Two-Tier Labor Markets in the Great Recession: France vs. Spain*

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Abstract

This paper analyzes the different response of unemployment to the Great Recession in France and Spain. Both countries share similar labor market institutions and unemployment rates around 8% just before the crisis. Yet, during the crisis, in France unemployment increased by 2 percentage points whereas in Spain it shot up to 19%. We assess what part of this differential is due to the larger gap between the dismissal costs of permanent and temporary contracts, and the laxer rules on the use of the latter in Spain. Using a calibrated search and matching model we estimate that Spain could have avoided about 45% of its unemployment surge had it adopted French employment protection legislation at the start of the crisis.

KEYWORDS: Temporary contracts, unemployment, Great Recession.

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1 Introduction

The goal of this paper is to explain the strikingly different response of Spanish unemployment relative to France during the so-called Great Recession triggered by the financial turmoil in 2007-2008. We focus on a comparison of these two economies because they share quite similar labor market institutions (employment protection legislation, unemployment benefits, wage bargaining, etc.) and exhibited similar unemployment rates, around 8%, just before the crisis started. However, while the French unemployment rate has only risen to 10% during the slump, Spanish unemployment –after falling from 22% in 1994 to 8% in 2007– has surged to 19% by the end of 2009. Our main contribution here is to analyze which part of this very different response can be attributed to what we identify as the main two differences between the labor market regulations of these two economies: a larger gap between the dismissal costs of workers with permanent and temporary contracts and a much laxer regulation on the use of the latter in Spain than in France. We argue that these differences, often ignored in cross-country comparisons of overall employment protection legislation (EPL), could explain up to 45% of the much higher rise of Spanish unemployment.

France and Spain allow us to tell an interesting tale of two neighboring countries. Both are among those European Union (EU) economies which most decidedly promoted temporary contracts in the past in order to achieve higher labor market flexibility. Creating a two-tier labor market is often seen as a politically viable way of achieving this goal when there is great resistance from protected insider workers (see Saint-Paul, 1996 and 2000). However, temporary employment is much more important in Spain, reaching around one-third of salaried employees until recently, whereas this share has been slightly below 15% in France. Therefore it seems natural to ask whether the markedly different unemployment impact of the recession is due to this difference, controling for other potential explanatory factors.

To explore these issues, in line with previous work by Blanchard and Landier (2002) and Cahuc and Postel-Vinay (2002), we propose a search and matching model with endogenous job destruction à la Mortensen-Pissarides (1994) which allows for the distinction between permanent and temporary jobs subject to different employment protection legislation. In our model, firms can offer both types of contracts and, at their expiration date, temporary contracts can be either transformed into permanent contracts or terminated at low or no cost at all. It is now well understood that facilitating the creation of temporary jobs promotes job creation but also increases job destruction, leading to an ambiguous effect on unemployment. However, one result that has drawn less attention in this strand of the literature is that the increase in job destruction induced by temporary jobs may have a larger adverse impact on unemployment if the gap in firing costs in favor of permanent contracts is high enough. The higher this gap, the lower will be the proportion of temporary jobs transformed into permanent jobs, because the much larger firing costs for the latter induce employers to use temporary jobs in sequence, especially if restrictions on their use are mild, rather than converting them into long-term contracts. This implies that facilitating a widespread use of flexible temporary contracts is more likely to raise unemployment on average over the business cycle in labor markets already regulated by stringent permanent job security provisions.

That labor market volatility increases with the introduction of flexible temporary jobs has been stressed, *inter alia*, by Bentolila and Saint-Paul (1992) and Boeri and Garibaldi (2007). They argue that two-tier labor market reforms have a transitional honeymoon, job-creating effect which typically precedes reductions in employment as a result of temporary workers' lower labor productivity. Deepening this line of research, Costain *et al.* (2010) and Sala *et al.* (2011) have recently studied the cyclical properties of dual labor markets subject to limitations on the use of temporary contracts.[1] In particular, they explore whether flexibility at the margin is the reason why labor markets with a relatively high degree of EPL may display similar volatility as fully flexible ones. For example, focusing also on the Spanish case, Costain *et al.* (2010) estimate that unemployment fluctuates 22% more in the prevailing dual labor market than it would in a unified economy with a single labor contract. In common with this strand of the literature, our approach focuses on the interactions between aggregate productivity shocks and EPL,

[1] See also Boeri (2010), which surveys the literature and analyzes qualitatively the effects of labor market policies in a two-tier economy.

including the regulation of temporary jobs. However, while available work focuses on labor market dynamics over the business cycle following a sequence of shocks, ours relies exclusively on a single shock which captures a particularly relevant event, as is the case of the Great Recession. This simpler approach has the advantage of enabling us to be more precise about the role played by specific features of labor contracts that can account for the different response of France and Spain to this global crisis.

From this perspective, our model differs from those of Costain *et al.* (2010) and Sala *et al.* (2011) in three main respects. First, they assume that temporary jobs can be destroyed at any time. However, regulations impose that destroying a temporary job before its date of termination entails a penalized severance pay and so, since firms almost never incur it, we exclude this option in our model. Second, we assume that time is needed to destroy permanent jobs, whereas they assume that these jobs can be instantly destroyed.[2] Our assumption is consistent with regulations which impose advance notice and induce delays in job destruction due to the time needed to settle legal disputes. Third, we also differ in how wage bargaining is modeled. We do not assume that employers have to pay firing costs if they do not agree on the initial wage contract. Instead, we assume that firing costs are paid when workers and employers separate only if a permanent contract has already been signed. As Ljungqvist (2002) has shown, assuming that firing costs are paid by the employer if there is a separation in the initial bargain magnifies the impact of firing costs on unemployment. We think that our assumption is more plausible and that it captures better the institutions of France and Spain, where labor contracts are renegotiated by mutual agreement (Malcomson, 1999; Cahuc *et al.*, 2006).

The rest of the paper is structured as follows. We start by documenting in Section 2 the relative performance of the French and Spanish labor markets during the crisis vis-à-vis the preceding expansion. In Section 3 we present the main features of the regulations affecting these two labor markets, devoting special attention to the EPL gap between permanent and temporary contracts, and discuss how strong duality in labor markets can also affect unemployment via sectoral specialization, labor mobility, and mismatch. In Section 4, we

[2] Garibaldi (1998) incorporated advance notice in a model with endogenous job destruction.

introduce a stylized search and matching model focusing on the equilibrium behavior of firms and workers in an economy with both temporary and permanent contracts, where it is possible to transform the former into the latter. In Section 5, we start by analyzing the extent to which our calibrated model, with each country maintaining their respective prevailing institutions before the slump, can account for the change in the performance of their labor markets from the boom (represented by 2005-2007) to the recession (2008-2009), following a common adverse shock affecting both economies. We then compute the share of the rise in Spanish unemployment during the crisis which is due to differences in EPL with France by running counterfactual simulations on how it would have evolved had Spain adopted French EPL either when the recession started or during the preceding expansion. Section 6 concludes.

2 Labor market performance before and during the crisis

As depicted in Figure 1, France and Spain 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 and showed much higher volatility. The difference increased up until the end of 1994 and shrank thereafter. By the end of 2005, the two unemployment rates seemed to have come full circle, reaching similar values around 8%. Since the onset of the worldwide recession, however, unemployment in Spain has shot up from 8% to 19% while French unemployment kept on falling, to 7.2%, and has then risen to 9.3%. In the rest of this section we briefly discuss some potential explanations for this strikingly different response.

Table 1 presents a few key labor market magnitudes from 1998:1 to 2007:4, an expansion, and 2008:1-2009:4, a recession. Focusing on private sector employees, it is apparent that throughout the boom employment growth has been much higher in Spain. It is the Spanish figures that are remarkable, while the French ones are typical of the euro area experience. The Spanish employment surge stems especially from construction and market services (8.1% and 6.8% per year, respectively), whereas the corresponding French figures were more moderate, including a fall in manufacturing employment.

In the downturn, France has suffered a sizeable employment fall (1.6%), which is however dwarfed by the Spanish free fall (5.7%). The latter stems especially from a collapse of almost 20% p.a. (i.e. 36% in total) of employment in construction and a 10.8% drop in manufacturing.

As discussed earlier, it is very hard to explain the extreme volatility of the Spanish labor market without recourse to the prevailing types of contracts. As shown in Table 1, temporary contracts in 1998 represented almost 14% of employees in France and 33% in Spain. During the expansionary period 1998-2007, the vast majority of (quarterly) flows from unemployment to salaried employment were under these contracts: 78.4% in France and 87.2% in Spain. Correspondingly, they also represented the majority of employment outflows, in particular 88% in France and 80.1% in Spain (from administrative sources). Consequently, the brunt of job losses since the end of 2007 has been borne by temporary jobs: while, in total, 277.000 net jobs where destroyed in France, actually 324.000 temporary jobs disappeared, and the corresponding figures for Spain are simply stunning, 1.33 and 1.38 million jobs, respectively.

3 Labor institutions in France and Spain

In this section, the institutional settings of the French and Spanish labor markets are briefly reviewed. We focus on EPL, unemployment benefits, and wage bargaining, arguing that the main difference arises from the higher EPL gap between permanent and temporary workers in Spain than in France. Finally, we examine labor mobility, which we document to be much lower in Spain, partly as a result of the high uncertainty associated with temporary jobs and the low conversion rates to permanent ones induced by the large EPL gap.

3.1 Employment protection

As mentioned earlier, France and Spain are among the countries where governments have, through their regulations, more strongly promoted temporary contracts to increase labor market flexibility aimed at reducing unemployment.

Table A1 in the Appendix presents the key features of regulations concerning dismissals in the two countries. Permanent contracts are subject to advance notice periods and severance pay.[3] Legal minimum severance pay for economic reasons in France is equal to 6 days of wages per year of service (the latter clause is understood hereafter) plus 4 extra days for tenure above 10 years. In Spain that pay is equal to 20 days, whereas for unfair dismissal it is equal to 45 days. Thus, it may seem that firing permanent employees is much cheaper in France than in Spain, but this is not necessarily so, since there are additional components of firing costs, such as notice periods, court procedures, etc. which should be taken into account

Computing overall measures of EPL is not easy. Let us consider the widely used OECD (2004) index of the strictness of EPL, which ranges from 0 to 6, with higher scores indicating stricter regulation. For 2008, from Venn (2009), this indicator gives the following scores: (a) for permanent jobs, 2.5 for both France and Spain; (b) for temporary jobs, 3.6 for France and 3.5 for Spain; and (c) for collective dismissals, 2.1 for France and 3.1 for Spain. The overall EPL score is 2.9 for France and 3.0 for Spain (where the US has the lowest value, 0.7, and Portugal and Turkey the highest, 4.3).[4] Hence, both countries are ranked in the middle-high range, with Spain appearing only marginally more regulated than France. However, there are good reasons for thinking that these EPL indices, based on legal regulations and not on their implementation, do not capture Spanish EPL satisfactorily. As argued below, *de facto* protection of temporary jobs is much weaker in Spain than in France, whereas the opposite holds for permanent jobs.

