to (4) with the flow income being the respective wages net of taxes.

4.3 Surplus sharing

Surplus is shared according to Nash-bargaining in which workers have bargaining power $\beta \in [0,1]$, with the different surplus expressions being given by:

$$S_t(\bar{\varepsilon}) = J_t(\bar{\varepsilon}) - V + W_t(\bar{\varepsilon}) - U \tag{9}$$

$$S_0(\varepsilon) = J_0(\varepsilon) - V + W_0(\varepsilon) - U \tag{10}$$

$$S_p(\varepsilon) = J_p(\varepsilon) - V + f + W_p(\varepsilon) - U \tag{11}$$

In steady state, the free-entry rule $V = 0$ implies:

$$h = q(\theta)\left[pJ_t(\bar{\varepsilon}) + (1-p)\left(J_0(\bar{\varepsilon})\right)\right] \tag{12}$$

Therefore, since $J_i(\bar{\varepsilon}) - V = (1-\beta)S_i(\bar{\varepsilon})$, $i = p, 0$, we get:

$$\frac{\theta h}{1-\beta} = \theta q(\theta)\left[pS_t(\bar{\varepsilon}) + (1-p)S_0(\bar{\varepsilon})\right] \tag{13}$$

Combining the different asset values to the employer and to the worker of the a temporary job, a new permanent job and a continuing permanent job, implies that the three different surpluses are as follows:

$$(r+\mu+\lambda)S_t(\varepsilon) = \varepsilon - b - \frac{\beta\theta h}{1-\beta} + \mu\int_{\underline{\varepsilon}}^{\bar{\varepsilon}} S_t(x)\mathrm{d}F(x) + \lambda\int_{\underline{\varepsilon}}^{\bar{\varepsilon}} \max[S_0(\varepsilon), 0]\mathrm{d}F(x) \tag{14}$$

$$(r+\mu)S_0(\varepsilon) = \varepsilon - b - \frac{\beta\theta h}{1-\beta} + \mu\int_{\underline{\varepsilon}}^{\bar{\varepsilon}} \max[S_p(x), 0]\mathrm{d}F(x) - \mu f \tag{15}$$

$$(r+\mu)S_p(\varepsilon) = \varepsilon - b - \frac{\beta\theta h}{1-\beta} + \mu\int_{\underline{\varepsilon}}^{\bar{\varepsilon}} \max[S_p(x), 0]\mathrm{d}F(x) + rf \tag{16}$$

From (15) and (16):

$$S_p(\varepsilon) = S_0(\varepsilon) + f. \tag{17}$$

The surplus from a continuing permanent job is larger than that from a new permanent job because the employer has to pay the firing cost only once the worker has been confirmed in that job. This is so because, at the time of the first encounter between the worker and the employer a disagreement does not entail any firing cost since the contract is not yet signed.

4.4 Job creation and job destruction

The previous expressions for the surpluses give us the productivity thresholds for long-term job destruction (LTJD) and long-term job creation (LTJC). Notice that the short-term job creation (STJC) is equal to the LTJD and the short-term job destruction (STJD) threshold does not exist, since jobs are created at the maximal productivity. The LTJD and LTJC are as follows:

$$S_p(\varepsilon^d) = 0 = \varepsilon^d - b - \frac{\beta\theta h}{1-\beta} + \mu \int_{\varepsilon^d}^{\overline{\varepsilon}} S_p(x)\mathrm{d}F(x) + rf \tag{LTJD}$$

$$S_0(\varepsilon^c) = 0 = \varepsilon^c - b - \frac{\beta\theta h}{1-\beta} - \mu f + \mu \int_{\varepsilon^d}^{\overline{\varepsilon}} S_p(x)\mathrm{d}F(x) \tag{LTJC}$$

Hence, subtracting LTJD from LTJC yields:

$$\varepsilon^c = \varepsilon^d + (\mu + r)f, \tag{18}$$

which shows that temporary jobs are destroyed more frequently than continuing permanent jobs, because they are exempt from firing costs.

From the expressions for $S_p(\varepsilon)$, $S_0(\varepsilon)$, $S_p(\varepsilon^d)$, and $S_0(\varepsilon^c)$, we then get the following relations:

$$S_0(\varepsilon) = \frac{\varepsilon - \varepsilon^c}{\mu + r} \quad \text{for} \quad \varepsilon > \varepsilon^c \tag{19}$$

$$S_p(\varepsilon) = \frac{\varepsilon - \varepsilon^d}{\mu + r} \quad \text{for} \quad \varepsilon > \varepsilon^d \tag{20}$$

where $S_p(\varepsilon)$ can be used to rewrite LTJD such that the destruction rule of permanent jobs becomes:

$$\varepsilon^d = b + \frac{\beta\theta h}{1-\beta} - \frac{\mu}{\mu + r} \int_{\varepsilon^d}^{\overline{\varepsilon}} \left(x - \varepsilon^d\right) \mathrm{d}F(x) - rf \tag{21}$$

This equation shows that the threshold productivity ε^d is an increasing function of labor market tightness, θ, and a decreasing function of the firing cost, f. The intuition for the first relationship is that a tighter labor market, by improving the value of unemployment U, reduces the surplus, thus making the employer-worker pair more exacting on how productive the matching must be to compensate them for their outside options. As regards the second relationship, it is consistent with the goal of firing costs of reducing the propensity to destroy jobs, implying that less productive jobs remain operative.

Moreover, (14) implies that

$$(r+\lambda)\int_{\underline{\varepsilon}}^{\overline{\varepsilon}} S_t(x)\mathrm{d}F(x) = \int_{\underline{\varepsilon}}^{\overline{\varepsilon}} x\mathrm{d}F(x) - b - \frac{\beta\theta h}{1-\beta} + \lambda\int_{\varepsilon^c}^{\overline{\varepsilon}} \frac{\varepsilon-\varepsilon^c}{\mu+r}\mathrm{d}F(x)$$

and then,

$$S_t(\varepsilon) = \frac{1}{(r+\mu+\lambda)}\left[\varepsilon + \frac{\mu}{r+\lambda}\int_{\underline{\varepsilon}}^{\overline{\varepsilon}} x\mathrm{d}F(x)\right] + \frac{1}{r+\lambda}\left[\lambda\int_{\varepsilon^c}^{\overline{\varepsilon}} \frac{x-\varepsilon^c}{\mu+r}\mathrm{d}F(x) - b - \frac{\beta\theta h}{1-\beta}\right] \tag{22}$$

Evaluation of (22) at $\overline{\varepsilon}$ yields $S_t(\overline{\varepsilon})$ which together with (19) evaluated at $\overline{\varepsilon}$, $S_0(\overline{\varepsilon})$, can be used to rewrite the job creation equation (JC) out of the free entry rule as:

$$\frac{h}{1-\beta} = q(\theta)\left[\begin{array}{c} \frac{p}{(r+\mu+\lambda)}[\overline{\varepsilon} + \frac{\mu}{r+\lambda}\int_{\underline{\varepsilon}}^{\overline{\varepsilon}} x\mathrm{d}F(x)] + \frac{p}{r+\lambda}[\lambda\int_{\varepsilon^c}^{\overline{\varepsilon}} \frac{(x-\varepsilon^c)}{\mu+r}\mathrm{d}F(x) - b - \frac{\beta\theta h}{1-\beta}] \\ +(1-p)\frac{\overline{\varepsilon}-\varepsilon^c}{\mu+r} \end{array}\right] \tag{JC}$$

By replacing ε^c by ε^d in equation JC, using equation (18), it is easy to show that, along the JC locus, labour tightness θ is a decreasing function of the reservation productivity ε^d. In other words, the lower the destruction threshold ε^d, the longer jobs last on average, which leads to a higher creation of vacancies. Conversely, for a given value of ε^d, a higher firing cost f reduces the expected present value of jobs and therefore hinders job creation.

