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TWO-TIER LABOUR MARKETS IN THE GREAT RECESSION: FRANCE *VERSUS* SPAIN*

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France and Spain have similar labour market institutions and their unemployment rates were both around 8% just before the Great Recession but subsequently that rate has increased to 10% in France and to 23% in Spain. In this article, we assess the part of this differential that is due to the larger gap between the firing costs of permanent and temporary contracts, and the laxer rules on the use of the latter in Spain. A calibrated search and matching model indicates that Spain could have avoided about 45% of its unemployment surge had it adopted the French employment protection legislation.

The goal of this article 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 2007–8. We focus on a comparison of these two economies not only because they share quite similar labour market institutions (employment protection legislation (EPL), unemployment benefits, wage bargaining, etc) but also because they exhibited similar unemployment rates, around 8%, just before the crisis started. However, while the French unemployment rate has only risen to about 10% during the slump, in Spain it has surged to almost 23% by the end of 2011. Our main contribution here is to analyse what part of this very different response can be attributed to what we identify as the main two differences between the labour 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 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 neighbouring countries. Both are among those EU economies which most decidedly promoted temporary contracts in the past in order to achieve higher labour market flexibility. Creating a two-tier labour market is often seen as a politically viable way of achieving this goal when there is great resistance from protected insider workers (Saint-Paul, 1996, 2000). However, temporary employment is much more widespread in Spain, reaching around one-third of salaried employees until recently (25% in 2011:4), whereas this share has

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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, controlling 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 and Pissarides (1994) which allows for the distinction between permanent and temporary jobs subject to different EPL. 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 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 favour of permanent contracts is high enough. The higher this gap, the lower will be the proportion of temporary jobs converted 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 labour markets already regulated by stringent permanent job security provisions.

That labour market volatility increases with the introduction of flexible temporary jobs has been stressed, among others, by Bentolila and Saint-Paul (1992) and Boeri and Garibaldi (2007). They argue that two-tier labour market reforms have a transitional honeymoon, job-creating effect, which typically precedes reductions in employment as a result of temporary workers' lower labour productivity. Deepening this line of research, Costain *et al.* (2010) and Sala *et al.* (forthcoming) have recently studied the cyclical properties of dual labour markets subject to limitations on the use of temporary contracts.[1] In particular, they explore whether flexibility at the margin is the reason why labour 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 labour market than it would in a unified economy with a single labour contract. In common with this strand of the literature, our approach focuses on the interactions between aggregate productivity shocks and EPL, including the regulation of temporary jobs. However, while available work focuses on labour 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 labour contracts that can account for the different response of France and Spain to this global crisis.

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

From this perspective, our model differs from those of Costain *et al.* (2010) and Sala *et al.* (forthcoming) 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 penalty 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 modelled. 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 better illustrates the institutions of France and Spain, where labour contracts are renegotiated by mutual agreement (Malcomson, 1999; Cahuc *et al.*, 2006).

The rest of this article is structured as follows. We start by documenting in Section 1 the relative performance of the French and Spanish labour markets during the crisis *vis-à-vis* the preceding expansion. In Section 2, we present the main features of the regulations affecting these two labour markets, devoting special attention to the EPL gap between permanent and temporary contracts; we also discuss how strong duality in labour markets can also affect unemployment via sectoral specialisation, labour mobility and mismatch. In Section 3, we introduce a stylised search and matching model focusing on the equilibrium behaviour 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 4, we start by analysing the extent to which our calibrated model, with each country maintaining its own institutions before the slump, can account for the change in the performance of their labour markets from the boom (represented by 2005–7) to the recession (2008–9), following common adverse shocks 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 5 concludes.

1. Labour 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.[3] From then on, both rates rose in tandem but the Spanish rate was always higher and showed much greater volatility. The difference increased until the end of

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

[3] For comparability, we show OECD standardised unemployment rates, which correct for methodological breaks.