Moreover, economic theory on the effects of firing costs on employment tells us that what matters 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 (Lazear, 1990). Rather,

[3] In France, this includes the regular permanent contract or *contrat à durée indeterminée* (CDI) and the *contrat nouvelles embauches* (CNE), with different severance pay and other conditions, introduced in 2005 for small firms (see Cahuc and Carcillo, 2006). In Spain it includes both regular permanent contracts, *contrato indefinido ordinario*, and the *contrato de fomento de la contratación indefinida*. In principle, the latter has lower severance pay but *de facto* most often firms incur the severance of the former under unfair dismissal to avoid judicial procedures.

[4] These scores correspond to definitions *EPR_v1*, *EPT_v1*, *EPC*, and *EP_v2*, respectively. Very similar values apply in 2005.

when the probability that workers contest dismissals is very high, other costs are relevant, namely those not appropriated by firms and workers but generated by third agents such as labor courts and labor authorities, i.e., *red-tape* costs. For example, in France, severance pay offered by firms in exchange for a quick resolution of collective dismissals is typically higher than either statutory or collectively-bargained severance. In Spain, the extra cost applies not only to collective dismissals but also to individual ones making it much higher. In effect, since firms that go to court lose in 3 out of 4 cases on average, they typically prefer to allege disciplinary reasons even for dismissals that are justified on economic grounds. In this way, they do not need to give advance notice and, upon immediately acknowledging the dismissal to be unfair, they avoid going to court by disbursing the penalty 45-day severance pay rate upfront.[5] In this paper we adopt a conservative strategy and focus on the distortionary effect of the firing tax component of severance pay, using estimated red-tape costs. As discussed in Section 5.2 below, these turn out to be 50% higher in Spain than in France, though in exchange the notice period is much shorter in Spain, a feature also accounted for in our calibrated model.

Further, the use of temporary contracts is much more limited in France.[6] They can only be used in nine specific cases: for replacing an employee who is absent or temporarily working part time, for transitorily replacing 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 industries (naval, entertainment, professional sports, etc.). In Spain, though temporary contracts may be used only for objective reasons (specific work, replacement, etc.), for training, to hire disabled workers, and to cover the part of the working day left uncovered by an employee close to retirement, there are no *de facto* restrictions. Employers are hardly ever monitored by

[5] This option has been available to firms in Spain since the Law 45/2002 and has been used by firms in 81% of dismissals of workers with permanent contracts since 2008 where the lower severance pay of 20 days associated to dismissals for economic reasons would have been much more natural.

[6] We use the term "temporary contracts" to denote all sorts of non-permanent contracts. We focus on fixed-term contracts, captured by the *contrat a duration determinée* (CDD) in France and the *contrato temporal* in Spain. Other non-permanent jobs exist in France, such as temporary jobs proper (*emploi interimaire* or *emploi temporaire*) and in Spain. Moreover, in both countries there are jobs intermediated by temporary work agencies and most apprenticeship contracts are temporary as well. Empirically, we shall consider all of these as temporary jobs.

the authorities to ensure compliance with the alleged reasons for hiring under temporary contracts. Finally, while in both countries the maximum duration of temporary contracts is 24 months, uncertain-completion jobs (e.g., in the construction industry in Spain before the crisis) may lawfully last for an indeterminate period.[7] In Venn (2009), the OECD acknowledged that its EPL indices did not take into account law enforcement and started to revise them regarding the operation of labor courts in line with our reasoning, but no attempt has been made yet to consider enforcement in temporary contracts.

In sum, the previous discussion leads us to claim that, in contrast with OECD rankings, EPL for permanent contracts is more stringent in Spain than in France, while the opposite is true for temporary contracts. Thus overall EPL may look similar but aggregate indices hide the fact that the gap in EPL between the two types of contracts is quite higher in Spain.[8]

3.2 Unemployment benefits

According to the OECD Benefits and Wages database (January 2010), the net replacement rate in 2005 for a childless average production worker married to a non-working partner was equal to 66% in France and to 62% in Spain. Likewise, if the same worker was married to a working partner and had two children, the replacement rates were similar: 81% in France and 85% in Spain.

In France, the length of benefits is equal to the worker's contribution period and it is capped at 23 months (but higher for workers older than 50).[9] In Spain, benefit length increases in steps implying durations that go from 22% to one-third of the contribution period –which has to be of at least 12 months– and it is capped at 24 months. In our simulations below, we take into account both statutory benefits and coverage, which is

[7]A labor market reform was approved in Spain in September 2010, altering severance pay for permanent and temporary contracts, in particular banning open-ended temporary contracts. Since this reform does not apply to the period we examine, we shall not consider it in our simulations below.

[8]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.

[9]In 2006-2008, the unemployed could receive benefits during 7, 12 or 23 months depending on the length of their contribution period (6, 12 or 16 months, respectively).

affected by duration rules.

Workers who exhaust unemployment insurance or are ineligible for it are entitled to the so-called "minimum integration income" (*Revenu Minimum d'Insertion*, RMI) in France, amounting to €454.63 (the minimum wage net of social contribution for full time workers being equal to €1,042) and €681.9 for a couple (plus child benefits).[10] 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. Additional welfare benefits are available in some regions, but coverage is typically low.

3.3 Wage bargaining

Collective wage bargaining is similar in the two countries, as a result of Spain adopting French regulations in the early 1980s, when its post-dictatorship system was established. In both countries most workers are covered by collective bargaining, above 90% in France and above 80% in Spain. Bargaining takes place mostly at the industry level and there is geographical fragmentation (through industry-department agreements in France and industry-province agreements in Spain). Conditions set in these agreements are usually extended to all firms and workers in the relevant industry or geographical area, discretionarily in France and automatically in Spain.

In Spain, workers are represented by worker delegates in firms with less than 50 employees and by worker committees in larger firms, reflecting French practice. Unions obtain representation from firm-level elections, where voters need not be unionized. As a result, union density is very low (8% in France and 14.6% in Spain in 2007, see Visser, 2009) but mostly irrelevant. France and Spain have the highest gaps in the OECD between the coverage of collective bargaining and union density.[11] One difference, though, is that

[10] The RMI was replaced, as of the third quarter of 2009, by the *Revenue de Solidarité Actives* (rSa). Another scheme, with an amount equivalent to the RMI (which is open to those older than 25 who have never worked) applies to those who have worked before and are no longer eligible: the *Allocation de Solidarité Specifique* (ASS), with an amount equivalent to the RMI.

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

whereas in Spain there are two nationally representative unions (CCOO and UGT), in France there are eight unions. Nonetheless, they are not equally powerful and two unions are especially influential, particularly in the public sector (CGT and CDFT). Lastly, it is worth noting that, although the monthly statutory minimum wage is higher in France than in Spain (1,321 and 728 euros in 2009, respectively; Eurostat), the ratio between the minimum and the average wage, or Kaitz ratio, is not very different (39% and 35% respectively).[12] Moreover, fewer full-time workers receive the minimum wage in Spain than in France (about 5% vs. 18%), because collective bargaining sets wage floors above the statutory level.

In sum, the two countries are not significantly different in their wage setting institutions and therefore we do not explore any potential differences in this dimension in the simulations below.

3.4 Mismatch, sectoral specialization and labor mobility

Besides the EPL gap, labor mobility is the other dimension in which the French and Spanish labor markets differ markedly.[13] This difference is not apparent in job mobility. In particular average job duration, considering all contracts, is equal to 7.6 years in France and 8.2 in Spain,[14] while the fractions of workers who have changed job in the preceding 10 years are 49% and 50%, respectively.[15]

Yet, geographical mobility is much lower in Spain. For instance, in Spain the fraction of people who have never moved after leaving the parental home is equal to 23% but only 8% in France. Moreover, while 30% of the French population has moved across regions, only 11% of Spaniards have done so. Overall, the interregional migration rate for people aged 15-64 is 2.1% in France and only 0.2% in Spain.[16]

[12] In computing these figures we take into account the substantial rebates (26 pp.) on social security contributions available to French employers who pay workers at the minimum wage.

[13] We are very grateful to Etienne Wasmer for suggesting that we take this issue into account.

[14] The source is the 2005 Eurobarometer analysis by Vandenbrande *et al.* (2006), Figure 20. Nevertheless, the OECD reports durations of 11.1 and 8.9 years, respectively, for France and Spain over the preceding period, 2000-2004 (OECD Employment database, 6/2011).

[15] Vandenbrande *et al.* (2006), Figure 23. This is in spite of the higher temporary employment rate in Spain, due to its higher EPL on permanent jobs vis-à-vis France.

[16] Sources: Vandenbrande *et al.* (2006), Figure 3, and Table 2, and OECD (2005), with the data

Low interregional mobility has raised the impact of the recession in Spain, since its regions have been hit quite differently by the crisis. The dependent employment destruction rates across regions, which range from -2.3% to -15.0% (2007:4-2009:4), are closely related to employment shares in Construction, which range from 19.2% to 55.0%, as attested by a raw correlation coefficient of 0.753.[17]

We argue that the strong dependence of the Spanish economy on the Construction industry since the late 1990s (11.9% of GDP and 13.3% of employment in 2007 vs. 6.3% and 6.9% in France; Eurostat) is partly related to the existence of a highly segmented labor market. As a result of Spain joining the euro area in 1998 with a higher inflation rate than France, real interest rates fell by 6 pp., against 1.5 pp. in France, fueling a strong investment boom. Investors in Spain bet rationally for low-value added industries rather than high value-added ones (like ICT) for at least two reasons. Firstly, the rigid permanent contracts would have been inadequate to specialize in more innovative industries, since higher labor flexibility is required to accommodate the higher degree of uncertainty typically associated with producing high value-added goods (Saint-Paul, 1997). Secondly, there was a large increase in the relative endowment of unskilled labor in Spain over the period. The higher availability of low-skilled jobs through very flexible temporary contracts led to an increase in the dropout rate from compulsory education (from 18% in 1990 to 32% in 1997) and then to a huge inflow of unskilled immigrants, causing a 10 pp. increase in the foreign population rate. As a result, many small and middle-sized firms adopted technologies which were complementary with this type of less-educated workers, leading to a boom in Construction.