In sum, the three unknowns θ, ε^c, and ε^d are defined by JC and by equations (18) and (21). A graphical representation of the equilibrium values is offered in Figure 2, where the crossing of the JC (having replaced ε^c by ε^d) and LTJD loci in the (θ, ε^d) space determines the equilibrium values of these two variables, whereas (18) determines the equilibrium value of ε^c. In Figure 3 we consider the effect of a larger difference in firing costs between permanent and temporary workers, relative to a situation where this gap is smaller. This is captured by a rise in f, which shifts upwards the LTJC locus and downwards the LTJD and JC schedules. Firms unambiguously become less exacting in firing permanent workers (lower ε^d) and more exacting in transforming temporary contracts into permanent ones (higher ε^c). In principle, although the effect on θ, and thus on unemployment, is ambiguous, the lower the conversion rate is (induced by higher f) the more likely it is that unemployment will rise due to excessive turnover of temporary workers, as Blanchard and Landier (2002), and Cahuc and Postel-Vinay (2002) have pointed out before. Figure 4, in turn, shows the effect of a reduction in p that, as mentioned earlier, we consider in part as an approximation to the burst of the real estate bubble in Spain, since this sector was one of the driving engines behind the high demand of temporary work in this economy. Now, the LTJC and LTJD loci remain unaffected whereas the JC schedule shifts downwards, since job creation is hindered by the recession. As a result, the equilibrium value of θ unambiguously decreases and the unemployment rate goes up. Lastly, a rise in λ would have a similar effect as a decline in p.

4.5 Unemployment flows

Let us write N_t the number of workers with a temporary contract, N_p the number of workers with a permanent contract and u the number of unemployed workers. Then we have:

$$\begin{aligned}\dot{N}_t &= pu\theta q(\theta) - \lambda N_t \\ \dot{N}_p &= (1-p)u\theta q(\theta) + \lambda N_t[1 - F(\varepsilon^c)] - \mu N_p F(\varepsilon^d)\end{aligned}$$

$$\dot{u} = \lambda F(\varepsilon^c) N_t + \mu F(\varepsilon^d) N_p - u\theta q(\theta)$$

In steady state, the number of workers in the different type of jobs and the unemployment rate, u, becomes:

$$N_t^* = \frac{1}{\lambda} pu\theta q(\theta) \tag{23}$$

$$N_p^* = \theta u q(\theta) \frac{1 - pF(\varepsilon^c)}{\mu F(\varepsilon^d)} \tag{24}$$

$$u^* = 1 - N_p^* - N_t^* \tag{25}$$

4.6 Wages

Wages are set according to Nash bargaining in which workers have bargaining power $\beta \in [0, 1]$. As mentioned earlier, wages are renegotiated on permanent jobs whereas we assume that they are not renegotiated on temporary jobs. First order conditions are:

$$(1-\beta)[W_t(\bar{\varepsilon})-U]=\beta\left[J_t(\bar{\varepsilon})-V\right] \quad (26)$$

$$(1-\beta)[W_0(\varepsilon)-U]=\beta[(J_0(\varepsilon)-V] \quad (27)$$

$$(1-\beta)[W_p(\varepsilon)-U]=\beta[(J_p(\varepsilon)+f-V] \quad (28)$$

By substituting into these relations the expressions of each asset value under the free-entry condition $V=0$, we get the following wages:

$$w_t=\beta(\bar{\varepsilon}+h\theta)+(1-\beta)b \quad (29)$$

$$w_0(\varepsilon)=\beta(\varepsilon+h\theta-\mu f)+(1-\beta)b \quad (30)$$

$$w_p(\varepsilon)=\beta\left(\varepsilon+h\theta+rf\right)+(1-\beta)b$$

where $w_0(\varepsilon)<w_p(\varepsilon)$ and $w_0(\varepsilon)<w_t$. Notice that $w_p(\varepsilon)=w_t+\beta[rf-(\bar{\varepsilon}-\varepsilon)]$, the wage of permanent workers is not necessarily larger than the wage of temporary workers because the latter always start at the highest productivity level, Nonetheless, the larger is f the more likely tis hat this inequality would hold.

Let us denote by N_0 the number of temporary jobs that have just been created from vacancies and have not yet been hit by a shock since their creation with productivity $\bar{\varepsilon}$, and by N_{0t} the number of permanent jobs that have not been hit by a shock since they were transformed from temporary jobs:

$$\begin{aligned}\dot{N}_0 &= (1-p)u\theta q(\theta)-\mu N_0\\ \dot{N}_{0t} &= \lambda N_t p[1-F(\varepsilon^c)]-\mu N_{0t}\end{aligned}$$

such that their steady state values become:

$$\begin{aligned}N_0 &= \frac{(1-p)u\theta q(\theta)}{\mu}\\ N_{0t} &= \frac{pu\theta q(\theta)[1-F(\varepsilon^c)]}{\mu}\end{aligned}$$

Using the previous employment sizes, we can next calculate the average wage in steady state, which is given by:

$$\overline{w} = \frac{N_t w_t + \frac{N_{0t}}{1-F(\varepsilon^c)} \int_{\varepsilon^c}^{\overline{\varepsilon}} w_0(x)\mathrm{d}F(x) + N_0 w_0(\overline{\varepsilon}) + \frac{(N_p - N_{0t} - N_0)}{1-F(\varepsilon^d)} \int_{\varepsilon^d}^{\overline{\varepsilon}} w_p(x)\mathrm{d}F(x)}{1-u} \tag{31}$$

Assuming that $F(.)$ is the c.d.f. of a uniform distribution $U[\underline{\varepsilon}, \overline{\varepsilon}]$, $\overline{w}$ becomes:

$$\overline{w} = \frac{\beta h\theta(1-u) + \beta\,\overline{\varepsilon}\,(N_t + N_0) + \beta\frac{\overline{\varepsilon}+\varepsilon^c}{2} N_{tp} + \beta\frac{\overline{\varepsilon}+\varepsilon^d}{2}(N_p - N_0 - N_{tp})}{(1-u)\,(1-b(1-\beta)) + f(\mu+r)(N_0 + N_{tp}) - frN_p} \tag{32}$$

We end by noting that in Appendix A2 we present an alternative model trying to capture an extreme form of wage rigidity. In particular, we assume that everyone gets the same wage, which is taken as exogenously given. This model will be considered as an alternative in the simulations presented below.