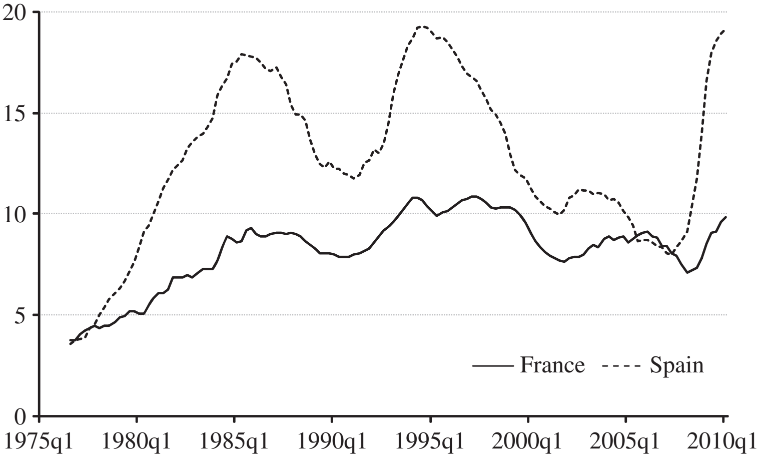

Fig. 1. *Unemployment Rate in France and Spain,* 1976–2010 (%)

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 23% in 2011, whereas French unemployment kept on falling, to 7.2%, and has then risen to around 10%. In the rest of this Section, we briefly discuss some potential explanations for this strikingly different response.

Table 1 presents a few key labour market magnitudes from 1998:1 to 2007:4, an expansion, and 2008:1 to 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 especially stems 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 labour market without recourse to the prevailing types of contracts. As shown in Table 1, in 1998 temporary contracts 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 were destroyed

Table 1

Labour 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**			
France	13.8	14.3	13.1
Spain	33.3	30.9	25.1

Annual growth rates (%)†	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‡		
France	1.3	1.1
Spain	0.3	2.5
6. Hiring on temporary contracts§		
France	78.6	83.3
Spain	90.5	89.6

Notes. *As a share of employees. †Computed as annual rates of end-of-period on start-of period quarterly levels. ‡Deflated by GDP Deflator, seasonally adjusted. §Average share over the corresponding period.
Sources. (1), (3) OECD Economic Outlook Database (http://www.oecd.org); (2) Eurostat Statistics Database (epp.eurostat.ec.europa.eu); (4) INSEE BDM Macroeconomic Database (http://www.bdm.insee.fr) for France and INE, Encuesta de Población Activa (http://www.ine.es) for Spain; (5) OECD Main Economic Indicators Database (http://www.oecd.org), (6) ACOSS (http://www.acoss.urssaf.fr) for France and Ministerio de Trabajo e Inmigración, Boletín de Estadísticas Laborales (http://www.mtin.es).

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.

2. Labour Institutions in France and Spain

In this Section, the institutional settings of the French and Spanish labour 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. Finally, we also examine labour mobility, which we document to be much lower during the slump in Spain, partly as a result of the high uncertainty associated with temporary jobs and their low conversion rates to permanent ones induced by the large EPL gap.

2.1. *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 labour market flexibility aimed at reducing unemployment.

Table A1 in the Appendix presents the key features of regulations concerning dismissals in the two countries as of 2009.[4] Permanent contracts are subject to advance notice periods and severance pay.[5] 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 per year for tenure above 10 years. In Spain, that pay is equal to 20 days, whereas for unfair dismissal, it is equal to 45 days.[6] 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 and court procedures, which should be taken into account.

Computing 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. From Venn (2009), this indicator gives an overall EPL score for 2008 of 3.0 for both France and Spain, where the US has the lowest value, 0.7, and Portugal and Turkey the highest, 4.3. Hence, both countries are ranked in the middle–high range. Given the degree of dualism in both countries, it is however very important to distinguish between firing costs for permanent and temporary contracts. The OECD index gives a score of 2.5 for individual dismissals on permanent jobs in both France and Spain and 2.1 for France and 3.1 for Spain concerning collective dismissals. The procedure for the latter applies only to workers on permanent contracts, so that it makes sense to compute the average of the indexes about individual and collective dismissals. Accordingly, the protection of permanent jobs is stronger in Spain, at 2.8, than in France, at 2.3.