Low geographical mobility is a source of mismatch and higher equilibrium unemployment via reallocation rather than via conventional aggregate shocks (Layard *et al.*, 1991). This has become quite apparent in the aftermath of the recession in Spain, where the range between the lowest and the highest regional unemployment rates rose from 10.3 pp. in 2007:4 to 15.6 pp. in 2009:4, while the standard deviation of those rates increased from

corresponding to 2003.

[17] These figures leave out the Balearic Islands, which have an abnormally high employment level in 2009:3 due to seasonal factors related to the turism industry.

3 to 5. In contrast, that range only grew in France from 9.6 pp. to 11.3 pp., while the standard deviation changed only from 1.3 to 1.4.[18]

Geographical mobility depends on many factors, among them institutional determinants of regional divergence in incomes and unemployment rates. For instance, Bentolila and Dolado (1991) found, for 1962-1986 (roughly a pre-temporary employment period in Spain), that if the national unemployment rate doubled (from 10% to 20%), the elasticity of interregional migration flows to regional wage and unemployment differentials halved. On the other hand, Rupert and Wasmer (2009), echoing earlier work by Oswald (1999), highlight the role of housing regulations in accounting for differences in unemployment between Europe and the US. The Spanish rental market works very poorly and represents only 12% of the housing market, against 40% in France. Therefore, it clearly hampers regional migration (Barceló, 2006), through various institutional factors, in particular a legal structure that favors tenants vis-à-vis landowners and an income tax system which heavily subsidizes owner-occupied housing (López-García, 2004).

Moreover, like with industrial specialization, differences in EPL may be strongly related to differences in labor mobility. The widespread use of temporary contracts may reduce regional migration despite its potentially beneficial effect on job creation. For example, using individual data for Spain, Antolín and Bover (1997) found that temporary employment reduces the likelihood of interregional migration. The insight is that a temporary job in a different region does not provide much job security whereas migrating means giving up, to a large extent, the support of family networks, which are a key insurance mechanism in Southern Europe (Bentolila and Ichino, 2008). In a similar vein, Becker *et al.* (2010) find, with a sample of 13 European countries over 1983-2004, that youth job insecurity discourages home-leaving, whereas parental job insecurity encourages it. Thus, to the extent that permanent and temporary contracts are respectively held by older and younger workers, the much higher EPL gap in Spain is consistent with its much lower home-leaving rate.

Overall, the above evidence indicates that the Great Recession is likely to have induced

[18] France: Labor Force Survey, BDM Macro-economic Database (www.bdm.insee.fr). Spain: Labor Force Survey (www.ine.es).

a much larger increase in mismatch in Spain than in France. Indeed, this is confirmed by Figure 2 which shows how the rather stable (from 1994 to 2007) Spanish Beveridge curve has experienced a large outward shift of both the vacancy and the unemployment rates during the Great Recession.[19] For France, though data are not available on vacancy stocks, only on flows (and thus the French Beveridge curve is not plotted), vacancy flows show no indication whatsoever of an outward shift from 1997 until 2009. This means that the correct interpretation of the effect of the slump on the Spanish labor market should include growing mismatch in addition to a negative aggregate shock. To take this combined feature into account in our calibration exercise,relying on our previous reasoning we take the shortcut of allowing for an exogenous and concomitant adverse shift in the Beveridge curve while the negative productivity shock occurs. Modelling sectoral specialization in an endogeneous way in this type of search and matching models with different EPL is beyond the scope of this paper.

4 Model

This section presents our search and matching model, inspired by Blanchard and Landier (2002) and Cahuc and Postel-Vinay (2002), where the seminal Mortensen-Pissarides (1994) model with endogenous job destruction is extended to allow for the distinction between temporary and permanent jobs entailing different dismissal costs, advance notice periods and wage renegotiation procedures.

4.1 Model setup

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

[19] Unemployment is expressed as a percentage of the labor force whereas vacancy is in per thousand. The figures in the graph are adapted from results in Bouvet (2009) spliced with survey data from the Encuesta de Coyuntura Laboral (www.mtin.es/estadisticas/ecl/Ecl22010/SER/index.htm), which start in 2000.

support $[\underline{\varepsilon}, \overline{\varepsilon}]$.[20] The idiosyncratic productivity shocks follow a Poisson distribution with incidence rate μ. In line with Pissarides (2000), it is assumed for simplicity that all new jobs start at the highest productivity $\overline{\varepsilon}$.[21]

There are two types of jobs, temporary and permanent, both endowed with the same productivity distribution. Trying to mimic realistic wage bargaining procedures, we assume that wages are renegotiated in permanent jobs but not in temporary jobs, where wages are often fixed for the whole duration of the contract. Unemployed workers have access to temporary jobs with probability p, exogenously set as EPL policy, and to initial permanent jobs with probability $1 - p$. Temporary jobs are terminated with per unit of time probability λ, at which point firms either convert them to permanent jobs or destroy them at no cost. A new value of productivity is drawn upon conversion.

There are two constraints to destroy permanent jobs. First, there are red-tape firing costs f, to be directly interpreted as the EPL gap under the previous assumption that termination of temporary contracts entails no red-tape firing costs. Secondly, time is needed to destroy permanent jobs: when an employer wishes to destroy this type of job, there is a firing permission arriving at a Poisson rate σ (Garibaldi, 1998) which typically captures not only advance notice, but also the uncertain length of time needed to settle legal disputes. We assume that between the date at which the employer decides to destroy the job and the date at which the authorization arrives, the productivity of the job is the lowest possible, i.e. $\underline{\varepsilon}$, and that the *interim* wage equals the average wage in the economy, $\overline{\omega}$ (see its definition below), capturing in this fashion a prototypical employment record in this economy.

Unemployment benefits are denoted by b. Is is important to highlight that both firing costs and unemployment benefits should be interpreted as monetary flows in terms of the average wage of a prototypical employment record, i.e., as $f\overline{\omega}$ and $b\overline{\omega}$, though for short they will be respectively referred to as f and b hereafter.

[20] We also introduce an aggregate shock, which corresponds to the Great Recession, rather than a sequence of shocks as in L'Haridon and Malherbet (2009), Costain *et al.* (2010) or Sala *et al.* (2011).

[21] This assumption reduces the number of productivity cutoff levels to just two (see equations PJD and PJC below) which simplifies considerably the analysis and calibration of the model, without qualitatively affecting its main implications had more cutoff levels been allowed.

There is a Cobb-Douglas matching function $m(u,v) = m_0 u^\alpha v^{1-\alpha}$ à la Pissarides (2000), with matching rates $q(\theta)$ for vacancies and $\theta q(\theta)$ for the unemployed. Thus, labor market tightness is given by $\theta = v/u$, where v and u are the masses of vacancies and unemployment, respectively. Note that a lower value of the shifter m_0 implies higher mismatch, that is, an outward shift of the Beveridge curve. Finally, there is a flow cost of keeping jobs vacant equal to $h > 0$ per unit of time.

In terms of notation, subindices are as follows: t stands for a temporary job, 0 for a new permanent job, p for a continuing permanent job, and a for jobs waiting for a dismissal authorization. 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 subject to firing costs when wages are initially being negotiated,
- $J_p(\varepsilon)$: Value to the firm of a continuing permanent job with productivity ε, subject to both firing cost f and advance notice,
- J_a : Value to the firm of a permanent job under advance notice,
- 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 job with productivity ε, not subject to firing costs when wages are initially being negotiated (recall 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 and advance notice,
- W_a : Value to the worker of a permanent job under advance notice.

4.2 Bellman equations

The Bellman equations for the firm's asset values are as follows:

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

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

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

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

$$rJ_a = \underline{\varepsilon} - \overline{\omega} - \sigma\left[f + J_a - V\right] \tag{5}$$

According to (1), keeping a job vacant 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 $\varepsilon - w_t$, where w_t is the pre-established wage for this type of contracts which does not depend on productivity.[22] After the productivity shock takes place, at rate μ, this type of job, with an asset value to the employer of $J_t(\varepsilon)$, necessarily continues until the arrival of the date at which it can be destroyed. This assumption captures the fact that employers laying off workers on temporary contracts before the end of the contract would have to pay the permanent-contract red-tape severance f and therefore prefer to wait to their termination date. Temporary contracts are terminated at rate λ.[23] Then, a new value of the productivity shock is drawn, in line with available evidence indicating that workers'

[22] This could seem as an assumption making temporary jobs quite unattractive to firms in exchange for reducing the number of productivity thresholds to just two. We could have assumed an alternative wage setting for temporary workers, like e.g. the value of being unemployed plus ε. However, even under our simplifying assumption, they may be preferred to initial permanent jobs, especially when dismissal costs (red tape and advance notice) are high.

[23] Assuming that the duration of temporary contracts is fixed rather than random leads to more complex formulations without changing the properties of the model.

productivity may be different under permanent and temporary contracts, and the job is either destroyed or converted into a new permanent job.[24]

The asset value to the employer of a new permanent job, filled either by an unemployed worker or by a worker on a temporary contract, is $J_0(\varepsilon)$, which according to (3) yields a flow profit of $\varepsilon - w_0(\varepsilon)$. Once a productivity shock occurs, at rate μ, the permanent contract either becomes a continuing one –with an asset value to the firm of $J_p(\varepsilon)$– or a job under advance notice –with an asset value of J_a– otherwise. Equation (4) indicates that the employer with a continuing permanent job obtains a flow profit of $\varepsilon - w_p(\varepsilon)$, such that the only difference with the value of a new job –defined by equation (3)– is that the worker can now use both the firing cost and the advance notice as additional threats in the wage bargain. As mentioned earlier, it is assumed that jobs under advance notice, whose value is defined by equation (5), have the lowest possible productivity $\underline{\varepsilon}$ and pay workers the average wage of the protypical employment record. These assumptions are a simple way to capture the fact that workers under advance notice generally provide low work effort and are paid a wage that depends on their past remuneration. Lastly, (5) also indicates that jobs under advance notice can be destroyed at an incidence rate σ.