5 Accounting for the impact of the crisis

In this section we first show how we calibrate a number of parameters in the model and then discuss the results from an empirical exercise in which we try to ascertain the extent to which the difference in employment protection regulation between Spain and France can account for the difference in the evolution of their respective unemployment rates.

5.1 Calibration of the model

To use our theoretical framework to shed light on the Spanish experience, we set the period of the model to one quarter. Some of the values of the model's parameters can be found directly from data, but others need to be endogenously calculated to fit a set of variables. The actual reference period used for variables is the latter part of the boom, namely 2005:1-2007:4. Parameter values are shown in Table 3.

The interest rate r is set at 1% per quarter. The matching function is Cobb-Douglas. Following the standard Hosios condition, the elasticity of the matching function with respect to unemployment (α) is set equal to the workers' Nash bargaining power β. As in most of the literature, we choose $\alpha = \beta = 0.5$.[8]

[8] See, e.g., Petrongolo and Pissarides (2001).

For unemployment benefit indicator b we use statutory replacement rates corrected for benefit coverage, setting it to 55% for France and 58% for Spain. Indicators f and p are chosen to represent each country's EPL. As regards f , it is chosen to fit red-tape firing costs. Kramarz and Michaud (2008) calculate the average firing cost for permanent workers in France to be around one year's wages, with red-tape costs accounting for one third of it (i.e. 1.33 quarters). For Spain, we compute it as the difference between statutory (20 days per year of service) and actually paid severance (45 days in either individual or collective dismissals), which is induced by labor courts and authorities, which using observed employment tenures yields a value of 2 quarters. Regarding the parameters p and λ, we choose them to be larger for Spain, trying to capture the much higher weight of employment in the construction sector, which has been an important source of hiring of temporary workers in this country. Parameter p represents the proportion of newly created contracts that are temporary, which is around 71% in France and 91% in Spain. Parameter λ represents the probability that a temporary contract is either transformed into a permanent one or terminated, which is around 13.5% in France and 21.3% in Spain.[9]

The distribution function for the idiosyncratic productivity is taken to be uniform to simplify calculus. As for its upper bound, $\bar{\varepsilon}$, it can be chosen arbitrarily, since all the other monetary values will take them as productive bases. We set $\bar{\varepsilon} = 1$. However, the standard deviation of the idiosyncratic productivity has to be calibrated, which in effect means choosing the lower bound of the support of the shock, $\underline{\varepsilon}$, under the previous assumption. There are other three parameters left: h, m_0, and μ. They are chosen to reflect labor market magnitudes in the good state since, between 2005 and 2007, the unemployment rates of France and Spain were close to each other and we are seeking to explain why unemployment has recently risen so fast in Spain as compared to France. We should therefore let the model explain the unemployment rate in the bad state (after the crisis) relative to the good state (before the crisis). However, the values reflected in either

[9] An alternative that we also pursued without achieving convergence in the simulation was to allow two types of productivity shocks, idiosyncratic and aggregrate, where the latter are governed by a Markov transition matrix among the different states of the economy; cfr. L'Haridon and Malherbet (2006).

state should ideally be steady-state instead of point-in-time values, which is not assured, especially in Spain where the unemployment rate shows clear signs of high persistence and volatility.

To uncover the values of $\underline{\varepsilon}$, h, m_0, and μ, we use four equations defining four key variables in the labor market which are computed using the French and Spanish Labor Force Surveys. The first equation defines the rate of transformation of temporary contracts into permanent ones, which reads

$$\lambda \frac{N_{0t} + (N_t - N_{0t})\left[1 - F(\varepsilon^c)\right]}{N_t}$$

or, in steady state:

$$\lambda \left[1 - F(\varepsilon^c)\right]$$

Next is the destruction rate of permanent jobs, which is equal to:

$$\mu F(\varepsilon^d) \tag{33}$$

Third, the share of temporary jobs in the total stock of jobs (in steady state), given by:

$$\frac{N_t^*}{N_t^* + N_p^*} = \frac{p\mu F(\varepsilon^d)}{p\mu F(\varepsilon^d) + \lambda\left[1 - F(\varepsilon^c)\right]} \tag{34}$$

Lastly, the unemployment rate (equation given above):

$$u^* = \frac{\lambda\mu F(\varepsilon^d)}{\lambda\mu F(\varepsilon^d) + \theta q(\theta)[\lambda(1 - F(\varepsilon^c)) + p\mu F(\varepsilon^d)]} \tag{35}$$

Finally, let us point out that the results derived from above-mentioned model are complemented in the simulation exercises with two other alternative specifications. On the one hand, we consider the case where the average wage ϖ applied to f and b during the recession corresponds to past wages, namely the wage holding in the good state, rather than the current average wage during the recession. This mimics the fact that both unemployment benefits and severance pay are linked to workers' tenure and experience, respectively. On the other hand, we also consider the case where all wages are the same and rigid, i.e., $w_t = w_o(\varepsilon) = w_p(\varepsilon) = \overline{w} = w$, where w is chosen to be the average wage in the good state. For notational convenience in what follows these three alternative models will be labeled as the "flexible wages", "semi-flexible wages" and "rigid wages" models.

5.2 Simulation results

In this section we report the results of the simulation exercises, which are still preliminary. We present targets (actual data) and outcomes (simulated data) for the two economies in both the expansionary and recessionary periods, for the three models just described, though for brevity we will mainly focus on the results of the intermediate "semi-flexible wages" model. So far we have mostly focused on targeting the unemployment rate. Table 3 shows the data (target values) for the four above-mentioned variables and the outcomes from the simulations. For the expansion –based on data for 2005-2007– we are able to match both the French and Spanish magnitudes fairly well.

The next step is to match the recession. Since this state is still in progress, target values are aimed at data observed in the latest available four-quarter period, namely 2008:3-2009:2. The crucial degree of freedom here is the parameter controling the severity of the shock. For this we assume that the shock distribution is changed through a mix of additive and multiplicative factors, namely ε is assumed to be uniformly distributed with support $\gamma[\underline{\varepsilon} - \delta, \overline{\varepsilon} - \delta]$, such that γ and δ are chosen to match the required moments in the bad state. Our choice for the "semi-flexible wages" model is γ =0.9 and δ=0 for France, and γ =1 and δ=0.19 for Spain.

The results presented in Table 3 indicate that we are able to match the unemployment rate well, but less so for the other variables. In particular, for Spain the simulation indicates an increase in the temporary employment rate, whereas the opposite is observed in the data.

Overall unemployment goes up by 7.8 percentage points (pp.) in Spain. We wish to use the simulations to measure the share of the increase in unemployment induced by the recession in Spain that can be attributed to differences in its employment protection and sectoral composition vis-à-vis France. We do it by computing what would have been the increase in unemployment if Spain had had French EPL and a lower weight of real estate employment. Both effects are captured by the firing cost, f, the share of hires on temporary jobs, p, and the destruction rate of temporary jobs, λ. To isolate the effect of differences in f, we make these counterfactual computations both for the case where the three parameters take the values for France and for the case where only f does. The computations are performed for all three alternative models.