For temporary jobs, there is a slight difference, 3.6 for France and 3.5 for Spain. We think this difference has the right sign but understates the magnitude, because EPL indices are based on legal regulations and not on their enforcement. Indeed, the OECD has recognised the importance of this point and has revised its indexes taking into account the operation of labour courts where permanent contracts are concerned (Venn, 2009) but not regarding the enforcement of restrictions on temporary contracts.[7] We argue that enforcement is relevant in explaining the more limited use of

[4] Labour market reforms have been undertaken in Spain in September 2010, June 2011 and February 2012. These are, however, structural changes that are left outside the period over which we calibrate our model.

[5] 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 (Cahuc and Carcillo, 2006). In Spain, it includes both regular permanent contracts, *contrato indefinido ordinario* and the *contrato de fomento de la contratación indefinida* (employment promotion contract).

[6] In the employment promotion permanent contract, severance pay for unfair dismissal is equal to 33 days. However, this contract is available only for hiring certain types of workers, and it does only represent around 10% of employees over our calibration period. Moreover, even with this contract, due to problems of lack of clarity in the interpretation of the law, most employers paid 45 days anyway.

[7] 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 these as temporary jobs.

temporary contracts in France than in Spain. In France, 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 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.[8] For these reasons, we believe that standard EPL indexes do not capture Spanish EPL satisfactorily, with the result that *de facto* protection of temporary jobs is much weaker in Spain than in France.

In sum, we conclude that the protection of permanent jobs is much more stringent in Spain than in France, whereas the regulation of temporary jobs is less stringent. Thus, while the overall EPL may look similar, aggregate indexes hide the higher EPL gap between the two types of contracts in Spain than in France.[9]

To obtain a relevant account of the distortive effects of job protection, however, we have to keep in mind that 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, 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 labour courts and labour 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. In effect, since firms that go to court lose in 3 out of 4 cases on average, they avoid this route (only 2% of dismissals are taken to court) and prefer to allege disciplinary reasons even for economically motivated dismissals. In this way, they need not give advance notice and, upon acknowledging the unfairness of the dismissal, they avoid going to court by disbursing the penalty 45-day severance pay rate upfront.[10] Collective dismissals, which are caused by economic reasons, entail severance pay of 20 days but until 2012 they required administrative authorisation, which was typically granted only if it was agreed with worker representatives. As a result, severance pay was raised significantly, on average amounting to 45 days.

[8] The Spanish labour market reform of September 2010 banned open-ended temporary contracts.

[9] For more details on the level and structure of firing costs in France, see Cahuc and Postel-Vinay (2002), Cahuc and Carcillo (2006), Bentolila and Jimeno (2006) and Bentolila *et al.* (2008*b*) for Spain.

[10] This option was been available to firms in Spain from December 2002 to January 2012 and was used by firms in 71% of dismissals of workers with permanent contracts since 2008, whereas the severance pay of 20 days associated to dismissals for economic reasons would have been the natural one.

In this article, 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 4.2 below, these turn out to be about three times higher in Spain than in France, though, in exchange, the Spanish notice period is much shorter, a feature also accounted for in our calibrated model.

2.2. *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).[11] 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 affected by duration rules.

Workers who exhaust unemployment insurance or are ineligible for it are entitled to the so-called minimum monthly integration income (*Revenu Minimum d'Insertion*, RMI) in France, amounting to €454.63 in 2009 (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).[12] 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.

2.3. *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. The coverage of collective bargaining is in fact very similar across countries: 90% in France and 88% in Spain in 2004 (Visser, 2011).

[11] In 2006–8, 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).

[12] 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).