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

$$rU = b + \theta q(\theta)[\,p(W_t(\overline{\varepsilon}) - U) + (1-p)(W_0(\overline{\varepsilon}) - U)] \tag{6}$$

$$rW_t(\varepsilon) = w_t + \mu \int_{\underline{\varepsilon}}^{\overline{\varepsilon}} [W_t(x) - W_t(\varepsilon)]\,\mathrm{d}F(x) + \lambda \int_{\underline{\varepsilon}}^{\overline{\varepsilon}} \max[W_0(x) - W_t(\varepsilon), U - W_t(\varepsilon)]\,\mathrm{d}F(x) \tag{7}$$

$$rW_0(\varepsilon) = w_0(\varepsilon) + \mu \int_{\underline{\varepsilon}}^{\overline{\varepsilon}} \max[W_p(x) - W_0(\varepsilon), W_a - W_0(\varepsilon)]\mathrm{d}F(x) \tag{8}$$

$$rW_p(\varepsilon) = w_p(\varepsilon) + \mu \int_{\underline{\varepsilon}}^{\overline{\varepsilon}} \max[W_p(x) - W_p(\varepsilon), W_a - W_p(\varepsilon)]\mathrm{d}F(x) \tag{9}$$

$$rW_a = \overline{\omega} + \sigma\,[U - W_a] \tag{10}$$

Equation (6) shows that an unemployed worker enjoys a flow earnings b and gets in contact with a vacancy at rate $\theta q(\theta)$, either of a temporary job or of a new permanent

[24] For example, Ichino and Riphahn (2005) have shown that the number of days of absence per week increases significantly once employment protection is granted at the end of the probation period.

job, with probabilities p and $1-p$, respectively. Expressions (7) to (9) 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. Lastly, (10) represents the asset value to the worker of being dismissed from a permanent job.

4.3 Surplus sharing

As is conventional in this type of models, the surplus is shared according to a Nash bargain in which workers have bargaining power $\beta \in [0,1]$. The surplus expressions are:

$$S_t(\bar{\varepsilon}) = J_t(\bar{\varepsilon}) - V + W_t(\bar{\varepsilon}) - U \tag{11}$$

$$S_0(\varepsilon) = J_0(\varepsilon) - V + W_0(\varepsilon) - U \tag{12}$$

$$S_p(\varepsilon) = J_p(\varepsilon) - J_a + W_p(\varepsilon) - W_a \tag{13}$$

where the surplus for temporary jobs is defined at the initial productivity level, $\bar{\varepsilon}$, and those of permanent jobs at the levels of the new productivity shock ε.

Since we have

$$W_a + J_a = \frac{\underline{\varepsilon} + \sigma\,(U - f + V)}{r + \sigma}$$

the surplus of continuing permanent jobs can be rewritten as

$$S_p(\varepsilon) = J_p(\varepsilon) - V + f + W_p(\varepsilon) - U - \left(\frac{\underline{\varepsilon} - r\,(U - f - V)}{r + \sigma}\right) \tag{14}$$

The free-entry rule $V = 0$ implies:

$$h = q\,(\theta)\,[pJ_t(\bar{\varepsilon}) + (1-p)\,J_0(\bar{\varepsilon})] \tag{15}$$

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

$$\frac{\theta h}{1-\beta} = \theta q\,(\theta)\,[pS_t\,(\bar{\varepsilon}) + (1-p)\,S_0(\bar{\varepsilon})] \tag{16}$$

Bargaining, together with free entry, implies:

$$\begin{aligned} W_0(\varepsilon) - U &= \beta S_0(\varepsilon) \\ J_0(\varepsilon) &= (1-\beta)S_0(\varepsilon) \\ W_p(\varepsilon) - W_a &= \beta S_p(\varepsilon) \\ J_p(\varepsilon) - J_a &= (1-\beta)S_p(\varepsilon) \end{aligned}$$

Combining (12) and (13) yields:

$$S_p(\varepsilon) = S_0(\varepsilon) + \frac{1}{r+\sigma}\left(\sigma f + b + \theta\frac{\beta h}{1-\beta} - \underline{\varepsilon}\right)$$

where $rU + \sigma f - \underline{\varepsilon} = b + \theta\frac{\beta h}{1-\beta} + \sigma f - \underline{\varepsilon} > 0$ to ensure that there is job destruction. Thus, the surplus from a continuing permanent job is larger than the surplus from a new permanent job, due to our previous assumption that the employer only has to pay the firing cost and to comply with the advance notice if the worker has been confirmed in the job, and not when disagreement arises at the time of the first encounter with the worker. The comparison between the surplus of a temporary job and that of a new permanent job is more cumbersome. On the one hand, the assumption that w_t is not renegotiated from its initial high value (at a productivity $\bar{\varepsilon}$) while $w_0(\varepsilon)$ is allowed to depend on ε, together with the assumption that the same the distribution of productivity shocks applies to both types of jobs, may lead to $S_t(\varepsilon) < S_0(\varepsilon)$ However,there is an effect in the opposite direction, namely that firms with new permanent jobs incur into red-tape firing costs plus advance notice in case of job destruction once wages have been negotiated while temporary jobs are terminated at no cost. Thus, the higher are these costs, the more likely is that the previous inequality might be reversed.

4.4 Job creation and job destruction

The previous expressions for the surpluses yield the productivity thresholds used by firms for the destruction of permanent jobs (PJD) and the creation of permanent jobs (PJC):[25]

$$S_p(\varepsilon^d) = 0 = \varepsilon^d - \frac{r}{r+\sigma}\left(\underline{\varepsilon} - \sigma f\right) - \frac{\sigma}{r+\sigma}\left(b + \theta\frac{\beta h}{1-\beta}\right) + \mu\int_{\varepsilon^d}^{\bar{\varepsilon}} S_p(x)\mathrm{d}F(x) \qquad \text{(PJD)}$$

$$S_0(\varepsilon^c) = 0 = \varepsilon^c + \frac{\mu}{r+\sigma}\left(\underline{\varepsilon} - \sigma f\right) - \frac{r+\sigma+\mu}{r+\sigma}\left(b + \theta\frac{\beta h}{1-\beta}\right) + \mu\int_{\varepsilon^d}^{\bar{\varepsilon}} S_p(x)\mathrm{d}F(x) \quad \text{(PJC)}$$

Hence, subtracting (PJD) from (PJC) yields:

$$\varepsilon^c = \varepsilon^d + \frac{r+\mu}{r+\sigma}\left(\sigma f + b + \theta\frac{\beta h}{1-\beta} - \underline{\varepsilon}\right) \tag{17}$$

[25] Notice that the job creation threshold does not exist for jobs filled by unemployed workers, since these jobs are created at the maximal productivity.

which shows that temporary jobs are destroyed more frequently than continuing permanent jobs, because they are exempt from firing costs. Moreover, the wedge between ε^c and ε^d increases with f and σ for given θ and, for a sufficiently large initial value of f, it does so irrespectively of the value of θ, as our simulations confirm.

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

$$S_0(\varepsilon) = \frac{\varepsilon - \varepsilon^c}{\mu + r} \quad \text{for} \quad \varepsilon \geq \varepsilon^c \tag{18}$$

$$S_p(\varepsilon) = \frac{\varepsilon - \varepsilon^d}{\mu + r} \quad \text{for} \quad \varepsilon \geq \varepsilon^d \tag{19}$$

where (18) and (19) can be replaced into (PJD) to derive the following productivity threshold for the destruction rule of permanent jobs:

$$\varepsilon^d = \frac{r}{r+\sigma}\left(\underline{\varepsilon} - \sigma f\right) + \frac{\sigma}{r+\sigma}\left(b + \theta\frac{\beta h}{1-\beta}\right) - \frac{\mu}{\mu+r}\int_{\varepsilon^d}^{\overline{\varepsilon}}\left(x - \varepsilon^d\right)\mathrm{d}F(x) \tag{20}$$

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.[26] The intuition for the first relationship is that a tighter labor market, by improving the value of unemployment U, reduces the surplus and thus makes the employer-worker pair more exacting on how productive the match 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, (11) 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,

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

[26] It can be also shown to be an increasing function of the average duration of the advance notice period ($1/\sigma$), for values of f sufficiently large, since sign($\partial\varepsilon^d/\partial\sigma$) =sign($rU - \underline{\varepsilon} - rf$). The intuition for this result is that, since the firm anticipates more firing restrictions when conditions are bad, it becomes more exacting (higher ε^d) as advance notice increases (as σ falls).

Evaluation of both (21) and (18) at $\overline{\varepsilon}$ yields $S_t(\overline{\varepsilon})$ and $S_0(\overline{\varepsilon})$, respectively, which can be then used to rewrite the overall job creation equation (JC) out of the free-entry rule as follows:

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

By replacing ε^c by ε^d in equation (JC), using equation (17), it is easy to show that, along the JC locus, labor tightness θ is a decreasing function of the job destruction productivity cutoff 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, besides the unemployment rate (see below), the steady-state equilibrium values of the other three unknowns in our model, θ, ε^c, and ε^d, are found by solving the system of equations given by (JC), (17) and (20). Equilibrium is depicted in Figure 3, where the crossing of the JC (having replaced ε^c by ε^d) and PJD loci in the (θ, ε^d) space determines the equilibrium values of these two variables, whereas (17) determines the equilibrium value of ε^c. In Figure 4 we consider the effect of an increase in the firing cost gap between permanent and temporary workers. This is captured by a rise in f, which shifts the PJD and JC schedules downwards and the PJC locus upwards.[27] Firms unambiguously fire less permanent workers (lower ε^d), transform temporary contracts into permanent ones less frequently (higher ε^c), and reduce labor market tightness (θ) for given values of the productivity thresholds. Although in principle the conventional ambiguity on the effect of firing costs on unemployment holds, as a result of the lower job creation and destruction rates, it will be shown below that, in a dual labor market which initially exhibits a high gap in firing costs, a further increase in f will raise unemployment. The intuition is that, if the conversion rate from temporary to permanent contracts is low to start with, a further rise in f exacerbates temporary workers' turnover precisely when less vacancies are being created. Thus, unemployment is likely to go up, as Blanchard and Landier (2002), and

[27]From equations (17) and (20), we get $\left.\frac{\mathrm{d}\varepsilon^c}{\mathrm{d}f}\right|_{\theta=constant} = \frac{\mu F(\varepsilon^d)}{1-\frac{\mu}{\mu+r}[1-F(\varepsilon^d)]} > 0$.

Cahuc and Postel-Vinay (2002) have pointed out before.

Figure 5, in turn, shows the effect of a reduction in p, an EPL policy parameter which, as mentioned earlier, captures restrictions in the use of temporary contracts. Now the PJC and PJD loci remain unaffected whereas the JC schedule shifts downwards, since job creation is hindered by the lower availability of flexible contracts. As a result, the equilibrium value of θ unambiguously decreases whereas the two productivity cutoff values fall. In other words, since decreasing p lowers job creation, firms become less exacting about hiring and firing, making job turnover less intense. As a result, despite the fall in θ, the impact of a reduction of p on the unemployment rate is ambiguous. However, as before, it can be shown that in economies with large firing costs to start with, a reduction in p is likely to decrease temporary workers' turnover, and this may reduce unemployment, as our quantitative simulations below show. Finally, it is straightforward to check that either a rise in λ (i.e. a higher frequency in the termination of temporary jobs) or a reduction in m_0 (i.e. an increase in mismatch) unambiguously lead to lower θ and higher unemployment.