The results are presented in Table 4. We follow a difference-in-differences approach. For example, in the first line we show the results in the flexible model, subtracting from the overall change in unemployment, 7.8 pp., the change predicted if Spain had had the French parameters, namely, 5.19 pp. The implication is that the recession would have raised the unemployment rate in Spain by 2.61 pp. less if Spain had those French labor market characteristics rather than its own. Both the semi-flexible and the rigid wages models provide similar outcomes, of 2.86 and 2.82 pp., respectively.[10]

To gauge the unemployment effect of the difference in dismissal costs across workers, we have also carried out simulations in which only f takes the value for France. Table 4 shows that the share of the overall change in unemployment explained by the difference in firing costs is around 25% of the overall change in both the flexible and semi-flexible models, and ten times smaller in the case of the rigid wage model. Note however that, though p and λ are assumed to be parameters of the model and therefore independent of the value of f, in practice it is very likely that lowering f would lead to a smaller share of temporary contracts in hiring (i.e., a reduction in p) and possibly also to a fall in the duration of temporary contracts since they could be more easily converted into permanent ones (i.e., a reduction in λ). In such a case the previous contributions of the firing costs gap to the unemployment rise should be interpreted as lower bounds of the true contributions.

Lastly, in order to complement the results of the above-mentioned simulations, which are restricted to steady states, Figure 5 depicts, for the "semi-flexible wages" model, the transition path of the Spanish unemployment rate in the recession. Figure 6 in turn shows how this path would have been if the values of the parameters f, p, and λ were

[10]The corresponding outcomes once we rescale these figures by a factor that takes into account that we are excluding the self-employed in our definition of employment are around 2.4 pp.

replaced by the French ones.[11] In both cases large overshooting occurs and after one year unemployment goes down to a new steady state with the properties discussed above: i.e., it is about 4.4 pp. larger than if the Spanish labor market had some of the French characteristics.

6 Conclusions

In this paper we explore how much of the significantly larger increase in unemployment in Spain vis-à-vis France during the current recession can be accounted for the difference in the employment protection legislation between the two countries. In particular, we wish to examine the impact of the larger gap between the dismissal costs of workers with permanent and temporary contracts in Spain as compared to France. This gap has apparently led to huge flows of temporary workers into and out of unemployment and, in the recession, to large job losses.

To undertake this task we have used a search and matching model inspired by previous work by Cahuc and Postel-Vinay (2002) that extends the Mortensen-Pissarides (1994) model to allow for the distinction between temporary and permanent jobs entailing different dismissal costs. After calibrating the parameters with data for the two economies, we simulate the model to replicate a few key labor market magnitudes for the expansion (2005-2007) and recession periods (2008:3-2009:2).

Subsequently we carry out a counterfactual exercise involving the key parameters capturing employment protection and industry composition in the model. Setting them for the Spanish economy to the French-economy levels indicates that the recession would have raised the unemployment rate in Spain by 2.5 percentage points less had Spain had the French EPL institutions and industry composition rather than its own.

Recently there have been several policy initiatives in Europe defending the idea of a

[11] The dynamics are easy to compute because the core of the model is forward looking. As soon as the economy is hit by an unfavorable shift in the distribution of shocks, the productivity thresholds jump to their new stady-state values. We then essentially look at the adjustment of the stocks given the new flows, noting that some permanent workers would be laid off even without having been hit by an "idiosyncratic" shock because of the shift in the thresholds.

single labor contract. Among the proposals are those of Blanchard and Tirole (2003) and Cahuc and Kramarz (2004) for France, Boeri and Garibaldi (2008) and Ichino (2009) for Italy, and a manifesto signed by 100 academic economists, see Andrés *et al.* (2008), for Spain. While not identical in their details, all these proposals highlight the negative effects induced by the permanent-temporary contract divide. As a result, they all advocate the elimination of temporary contracts and the introduction of a single labor contract with severance pay that is increasing with seniority in the job.[12] The results in this paper, by quantifying the impact of temporary contracts on the rise in unemployment in the crisis, provide some support for the idea of the single contract.

[12] For a specific proposal of a single contract for Spain and its consequences in terms of expected protection and job stability, see Garcia-Perez (2009).

Appendix

Table A1. Employment protection legislation in France and Spain

	Permanent contracts	Fixed-term contracts
France		
* Notice period	1 month if 6<seniority (mos.)< 24 2 months if seniority (mos.)> 24	
* Severance pay		
1. Economic reasons	6 days of wages pyos. (20% of wage) +0.08 days' wages pyos.>10 yrs (1/15 of monthly wage)	3 days of wages pyos.
2. Personal reasons (before July 2008)	Minimum seniority: 1 year 3 days of wages pyos. (10% of wage) +0.04 days' wages pyos.>10 yrs	
Observations	Personalized plan for up to 12 months	Max. duration: 24 months Restricted to 9 cases (see text)
Spain		
* Notice period	1 month	
* Severance pay		
1. Economic reasons	20 days of wages pyos. Max. seniority cov.: 12 months	8 days of wages pyos. (0 days in some cases, see text)
Observations	Collective dismissal requires administrative approval	Max. duration: 24 months Unrestricted
2. Unfair dismissal	45 days of wages pyos. Max. seniority cov.: 42 months	

Note: "pyos." means per year of service.

A Appendix A2. A model with exogenous wages

As an alternative setup, let us assume that everyone gets the same wage, w. We have the following asset value equations with the same notations as before

$$rV = -h + q(\theta)\left[p\left(J_t(\bar{\varepsilon}) - V\right) + (1-p)\left(J(\bar{\varepsilon}) - V\right)\right]$$

$$rJ_t(\varepsilon) = \varepsilon - w + \mu \int_{\underline{\varepsilon}}^{\bar{\varepsilon}} \left[J_t(x) - J_t(\varepsilon)\right] \mathrm{d}F(x) + \lambda \int_{\underline{\varepsilon}}^{\bar{\varepsilon}} \max[J(x) - J_t(\varepsilon), V - J_t(\varepsilon)] \mathrm{d}F(x)$$

$$rJ(\varepsilon) = \varepsilon - w + \mu \int_{\underline{\varepsilon}}^{\bar{\varepsilon}} \max[J(x) - J(\varepsilon), V - J(\varepsilon) - f] \mathrm{d}F(x)$$

$$rU = b + \beta\theta q(\theta)[pS_0(\bar{\varepsilon}) + (1-p)S_t(\bar{\varepsilon})]$$

The reservation values ε^c and ε^d are defined by

$$(\mu + r)J(\varepsilon^c) = 0 = \varepsilon^c - w + \mu \int_{\varepsilon^d}^{\bar{\varepsilon}} J(x) \,\mathrm{d}F(x)$$

$$(\mu + r)J(\varepsilon^d) + (\mu + r)f = 0 = \varepsilon^d - w + \mu \int_{\varepsilon^d}^{\bar{\varepsilon}} J(x) \,\mathrm{d}F(x) + (\mu + r)f$$

This implies

$$\begin{aligned} \varepsilon^d &= w - \mu \int_{\varepsilon^d}^{\bar{\varepsilon}} \frac{\varepsilon - \varepsilon^d}{r + \mu} \mathrm{d}F(x) - rf \\ \varepsilon^c &= w - \mu \int_{\varepsilon^d}^{\bar{\varepsilon}} \left(\frac{x - \varepsilon^d}{r + \mu} - f\right) \mathrm{d}F(x) \end{aligned}$$