Employees in Spain 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 unionised. As a result, France and Spain have the highest gaps in the OECD between the coverage of collective bargaining and union density, where the latter is very low (8.2% in France and 16.7% in Spain in 2003, Visser, 2011)[13] but mostly irrelevant. One difference, though, is that 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 CFDT). Lastly, it is worth noting that, although the monthly statutory gross 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).[14] Moreover, fewer full-time workers receive the minimum wage in Spain than in France (about 5% *versus* 18%), because collective bargaining sets wage floors above the statutory level.

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

2.4. *Mismatch, Sectoral Specialisation and Labour Mobility*

Besides the EPL gap, labour mobility is the other dimension in which the French and Spanish labour markets differ markedly.[15] 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,[16] while the fractions of workers who have changed job in the preceding 10 years are 49% and 50%, respectively.[17]

Yet, geographical mobility is much lower in Spain. For instance, 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.[18]

Low interregional mobility has made the impact of the recession more acute 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% to 55%, as attested by a raw correlation coefficient of 0.75.

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

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

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

[16] 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 period 2000–4 (OECD Eployment database, 6/2011).

[17] See 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.

[18] Sources: Vandenbrande *et al.* (2006, Figure 3, and Table 2), and OECD (2005), with the data corresponding to 2003.

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 *versus* 6.3% and 6.9% in France) is partly related to the existence of a highly segmented labour market. In effect, as a result of Spain joining the euro area in 1999 with a higher inflation rate than France, real interest rates fell by 6 p.p., against 1.5 p.p. in France, fuelling 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.[19] First, the rigid permanent contracts would have been inadequate to specialise in more innovative industries, as higher labour flexibility is required to accommodate the higher degree of uncertainty typically associated with producing high-value-added goods (Saint-Paul, 1997). Second, there was a large increase in the relative endowment of unskilled labour 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 p.p. 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 through 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 p.p. in 2007:4 to 15.6 p.p. in 2009:4, while the standard deviation of those rates increased from 3 to 5. In France, by contrast, that range only grew from 9.6 p.p. to 11.3 p.p., while the standard deviation rose only from 1.3 to 1.4.[20]

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 1962–86 (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. In fact, the structure of collective bargaining has tended to reduce regional wage differentials, which itself reduces interregional migration flows.

On the other hand, Rupert and Wasmer (2012), 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, such as a legal structure that favours tenants *vis-à-vis* landowners and an income tax system which heavily subsidises owner-occupied housing (López-García, 2004).

Moreover, like with industrial specialisation, differences in EPL may be strongly related to differences in labour mobility. The widespread use of temporary contracts

[19] In addition, new legislation was introduced in 1998 allowing for a higher availability of land for residential construction with the goal of reducing real state prices, which obviously failed badly. Municipalities found in this sector a powerful source of tax collection. This, together with the high rise in immigration and the segmented labour market, fuelled the housing bubble that burst in the recession.

[20] France: Labour Force Survey, BDM Macroeconomic Database (http://www.bdm.insee.fr); Spain: Labour Force Survey (http://www.ine.es).

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 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 (less) and the unemployment rates (more) during the Great Recession.[21] 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. All this means that the correct interpretation of the effect of the slump on the Spanish labour market should include a 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 coinciding with the adverse productivity shock. Modelling sectoral specialisation in an endogenous way in this type of search and matching models with different EPL levels is beyond the scope of this study.

3. 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 and 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.

3.1. *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 normalised to 1.

[21] Unemployment is expressed as a percentage of the labour force, whereas vacancies are per thousand. The figures in the graph are adapted from results in Bouvet (2012) spliced with survey data from the Encuesta de Coyuntura Laboral (http://www.mtin.es/estadisticas/ecl/Ecl22010/SER/index.htm), which start in 2000.