4.5 Unemployment flows

Let us denote by N_t the number of workers with a temporary contract, N_p those with a permanent contract not subject to advance notice, N_a those with a permanent contract subject to advance notice, and u those unemployed. Then we have:

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

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

$$N_t^* = \frac{1}{\lambda} p u^* \theta q(\theta) \tag{22}$$

$$N_p^* = \theta u^* q(\theta) \frac{1 - pF(\varepsilon^c)}{\mu F(\varepsilon^d)} \tag{23}$$

$$N_a^* = \frac{u^*\theta q(\theta)}{\sigma}\left[1 - pF(\varepsilon^c)\right] \tag{24}$$

$$N_a^* + N_p^* = \frac{u^*\theta q(\theta)}{\mu F(\varepsilon^d)}\left[1 - pF(\varepsilon^c)\right]\frac{\sigma + \mu F(\varepsilon^d)}{\sigma} \tag{25}$$

$$u^* = 1 - N_p^* - N_a^* - N_t^* \tag{26}$$

Solving (23), (25) and (26) for the unemployment rate in steady state, yields:

$$u^* = \frac{\lambda\sigma\mu F(\varepsilon^d)}{\lambda\sigma\mu F(\varepsilon^d) + \theta q(\theta)[\sigma\mu pF(\varepsilon^d) + \lambda\left[1 - pF(\varepsilon^c)\right]\left[\sigma + \mu F(\varepsilon^d)\right]} \tag{27}$$

This equation allows us to provide a heuristic explanation why unemployment might be higher the larger is the EPL gap. To see this, first notice that u^* increases *ceteris paribus* with the cutoff productivity levels ε^d and ε^c, and that, according to (20), the direct effect of a higher gap f is to increase the wedge $\varepsilon^c - \varepsilon^d$. In other words, the higher is f the more likely it is that $F(\varepsilon^c) \gg F(\varepsilon^d)$. Then, by continuity, this argument leads to the existence of a threshold value of the gap in firing costs, $\overline{f}$, such that, for $f > \overline{f}$, u^* will unambiguosly increase with f. The insight is that, if the initial value of f is sufficiently large, $F(\varepsilon^c)$ will become the dominant term when differentiating (27) with respect to f.[28]

The effect of a reduction in the proportion of temporary jobs p on unemployment is ambiguous, as reflected by the two counteracting terms in the denominator of (27) associated to p: $\sigma\mu F(\varepsilon^d)$, on the one hand, and $-\lambda F(\varepsilon^c)\left[\sigma + \mu F(\varepsilon^d)\right]$, on the other. However, using the same argument as before, when f is sufficiently large, $F(\varepsilon^c)$ will dominate $F(\varepsilon^d)$ in the differentiation of (27) with respect to p, so that a reduction in p lowers unemployment. The intuition is now that a lower p means restricting the use of temporary jobs which, in an economy with a large f, are destroyed more frequently than permanent jobs.

Taking both effects together, as we will see below in the simulations section, the fact that Spain has a larger fraction of temporary workers (p) and that firing of permanent workers is more costly imply that the joint surplus of a match is lower in this country, so that unemployment becomes very responsive to adverse shocks.

[28] The exact value of $\overline{f}$ is difficult to obtain since it depends on the other parameter values in a rather cumbersome way. Yet, the intuition given above remains valid.

4.6 Wages

As mentioned earlier, wages are set according to a Nash bargain in which workers have bargaining power $\beta \in [0,1]$. While they can be renegotiated on permanent jobs, we assume that this is not the case for temporary jobs, where the wage w_t is taken to be invariant throughout the length of the contract. Nash bargaining yields:

$$(1-\beta)[W_t(\bar{\varepsilon}) - U] = \beta\,[J_t(\bar{\varepsilon}) - V] \tag{28}$$

$$(1-\beta)[W_0(\varepsilon) - U] = \beta[(J_0(\varepsilon) - V] \tag{29}$$

$$(1-\beta)[W_p(\varepsilon) - W_a] = \beta[(J_p(\varepsilon) - J_a] \tag{30}$$

Using (2)-(4) and (7)-(9), $rU = b + \theta\frac{h\beta}{1-\beta}$, $J_a = \frac{\varepsilon - \overline{\omega} - \sigma f}{r+\sigma}$, and $W_a = \frac{\overline{\omega} + \sigma U}{r+\sigma}$, we get the following expressions for the wages:

$$w_t = \beta\bar{\varepsilon} + (1-\beta)rU \tag{31}$$

$$w_0\left(\varepsilon\right) = \beta\left(\varepsilon + \frac{r+\mu+\sigma}{r+\sigma}\theta h - \frac{\sigma}{r+\sigma}\mu f\right) + \frac{\mu}{r+\sigma}(\beta\underline{\varepsilon} - \overline{\omega}) + \frac{r+\mu+\sigma}{r+\sigma}(1-\beta)b \tag{32}$$

$$w_p\left(\varepsilon\right) = \beta\left(\varepsilon + \frac{\sigma}{r+\sigma}\theta h + \frac{\sigma}{r+\sigma}rf\right) - \frac{r}{r+\sigma}(\beta\underline{\varepsilon} - \overline{\omega}) + \frac{\sigma}{r+\sigma}(1-\beta)b \tag{33}$$

It can be checked that $w_0(\varepsilon) < w_p(\varepsilon)$ and that, for large values of σ and f, $w_0(\varepsilon) < w_t$. Notice that when $\sigma \to \infty$ (i.e. no advance notice), $w_p(\varepsilon) = w_t + \beta[rf - (\overline{\varepsilon} - \varepsilon)]$, so that 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 it is that $w_p(\varepsilon) > w_t$. Similar qualitative results hold when σ is finite.

Finally, to compute the average wage in steady state, $\overline{\omega}$, let us denote by N_0 the number of temporary jobs that have just been created with productivity $\bar{\varepsilon}$ and which have not yet been hit by a productivity shock since their creation. We also denote by N_{0t} the number of permanent jobs that have not been hit by a shock since the time when they were transformed from temporary jobs. Then:

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

so that their steady-state values become:

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

Using the previous employment sizes, it follows that the weighted average wage in this economy is equal to:

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

For example, assuming that $F(.)$ is the c.d.f. of a uniform distribution $U[\underline{\varepsilon}, \overline{\varepsilon}]$ and that there is no advance notice, $\overline{\omega}$ is given by:

$$\overline{\omega} = \frac{\beta h\theta(1-u) + \beta\,\overline{\varepsilon}\,(N_t + N_0) + \beta\frac{\overline{\varepsilon}+\varepsilon^c}{2}N_{ot} + \beta\frac{\overline{\varepsilon}+\varepsilon^d}{2}(N_p - N_0 - N_{0t})}{(1-u)\,(1-b(1-\beta)) + f(\mu+r)(N_0+N_{ot}) - frN_p}$$

5 Accounting for the impact of the crisis

In this section we first show how we calibrate a number of key parameters in the model and then discuss the results of a simulation exercise where we try to ascertain the extent to which the difference in EPL regulation between Spain and France can account for the different evolution of their respective unemployment rates during the crisis.

5.1 Calibration of the model

The length of a model period is chosen to be one quarter. Some of the values of the model's parameters can be imputed directly from data, but others need to be endogenously calibrated to fit a set of labor market magnitudes. Our reference period for the calibration is the latter part of the boom, namely 2005:1-2007:4. The reason is that the unemployment rates in both countries were similar at that time and our goal is to let the model explain the unemployment rate in the bad state (namely 2008:1-2009:4) relative to the good state.

Parameter values are presented in Table 2. The interest rate r is set at 1% per quarter and, like in most of the literature (see, Petrongolo and Pissarides, 2001), the values of the elasticity of the matching function with respect to unemployment (α) and the bargaining power (β) are both chosen to be 0.5.

As for the 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, σ, and p are chosen to represent each country's EPL. Regarding f, recall that it reflects red-tape firing costs. Kramarz and Michaud (2010) 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 this amount (i.e. 1.33 quarters). For Spain, we compute it as the difference between actually paid severance (45 days of wages per year of service, in either individual or collective dismissals) which is induced by labor courts and authorities, and statutory severance for dismissals based on economic reasons (20 days), multiplied by the observed average employment tenure, obtaining a value of 2 quarters.[29] Thus, the value of f for Spain is 50% higher than in France. In contrast, the average advance notice period ($1/\sigma$) is longer in France, where it is set to last four months ($\sigma = 0.75$), than in Spain, where it is set at 3 weeks ($\sigma = 4.3$).[30]

Parameter p, which represents the proportion of newly created contracts that are temporary, is set to 0.85 in France and 0.91 in Spain in the boom (from monthly Social Security data). As already indicated, one of the main reasons for the larger value of p in Spain is the much higher weight of employment in the construction industry during the reference period which, as argued before, has been an important source of hiring of temporary workers in this country. Parameter λ, which captures the (inverse of) the duration of temporary contracts, is set equal to 0.88 both in France and Spain before the crisis, in line with information drawn from their respective Labor Force Survey (LFS).[31]

To simplify computations, the idiosyncratic productivity shock is assumed to be uniformly distributed, with $\underline{\varepsilon} = 0$ and $\bar{\varepsilon} = 1$. Finally, to uncover the values of the remaining

[29] We use a conservative estimate of 8 years of tenure, based on Labor Force Survey data.

[30] In France, the advance notice period is 2 months but it increases to 3 months in many collective agreements and is above 6 months for collective layoffs. Further, the fact that employers ought to interview the worker often implies that it takes around one more month before the employer can send the letter letting the worker know that he/she is fired. In Spain, Law 45/2002, discussed in Section 3.1, has reduced substantially the advance notice period since 2002.

[31] For Spain we also use Social Security data, namely the Muestra Continua de Vidas Laborales (MCVL).

three parameters (h, m_0, and μ), for which no direct information is available, we calibrate them to match the outcomes of the following three equations defining key labor market variables related to temporary and permanent jobs and the overall unemployment rate (which are computed using each country's LFS). The first equation refers to the destruction rate of permanent jobs, which is defined (in steady state) by:

$$\frac{\sigma N_f^*}{N_p^* + N_a^*} = \frac{\sigma \mu F(\varepsilon^d)}{\sigma + \mu F(\varepsilon^d)} \tag{34}$$

Secondly, the steady-state share of temporary jobs in the stock of jobs is given by:

$$\frac{N_t^*}{N_t^* + N_p^* + N_a^*} = \frac{p\sigma\mu F(\varepsilon^d)}{\lambda \left[\sigma + \mu F(\varepsilon^d)\right] \left[1 - pF(\varepsilon^c)\right] + p\sigma\mu F(\varepsilon^d)} \tag{35}$$

Lastly, we use the steady-state unemployment rate given in equation (27).