We can now compute the present value of a temporary job:

$$J_t(\varepsilon) = \frac{1}{(\lambda + \mu + r)} \left(\varepsilon + \frac{\mu}{(\lambda + r)} \int_{\underline{\varepsilon}}^{\bar{\varepsilon}} x \,\mathrm{d}F(x)\right) - w + \lambda \int_{\varepsilon^c}^{\bar{\varepsilon}} \frac{x - \varepsilon^c}{r + \mu} \mathrm{d}F(x)$$

The equilibrium values of ε^c, ε^d, and θ are defined by

$$\begin{aligned} \varepsilon^c &= w - \mu \int_{\varepsilon^d}^{\bar{\varepsilon}} \left(\frac{x - \varepsilon^d}{r + \mu} - f\right) \mathrm{d}F(x) \\ \varepsilon^d &= w - \mu \int_{\varepsilon^d}^{\bar{\varepsilon}} \frac{x - \varepsilon^d}{r + \mu} \mathrm{d}F(x) - rf \\ \frac{h}{q(\theta)} &= p\left[\frac{1}{(\lambda + \mu + r)} \left(\bar{\varepsilon} + \frac{\mu}{(\lambda + r)} \int_{\underline{\varepsilon}}^{\bar{\varepsilon}} x \,\mathrm{d}F(x)\right) - w + \lambda \int_{\varepsilon^c}^{\bar{\varepsilon}} \frac{x - \varepsilon^c}{r + \mu} \mathrm{d}F(x)\right] \\ &\quad + (1-p)\frac{\bar{\varepsilon} - \varepsilon^c}{r + \mu} \end{aligned}$$

and the flow equations are

$$\begin{aligned}\dot{N}_t &= pu\theta q(\theta) - \lambda N_t \\ \dot{N}_p &= (1-p)u\theta q(\theta) + \lambda N_t[1 - F(\varepsilon^c)] - \mu F(\varepsilon^d)N_p \\ \dot{u} &= \lambda F(\varepsilon^c)N_t + \mu N_p F(\varepsilon^d) - u\theta q(\theta)\end{aligned}$$

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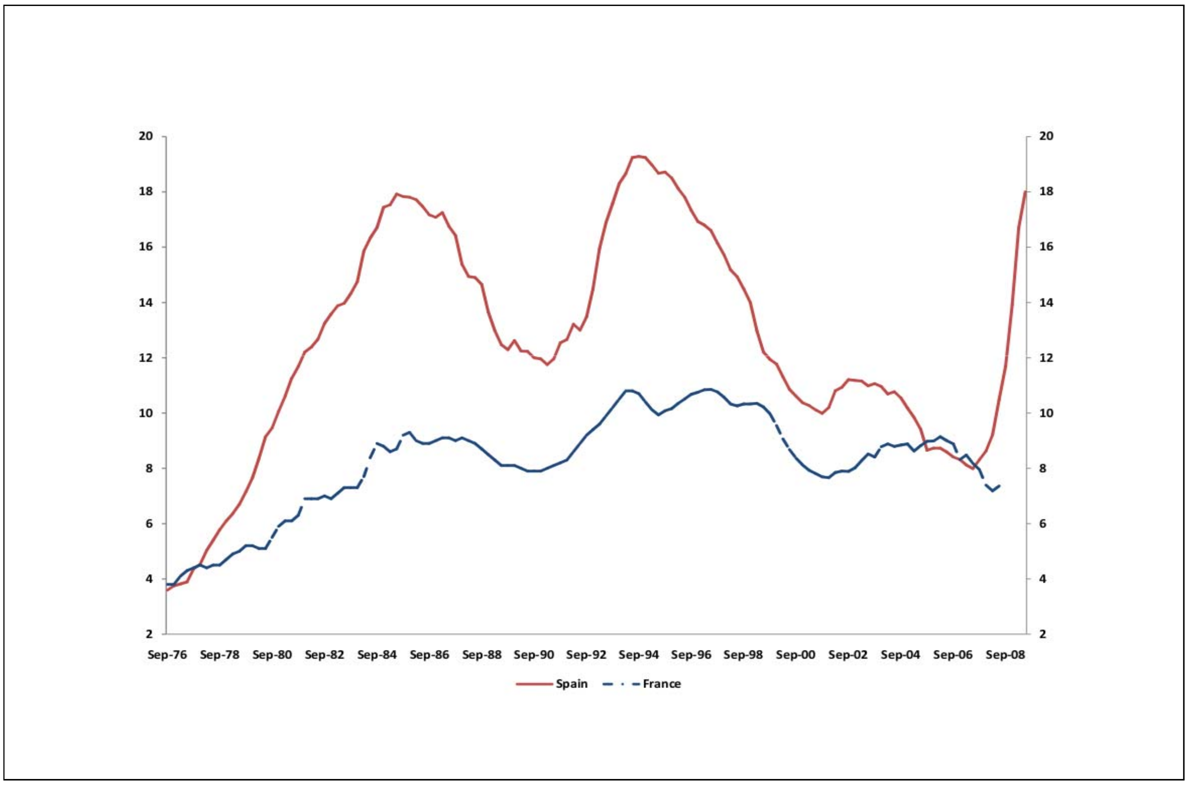

Figure 1: Unemployment rate in France and Spain

Table 1: Labor market evolutions in France and Spain

Levels (%)			1998:1	2007:4	2009:2
1.	Unemployment	France	10.3	7.4	9.2
		Spain	15.2	8.6	18.0
2.	Fixed-term employment[1]	France	13.8	14.3	12.8
		Spain	33.3	30.9	25.4
3.	Hours of work[2]	France	40.7	37.7	37.7
		Spain	38.8	39.0	39.7

Annual growth rates (%)			1998:1-2007:4	2008:1-2009:2
4.	Gross Domestic Product	France	2.3	-2.2
		Spain	3.7	-2.7
5.	Labor force	France	0.8	1.0
		Spain	3.3	1.8
6.	Employment	France	1.1	-0.4
		Spain	4.2	-5.3
7.	Private non-agricultural employees:			
	(a) Total	France	1.5	-1.8
		Spain	5.6	-6.3
	(b) Construction	France	2.4	-0.7
		Spain	8.1	-23.3
	(c) Manufacturing	France	-0.7	-3.4
		Spain	2.0	-10.8
	(d) Market services	France	2.2	-1.4
		Spain	6.8	-0.9
8.	Real hourly earnings[3]	France	1.3	0.5
		Spain	0.3	1.4
9.	Hiring on temporary contracts	France	71.3	n.a.
		Spain	84.7	89.1

Notes: [1] As a share of employees. [2] Full-time employees. The last period is 2008:4. [3] Deflated by GDP Deflator, seasonally adjusted.
Sources: (1),(4)-(6), OECD Economic Outlook Database (www.oecd.org); (2),(3) Eurostat Statistics Database (epp.eurostat.ec.europa.eu); (7), INSEE BDM Macroeconomic Database (www.bdm.insee.fr) for France and INE, Encuesta de Población Activa (www.ine.es) for Spain; (8) OECD Main Economic Indicators Database (www.oecd.org), (9) Dares DMMO-EMMO (www.dmmo.travail.gouv.fr) for France and Ministerio de Trabajo e Inmigración, Boletín de Estadísticas Laborales (www.mtin.es).