Once the model has been calibrated to reproduce the stylized facts (targeted and some non-targeted variables) during the reference period, we obtain simulations for the recession allowing for adverse changes in the productivity distribution and possibly in mismatch. These simulations are obtained for two specifications of the average wage, $\overline{\omega}$, applied in computing the firing cost and the unemployment benefit during the recession. In the first one we consider that $\overline{\omega}$ corresponds to the contemporaneous calibrated average wage (i.e. in the bad state). In the second specification $\overline{\omega}$ takes its previously calibrated value in the good state. This is meant to mimic the fact that in reality unemployment benefits and severance pay are linked to workers' previous experience and tenure, respectively. For notational convenience, these two specifications will be labeled as the *endogenous wage model* and the *fixed f-b model*, respectively.

5.2 Simulation results

In this section we summarize the main results of several simulation exercises. We present targets (actual data) and outcomes (simulated data) for both countries in the expansionary and recessionary periods, using the two alternative ways of computing $\overline{\omega}$ just described. For the sake of brevity, however, we will mainly focus on the results stemming from the *fixed f-b model*, which we see as a more realistic setup.

Table 3 presents the data and the simulated steady-state values of the unemployment rate, the permanent jobs destruction rate, and the share of temporary contracts during the expansion (2005:1-2007:4) and the recession (2008:1-2009:4).[32] Further, we add in the last column a relevant non-targeted moment, namely the conversion rate of fixed-term contracts within the same firm. As can be observed, for both countries we are able to match fairly well the chosen targets during the reference expansionary period, especially for the unemployment and the temporary employment rates.[33]

We follow two approaches in running the simulations for the recession. First, we consider a *baseline* simulation where the only degree of freedom in matching targets during the slump is a parameter controling the severity of the productivity shock through a shift in its distribution, whereas all other parameters in the model remain the same as in the preceding expansion. Specifically, we assume that the productivity (uniform) distribution is adversely shifted by a multiplicative factor γ, so that its support shrinks from $[0, 1]$ in the boom to $[0, \gamma]$, with the parameter $\gamma \in (0, 1)$ being calibrated to match the required three targets during the recession under the assumption that the shock is permanent and unanticipated. Secondly, we compute an *alternative* simulation where, besides the severity of the shock, we allow for another model parameter to change, namely m_0. As discussed earlier, this is meant as a shortcut to allow reallocation shocks to play a role in capturing higher mismatch created by the collapse of the Construction industry in Spain, so as to check if there is any improvement in the matching of the targets.

Table 3 (row 4) shows that, in the baseline simulation, we match fairly well the unemployment and temporary employment rates for France during the recession with a value of γ equal to 0.90, namely a 10% adverse shift in average productivity. Notice, however, that this exercise only makes sense if the unemployment rate reaches its steady-state value

[32] Given the trending behavior of the unemployment and the temporary employment rates, especially in Spain, in a few instances we have replaced the period average by a given data point which we see as more representative of the corresponding business cycle phase.

[33] The targeted permanent job destruction rate anchors the incidence rate of productivity shocks. Because the actual mean length of permanent jobs is quite large, we obtain a quite low incidence rate. This may seem conflicting with the fact that the incidence rate governs the switch between the value functions $J_0(\varepsilon)$ and $J_p(\varepsilon)$ but recall that as soon as the firm and the worker have agreed on a wage, the job is subject to a firing cost. However, since the wage is set by mutual agreement, this event does not trigger renegotiation, as the firm cannot credibly threat to separate.

fast enough. Figure 6 shows that this is indeed the case: the speed of adjustment of the unemployment rate is high in France where most of the adjustment to the new steady state after the negative shock takes place in 6 months (25 weeks).[34]

Table 3 (row 8), shows that the baseline simulation for Spain with $\gamma = 0.77$ (a much more adverse shock than in France) matches the value of the unemployment rate during the recession well, but fails badly in matching the share of temporary jobs. This has fallen from 33.3% to 27%, whereas the simulation yields an increase to almost 38%. Given this result and the discussion in Section 3.4 on the rise in mismatch following the aggregate shock in Spain, we perform the alternative simulation, allowing for a newly calibrated value of m_0 together with a new γ. This exercise yields a reduction of m_0 from its initial value of 2.5 to 1.5 and a similar value for γ to that obtained for France, namely $\gamma = 0.87$. Since the outward shift in the Beveridge curve illustrated in Figure 2 reflects reallocation distortions rather than aggregate shocks, the correct interpretation of the recession in Spain is a combination of both types of shocks. In line with the discussion in Section 3.4, workers who have lost their jobs in regions with high unemployment, due to the collapse in Construction, find it very costly to move to other regions with lower unemployment because of both the instability associated to temporary jobs and the rigid regulations of the rental market. The results reported in the last row of Table 3 for this alternative scenario show a substantial improvement in matching the target for temporary work (27.9%), while the much higher unemployment rate remains satisfactorily reproduced.

Figure 7 represents the transitional dynamics of the Spanish unemployment rate. Like in France, the speed of adjustment to the steady state is rather fast. Accordingly, comparing steady states in the expansion and the recession allows us to account well for changes in the unemployment rates in both countries. [35]

[34] 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 productivity, the thresholds and the labor market tightness jump to their new steady-state value. We then essentially look at the adjustment of the stocks given the new flows, noting that some permanent workers will be laid off even without having been hit by an "idiosyncratic" shock because of the shift in the thresholds.

[35] Fast convergence to steady state allows us also to ignore different developments in the growth rate of the labor force (3.3% and 1.8% in Spain during the good and bad states, respectively, against 0.8% and 1% in France) due to large migration inflows in Spain (see Bentolila *et al.*, 2008a). The reason is unemployment rates are independent from the size of the labor force in steady state, Nonetheless, it

5.2.1 Counterfactual simulations: Spain with French EPL

Once we have managed to get a calibration that behaves satisfactorily in both the good and bad states, we can use this model to run counterfactual simulations aimed at gauging the share of the increase in unemployment induced by the recession in Spain that can be attributed to differences in its EPL vis-à-vis France's. First, we carry out this simulation by computing what would have been the increase in unemployment during the Great Recession had Spain adopted French EPL when the slump was starting.[36]

We interpret the adoption of French EPL in two ways, namely in a broad and in a narrow sense. First, it is interpreted as involving not only the direct effect on worker turnover of adopting a lower value of f but also the related indirect effects of a reduction in f on the use of temporary contracts. A lower f is bound to lead to many more conversions as well as more direct hiring of workers under permanent contracts. Thus, under this broad interpretation, besides using the French value of f, we also impute to Spain the French share of new hires on temporary jobs, p, namely 85% rather than 91%. This can also be interpreted as a tightening of the enforcement of the criteria for allowing the use of temporary contracts.

The results from these simulations are presented in Table 4. To compute the counterfactual rise in Spanish unemployment, we follow a difference-in-differences approach where we compare steady-state unemployment before and after the negative aggregate shock. For instance, for the fixed f-b model under the broad interpretation of EPL, the first row in panel A of Table 4 shows the result of subtracting from the overall change in unemployment, 7.43 pp., the change predicted had Spain had the French parameters, namely, 4.05 pp. The implication is that the recession would have raised the unemployment rate in Spain by 3.38 pp. less (i.e. about 45% of the actual increase), had Spain adopted French EPL when the recession started, rather than kept its own. The endogenous wage model provides a lower outcome of 1.42 pp. (about 20% less unemployment

might be worth looking at employment rates and flows between participation and non-participation to have a better understanding of the dynamics of unemployment but this is again beyond the scope of this paper.

[36] Notice that this assumption about the timing of the adoption of French EPL in Spain implies that we do not need to re-calibrate the model in the good state.

than the actual increase) revealing that higher wage flexibility reduces the adverse effects of the EPL gap and the corresponding widespread use of temporary contracts on unemployment. However, it is likely that the endogenous wage model overestimates downward wage flexibility since, according to the simulations for this case, real wages fall by 0.2%, while in reality they increased by 2.5% during the slump (see Table 1).

Next, in order to shed more light on how the adoption of French EPL would have affected unemployment in Spain, we also provide the results of an alternative counterfactual simulation where it is assumed that the French EPL regulation was adopted during the expansion rather than when the recession started. In other words, denoting the Spanish unemployment rate with Spanish regulations in state i (i = *expansion,recession*) as $u_{SP}(f\text{-}p_{SP}, i)$ and with French regulation as $u_{SP}(f\text{-}p_{FR}, i)$, we can decompose the simulated increase in unemployment with the *fixed f-b model*, i.e., Δu_{SP} in three terms:

$$\begin{aligned}
\Delta u_{SP} &= u_{SP}(f\text{-}p_{SP}, recession) - u_{SP}(f\text{-}p_{SP}, expansion) \\
&= [u_{SP}(f\text{-}p_{SP}, recession) - u_{SP}(f\text{-}p_{FR}, recession)] && \text{(I)} \\
&\quad +[u_{SP}(f\text{-}p_{FR},\ recession) - u_{SP}(f\text{-}p_{FR}, expansion)] && \text{(II)} \\
&\quad +[u_{SP}(f\text{-}p_{FR}, expansion) - u_{SP}(f\text{-}p_{SP}, expansion] && \text{(III)}
\end{aligned}$$

where Δu_{SP} = 7.43 pp., (I) = 3.38 pp. (both from Table 4), (II) = 6.19 pp., and (III) = −2.14 pp. In this fashion, we can intepret these results as implying that the higher depth of the recession in Spain than in France has been responsible for an increase of 6.2 pp. in its unemployment rate.[37] Comparison of (I) and (III) illustrates that the combination of a flexible regulation of temporary jobs and a stringent EPL for permanent jobs raises unemployment not only during recessions but also in expansions, since unemployment is always lower in Spain when it has French institutions. Interestingly, the adverse effects of this combination are stronger in recessions (3.4 pp.) than in booms (2.1 pp.).

Regarding the dynamics, Figure 8 depicts three transition paths of the Spanish unemployment rate in the recession again for the fixed f-b model. Instead of depicting the

[37] Comparing (II) with the actual unemployment increase we obtain the effect of less stringent EPL on the dynamic response of the labor market to an adverse shock. This effect is in line with the findings of Costain *et al.* (2010), and Sala *et al.* (2011).

unemployment rate in levels, we plot here the deviations of the unemployment rate following the recession from the steady-state value in the good state, i.e. $u = 10.2\%$ (see the third panel in Table 3). The solid line corresponds to the simulation with Spanish parameters whereas the dashed line captures the case where the values of both f and p are replaced by the French ones. As can be observed, the dynamics in the counterfactual scenario exhibit an overshooting of about 2 pp. in the short-run after the adverse productivity shock hits the economy. The reason is that a reduction in the EPL gap, concerning both firing costs and the use of temporary contracts, exacerbates job destruction in the short run during the recession by making layoffs less expensive. Specifically, an increase in the productivity cutoff for job destruction, ε^d, from 0.76 to 0.86 induces the overshooting. Yet, in the long run, this is offset by much higher job creation, leading to a fall in unemployment towards a new steady state where it would have been 3.4 pp. lower had Spain adopted French EPL rather than kept his own EPL.

Next, panel B in Table 4 presents the results of the simulation under the narrow interpretation of French EPL adoption, i.e. Spanish unemployment with French layoff costs but the Spanish regulation of temporary jobs. The line with crosses in Figure 8 depicts the transitional dynamics of the unemployment rate in this case. The result of the counterfactual increase in Spanish unemployment, is significantly smaller than before. This result stresses the importance of the regulation of fixed temporary jobs in combination with a reduction in the EPL gap, especially because, as stressed in Section 3.4, we believe that there should be a close link between changes in f and those in p. Endogeneizing p as a function of f is bound to be hard in this type of equilibrium search and matching models but it remains a relevant item in our research agenda.

Finally, panel C in Table 4 reports the results obtained in the converse simulation exercise, now addressing the question: By how much would French unemployment have risen during the recession had France adopted Spanish EPL? In line with our previous discussion, we use the broad interpretation of Spanish EPL in terms of the bundle of parameters (f, p). The result is that, instead of the observed rise of 1.5 pp., the French unemployment rate would have risen by 3.1 pp., that is 1.9 pp. more than with their own regulations when the average wage $\overline{\omega}$ applied to f and b is as in the good state, and by only 1.3 pp. under the endogenous wage model. Therefore, these results confirm the previous counterfactual findings for Spain that a higher (f, p) combination induces a larger increase in unemployment to a given negative shock.

6 Conclusions

In this paper we explore how much of the significantly larger increase in unemployment in Spain vis-à-vis France during the Great Recession can be accounted for by the difference in EPL between the two countries. We have argued that the larger gap between the dismissal costs of workers with permanent and temporary contracts in Spain as compared to France has led to different labor mobility and industrial specialization, huge flows of temporary workers into and out of unemployment and, as a result, large job losses during the Great Recession.

To carry out this task, inspired by previous work by Blanchard and Landier (2002) and Cahuc and Postel-Vinay (2002), we have used a search and matching model that extends Mortensen-Pissarides (1994) to allow for the distinction between temporary and permanent jobs entailing different dismissal costs and advance notice periods. 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 (2008-2009).

Subsequently we undertake several counterfactual exercises involving the key parameters capturing employment protection and industry composition in the model, which we interpret to be closely related. Imputing the French-economy levels of a couple of subsets of these parameters to the Spanish economy yields a robust result, namely that the current recession would have raised the unemployment rate in Spain by about 45% less than the observed rise (8 pp. on average between 2005-2007 and 2008-2009) had Spain adopted French EPL institutions rather than kept its own. It is worth noting that this could be interpreted as a conservative estimate of the true effect, since we have only considered the effect of red-tape firing costs in our exercise. Moreover, if wage rigidity were considered to be higher than that implied by standard Nash bargaining, then it is likely that the contribution of the overall gap in EPL to the surge in Spanish unemployment during the Great Recession could have been even larger.

Recently there have been several policy initiatives in Europe defending the idea of eliminating the firing cost gap through the introduction of a single labor contract. Among these 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.[38] The results in this paper, by finding a rather sizable impact of the firing cost gap on the rise in unemployment during the crisis, provide some support for these proposals.

[38] For a specific proposal of a single contract for Spain and its consequences in terms of expected protection and job stability, see García-Pérez and Osuna (2011).

Appendix

Table A1. Employment protection legislation in France and Spain

	Permanent contracts	Temporary contracts
France		
* Notice period	1 month if 6<seniority (months)<24	
	2 months if seniority (months) > 24	
* Severance pay		
1. Economic reasons	6 days of wages p.y.s. (20% of wage)	3 days of wages p.y.s.
	+ 4 days' wages p.y.s. if sen.>10 yrs. (2/15 of monthly wage)	
2. Personal reasons (before July 2008)	Minimum seniority: 1 year	
	3 days of wages p.y.s. (10% of wage)	
	+ 2 days' wages p.y.s. if sen.>10 yrs.	
Observations	Personalized plan for up to 12 months	Max. duration: 24 months
		Restricted to 9 cases
Spain		
* Notice period	1 month	
* Severance pay		
1. Economic reasons	20 days of wages p.y.s.	8 days of wages p.y.s.
	Max. seniority coverage: 12 months	(0 days in some cases)
Observations	Collective dismissal requires administrative approval	Max. duration: 24 months
		Restricted to 4 cases
2. Unfair dismissal	45 days of wages p.y.s. (*)	
	Max. seniority coverage: 42 months	

Note: "p.y.s." means per year of service. (*) 33 days p.y.s. in the employment-promotion permanent contract, though usually 45 days are paid anyway.

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Table 1: Labor market evolutions in France and Spain

Levels (%)			1998:1	2007:4	2009:4
1.	Unemployment	France	10.3	7.5	9.7
		Spain	15.2	8.7	18.9
2.	Fixed-term employment[1]	France	13.8	14.3	13.1
		Spain	33.3	30.9	25.1
Annual growth rates (%)[2]				1998:1-2007:4	2008:1-2009:4
3.	Gross Domestic Product	France		2.3	-1.1
		Spain		3.7	-2.2
4.	Private non-agricultural employees:				
	Total	France		1.5	-1.6
		Spain		5.6	-5.7
	Construction	France		2.4	-1.8
		Spain		8.1	-19.8
	Manufacturing	France		-0.7	-3.2
		Spain		2.0	-10.8
	Market services	France		2.2	-1.1
		Spain		6.8	-0.9
5.	Real hourly earnings[3]	France		1.3	1.1
		Spain		0.3	2.5
6.	Hiring on temporary contracts[4]	France		78.6	83.3
		Spain		90.5	89.6

Notes: [1] As a share of employees. [2] Computed as annual rates of end-of-period on start-of period quarterly levels. [3] Deflated by GDP Deflator, seasonally adjusted. [4] Average share over the corresponding period.
Sources: (1),(3), OECD Economic Outlook Database (www.oecd.org); (2) Eurostat Statistics Database (epp.eurostat.ec.europa.eu); (4), INSEE BDM Macroeconomic Database (www.bdm.insee.fr) for France and INE, Encuesta de Población Activa (www.ine.es) for Spain; (5) OECD Main Economic Indicators Database (www.oecd.org), (6) ACOSS (www.acoss.urssaf.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	0.01	0.01
Matching function elasticity	α	0.50	0.50
Worker bargaining power	β	0.50	0.50
Institutional parameters:			
Unemployment benefit replacemente rate	b	0.55	0.58
Severance pay for permanent employees	f	1.33	2.00
Dual labor market flow rates:			
Probability of hiring into a temporary job	p	0.85	0.91
Probability of temporary contract ending	λ	0.88	0.88
Parameters estimated by indirect inference:			
Cost of keeping jobs vacant	h	0.50	0.25
Matching efficiency level in expansion	m_0	1.50	2.50
Matching efficiency level in recession	m_0'	1.50	1.50
Incidence rate of productivity shocks	μ	0.04	0.09
Lower bound of productivity shock	$\underline{\varepsilon}$	0.00	0.00
Shocks multiplicative shift factor in recession	γ	0.90	0.87
Advance notice rate	σ	0.75	4.30

[1] Reference period: 2005:1-2007:4, save for m_0', for which it is 2008:1-2009:4.

Table 3: Simulation results

	Unemployment rate	Perm. jobs destruction rate	Temporary employment rate	Transition temp. to permanent
France - Expansion				
Data	0.0850	0.0150	0.1260	0.0470
Model	0.0854	0.0305	0.1137	0.0820
France - Recession				
Data	0.0980	0.0130	0.1250	0.0370
Model	0.0973	0.0304	0.1145	0.0793
Spain - Expansion				
Data	0.1030	0.0470	0.3330	0.1000
Model	0.1022	0.0655	0.3300	0.0460
Spain - Recession				
Data	0.1790	0.0400	0.2700	0.0750
Model (1)	0.1736	0.0641	0.3793	0.0178
Model (2)	0.1765	0.0611	0.2796	0.0705

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

	Δu_{SP}	$\Delta u_{SP}(FR)$	$\Delta u_{SP}-$ $\Delta u_{SP}(FR)$
A. Spain with French EPL: f and p			
* Fixed f-b model	7.43	4.05	3.38
* Endogenous wage model	7.27	5.85	1.42
B. Spain with French EPL: f			
* Fixed f-b model	7.43	6.13	1.30
* Endogenous wage model	7.27	7.28	-0.01
	Δu_{FR}	$\Delta u_{FR}(SP)$	$\Delta u_{FR}-$ $\Delta u_{FR}(SP)$
C. France with Spanish EPL: f and p			
* Fixed f-b model	1.19	3.08	-1.90
* Endogenous wage model	1.28	2.58	-1.30

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. The mirror definitions apply to Δu_{FR} and $\Delta u_{FR}(SP)$.