Table 2: Calibrated and estimated parameters[1]

		France	Spain
Standard parameters:			
Interest rate	r	0.010	0.010
Matching function elasticity	α	0.500	0.500
Worker bargaining power	β	0.500	0.500
Institutional parameters:			
Unemployment benefit replacemente rate	b	0.550	0.580
Severance pay for permanent employees	f	1.330	2.000
Dual labor market flow rates:			
Probability of hiring into a temporary job	p	0.710	0.910
Probability of temporary contract ending	λ	0.135	0.213
Parameters estimated by indirect inference:			
Cost of keeping jobs vacant	h	0.600	0.900
Matching efficiency level	m_0	0.350	1.200
Incidence rate of productivity shocks	μ	0.020	0.090
Lower bound of productivity shock	$\underline{\varepsilon}$	0.500	0.500
Shocks multiplicative shift factor in recession	γ	0.900	1.000
Shocks additive shift factor in recession	δ	0.000	0.193

[1] Reference period: 2005:1-2007:4.

Table 3: Simulation results

	Unemployment rate[1]	Permanent jobs destruction rate	Temporary employment rate	Transition temp. to permanent
France - Expansion:				
Data	0.085	0.015	0.126	0.047
Model	0.080	0.013	0.125	0.037
France - Recession				
Data	0.098	0.013	0.125	0.037
Model	0.093	0.012	0.102	0.047
Spain - Expansion:				
Data	0.103	0.008	0.333	0.100
Model	0.100	0.038	0.338	0.053
Spain - Recession:				
Data	0.177	0.016	0.270	0.075
Model	0.178	0.055	0.454	0.045

[1] As a share of employees plus unemployed (i.e. self-employed are excluded).

Table 4: Differential increase in unemployment in Spain induced by the recession explained by differences with France (percentage points)

	Δu_{SP}	$\Delta u_{SP}(FR)$	$\Delta u_{SP} - \Delta u_{SP}(FR)$
French parameters: f, p, and λ			
Flexible model	7.80	5.19	2.61
Semi-flexible model	7.80	4.94	2.86
Rigid model	7.07	4.25	2.82
French parameters: f			
Flexible model	7.80	7.11	0.69 (26.4%)
Semi-flexible model	7.80	7.08	0.72 (25.2%)
Rigid model	7.07	7.08	0.07 (2.5%)

Note: Δu_{SP} denotes the change in unemployment explained by the model simulated for the Spanish economy and $\Delta u_{SP}(FR)$ the change in unemployment explained by the model simulated for the Spanish economy with the indicated set of parameter values corresponding to the simulated French economy.