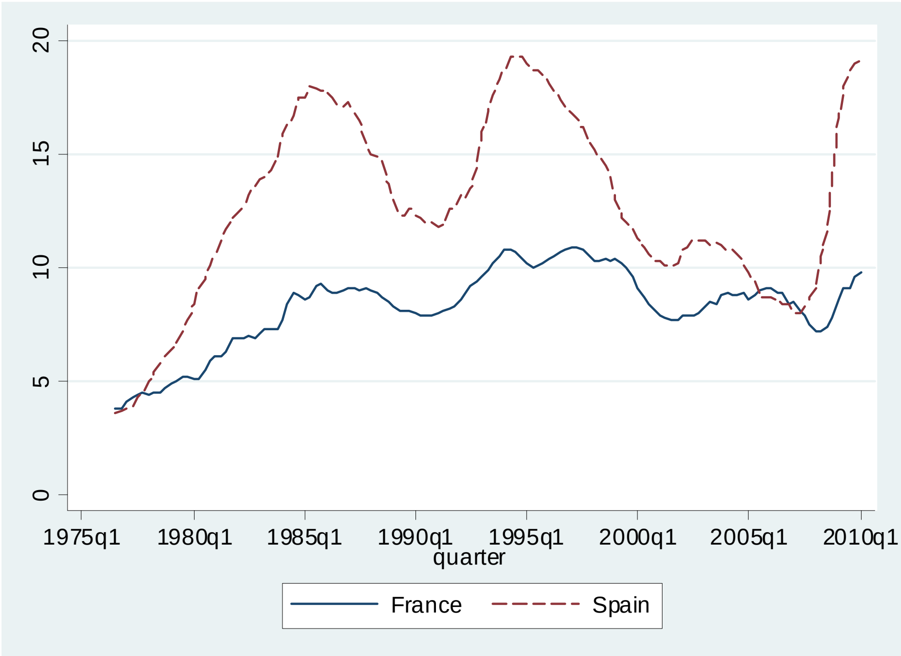

Figure 1: Unemployment rate in France and Spain, 1976-2010

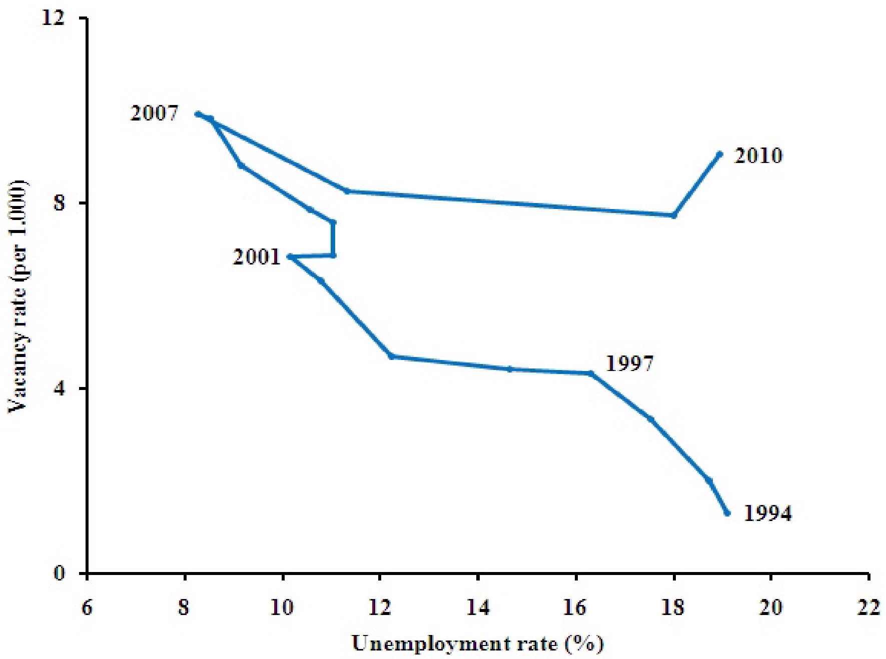

Figure 2: Beverigde curve for Spain, 1994-2010

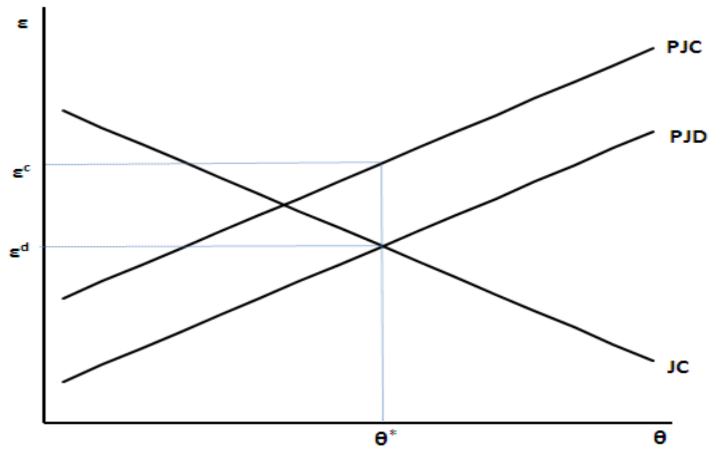

Figure 3: Labor market equilibrium

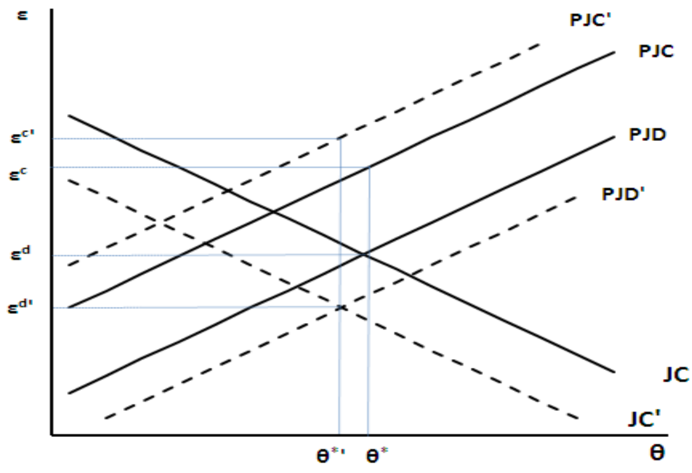

Figure 4: Effects of an increase in the firing cost (f)

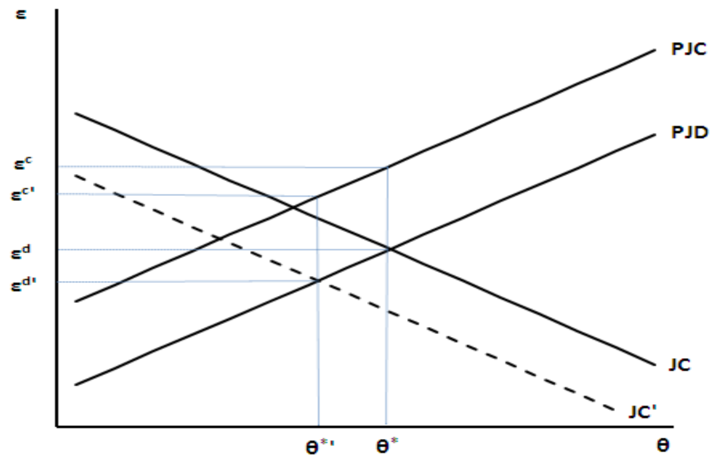

Figure 5: Effects of a reduction in the proportion hires on temporary contracts (p)

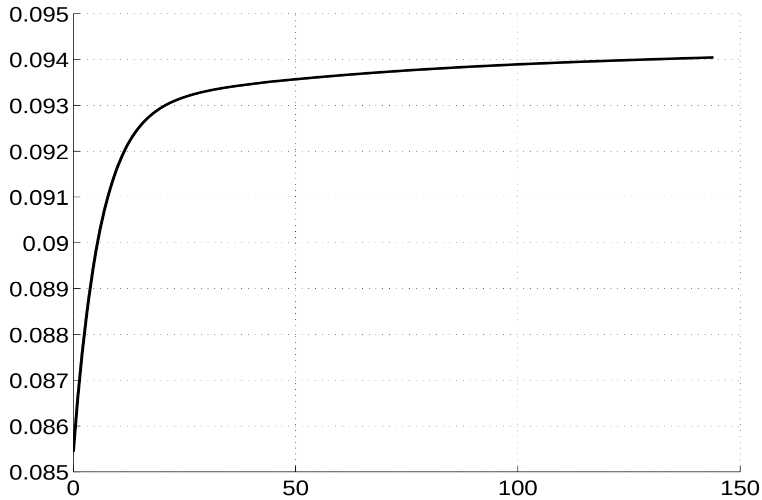

Figure 6: Simulated change in unemployment rate in France (period in weeks)

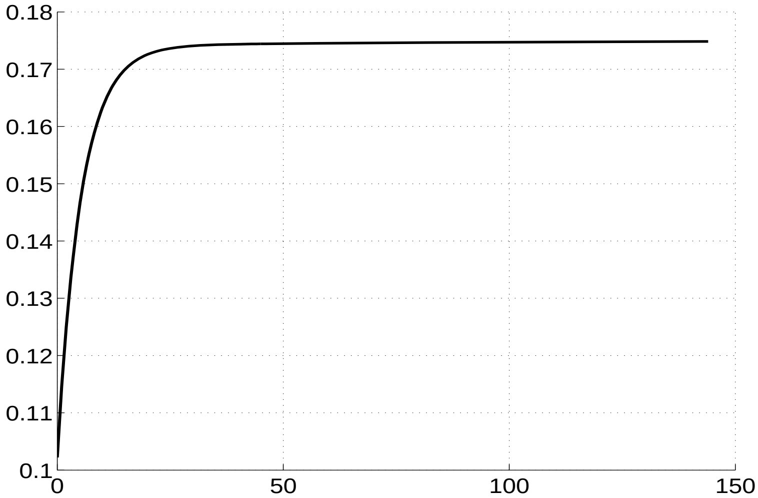

Figure 7: Simulated change in unemployment rate in Spain (period in weeks)

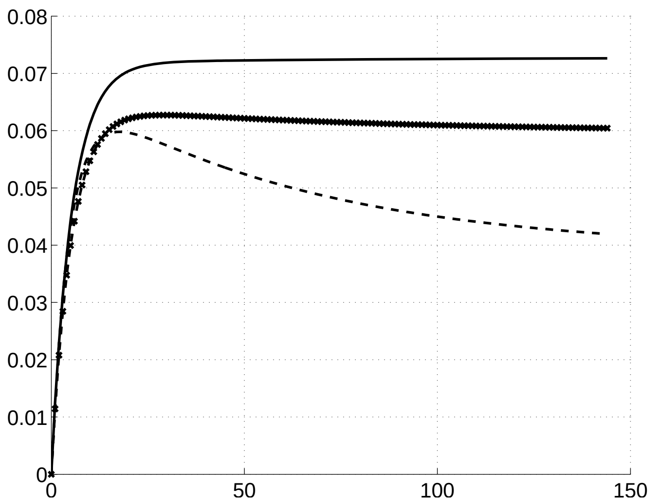

Figure 8: Change in unemployment rate in Spain with Spanish EPL (solid line), with French layoff costs and French regulation of temporary jobs (dotted line), with French layoff costs and Spanish regulation of temporary jobs (line with crosses), (period in weeks)