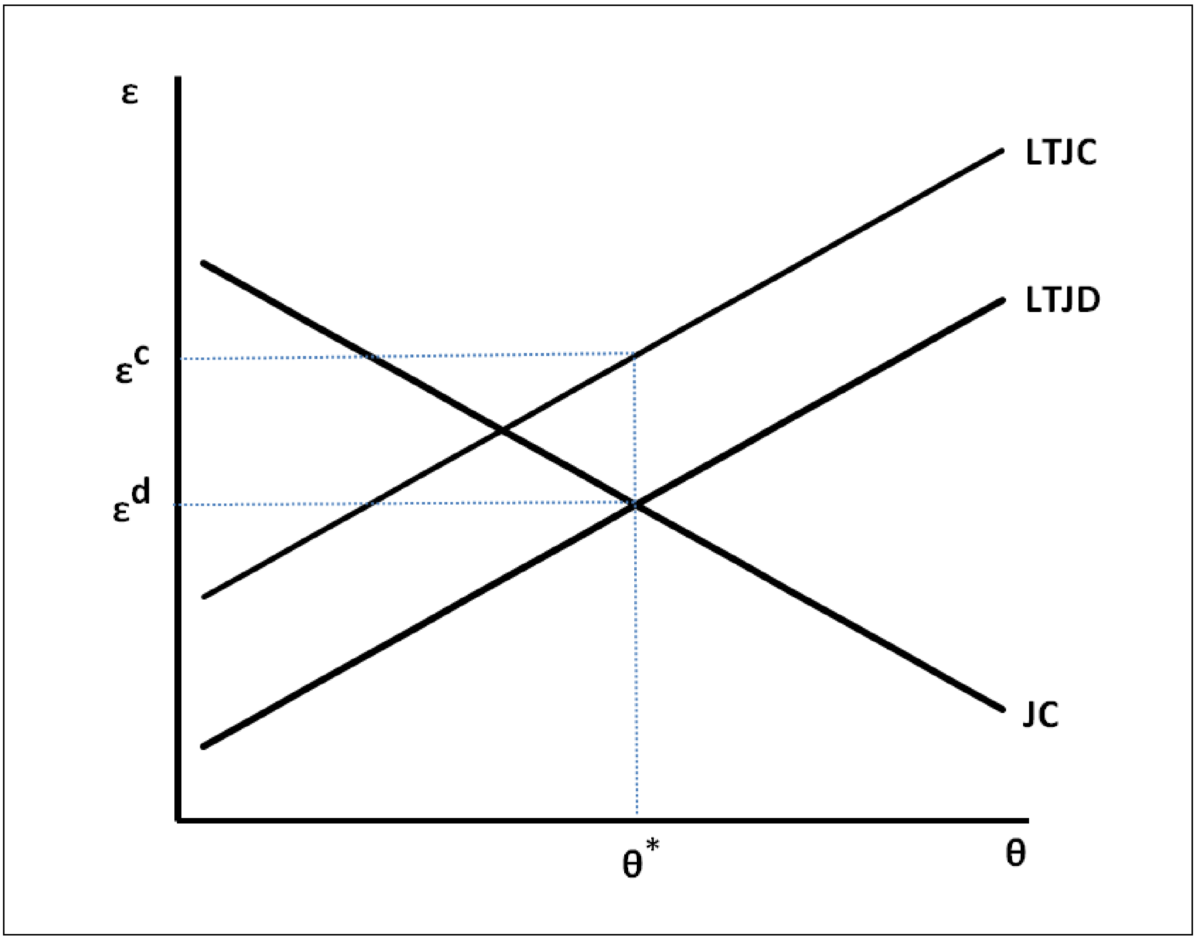

Figure 2: Labor market equilibrium

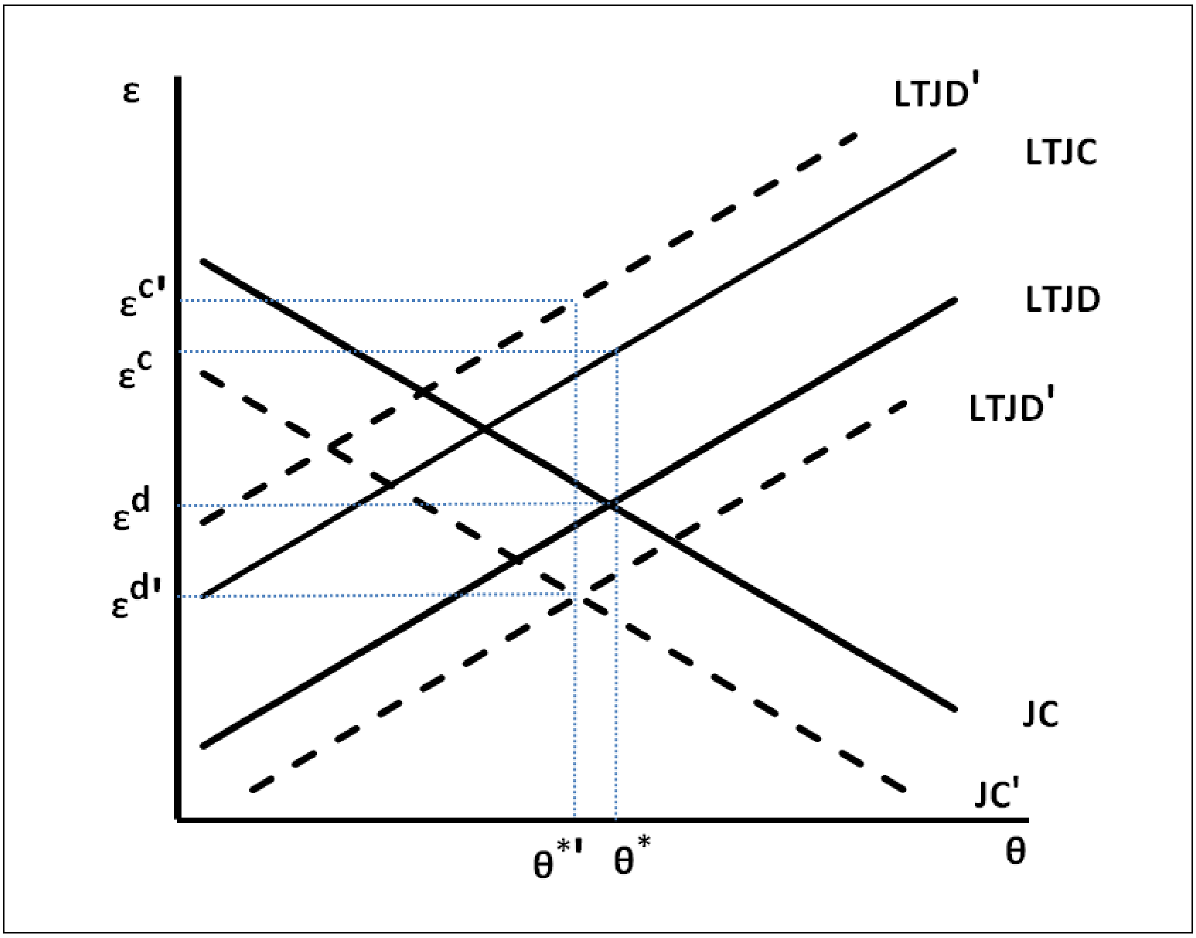

Figure 3: Effects of an increase in the firing cost (f)

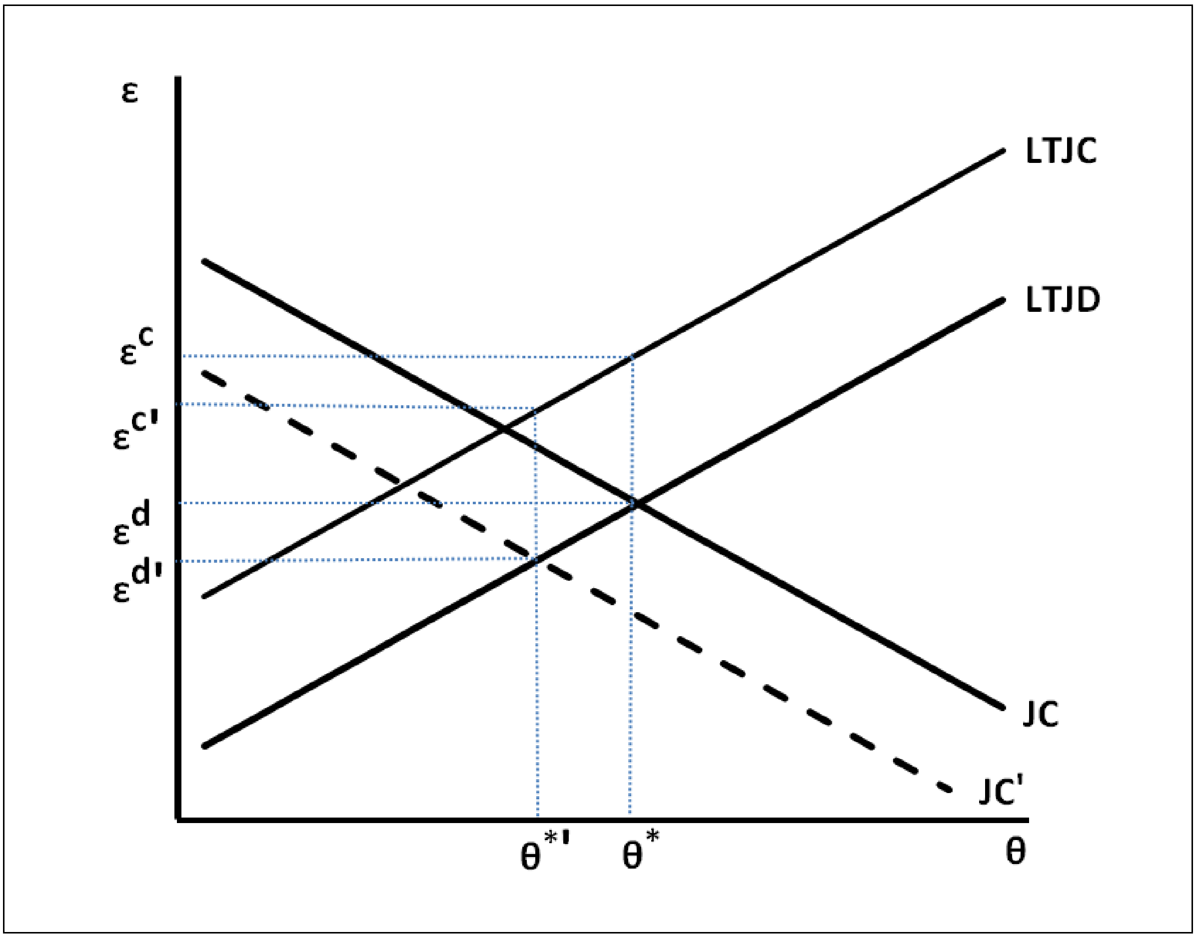

Figure 4: Effects of a reduction in the proportion hires on temporary contracts (p)

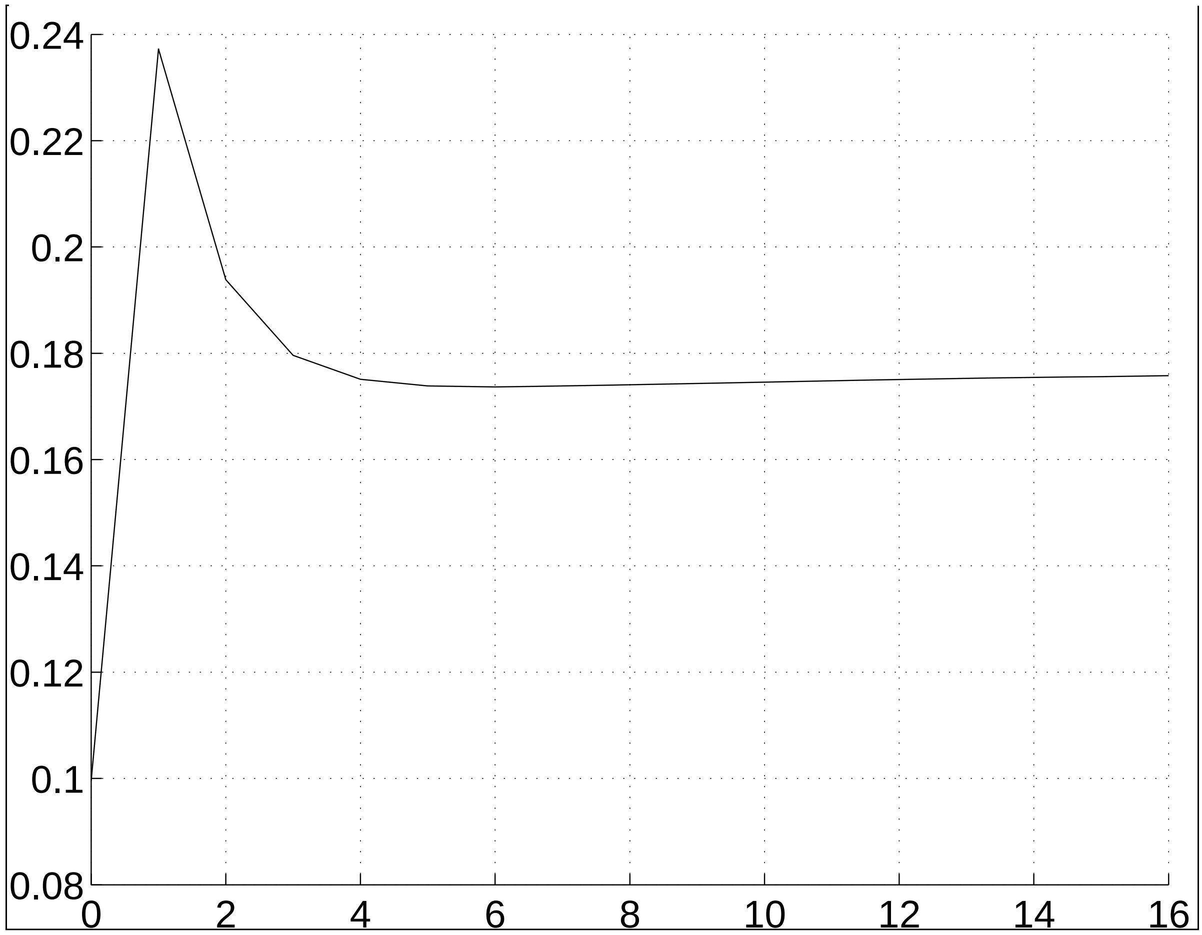

Figure 5: Simulated increase in the unemployment rate in Spain due to the recession in the semi-flexible model

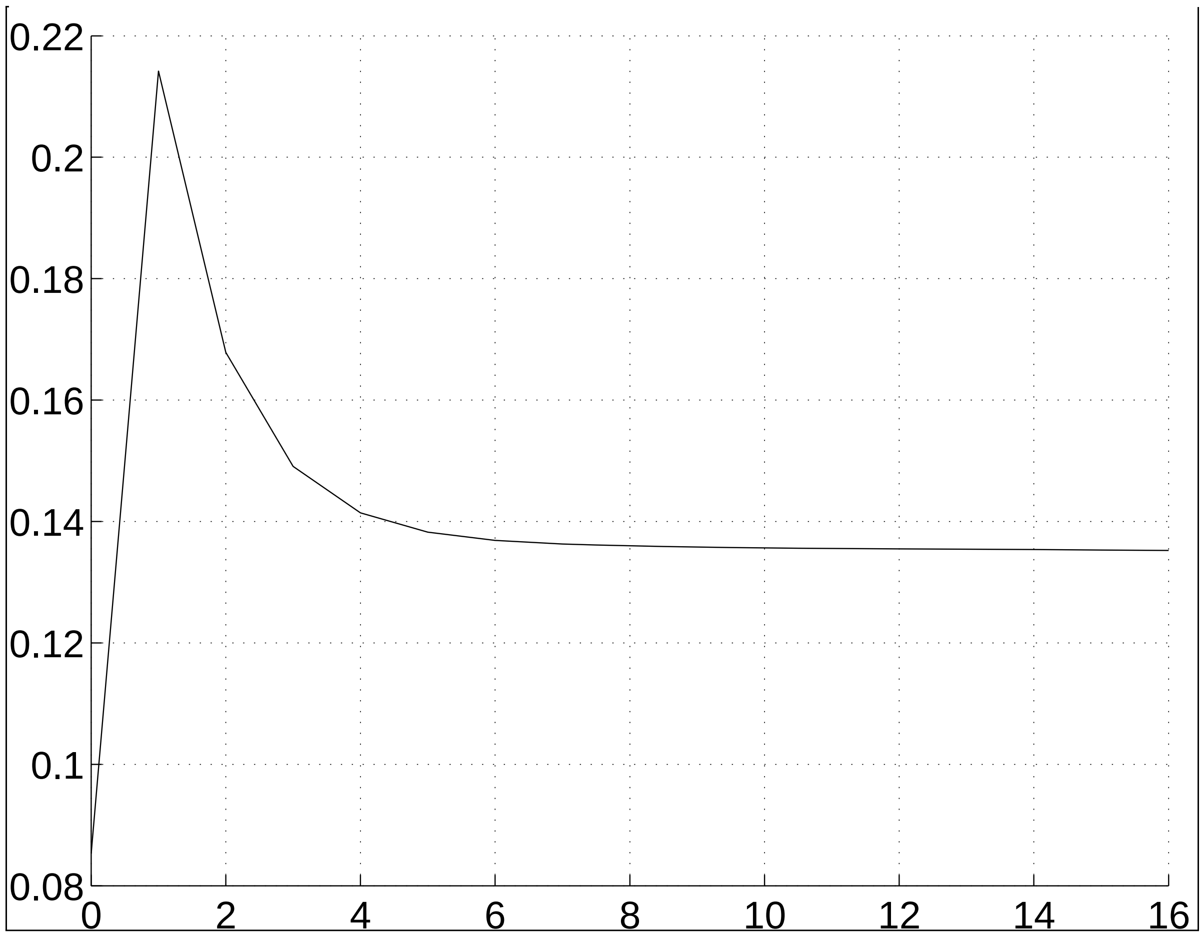

Figure 6: Simulated increase in the unemployment rate in Spain due to the recession in the semi-flexible model with French f, p, and λ