Fig. 2. *Beverigde Curve for Spain,* 1994–2010

Job matches have an idiosyncratic productivity distribution $F(\varepsilon)$, drawn over the support $[\underline{\varepsilon},\bar{\varepsilon}]$.[22] 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 level $\bar{\varepsilon}$.[23]

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 in permanent jobs are renegotiated by mutual agreement whereas they are fixed in temporary jobs until they expire. Both assumptions seem reasonable. On the one hand, in our setup, employment, unemployment, average wages and worker flows are identical regardless of whether wages are continuously renegotiated or set by mutual agreement since, as Malcomson (1999) has shown, these two types of renegotiations induce efficient separations. On the other hand, if wages in temporary jobs were to be renegotiated continuously, those with negative surplus would be destroyed, which is not the case in reality, where they last until their termination. Unemployed workers have access to temporary jobs with probability p, exogenously set as EPL policy, and to initial permanent jobs with probability $1 - p$.[24] Temporary jobs

[22] 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.* (forthcoming).

[23] This assumption reduces the number of productivity cut-off 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 cut-off levels been allowed.

[24] An alternative modelling strategy would be to add another cut-off value of productivity such that permanent jobs are created upon meeting if productivity exceeds this threshold and temporary jobs are created otherwise. Again, this would complicate the model quite a lot and, moreover, it is not obvious that productivity is the relevant variable determining the choice between contracts since, in reality, not all temporary jobs are low-productivity ones. Indeed, the relevant variable is likely to be the productivity shock arrival rate. Yet, allowing for heterogenous arrival rates is beyond the scope of this study; see Cahuc *et al.* (2012).

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 on the firm's ability 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. Second, 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 authorisation 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, $\bar{\omega}$ (see its definition below), capturing in this fashion a prototypical employment record in this economy.

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

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, labour 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, leading to an outward shift of the Beveridge curve. As mentioned earlier, we will use changes in m_0 in the calibration exercises as a shortcut to capture growing mismatch concomitant to adverse productivity shocks in highly segmented labour markets. 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 under advance notice. Steady-state asset values 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 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.

3.2. *Bellman Equations*

The Bellman equations for the firm's asset values are given by

$$rV = -h + q(\theta)\{p[J_t(\bar{\varepsilon}) - V] + (1-p)[J_0(\bar{\varepsilon}) - V]\}, \quad (1)$$

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

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

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

$$rJ_a = \underline{\varepsilon} - \overline{\varpi} - \sigma(f + J_a - V). \quad (5)$$

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 $\bar{\varepsilon}$. If a temporary contract is signed, (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. 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.[25] Then, a new value of the productivity shock is drawn, in line with available evidence indicating that workers' productivity may be different under permanent and temporary contracts, and the job is either destroyed or converted into a new permanent job.[26]

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

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

[26] 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.

$J_p(\varepsilon)$ – 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 (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 (5), have the lowest possible productivity $\underline{\varepsilon}$ and pay workers the average wage of the prototypical 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 this status can be destroyed at an incidence rate σ.

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

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

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

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

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

$$rW_a = \overline{\varpi} + \sigma(U - W_a). \tag{10}$$

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 job, with probabilities p and $1 - p$, respectively. Expressions (7)–(9) represent the asset values to the worker of the different jobs and their interpretation is similar to those in (2)–(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.

3.3. *Surplus Sharing*

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

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

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

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

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

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

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

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

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

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

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 $rU + \sigma f - \underline{\varepsilon} = b + \theta[\beta h/(1 - \beta)] + \sigma f - \underline{\varepsilon} > 0$ 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. This is 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 distribution of productivity shocks applies to both types of jobs, may lead to $S_t(\varepsilon) < S_0(\varepsilon)$. There is, however, an obverse effect, namely that firms with new permanent jobs incur red-tape firing costs plus advance notice in case of job destruction once wages have been negotiated whereas temporary jobs are terminated at no cost. Thus, the higher are these costs, the more likely it is that the previous inequality might be reversed.

3.4. *Job Creation and Job Destruction*

The prior 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):[27]

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

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

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

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

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 regardless 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:

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

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

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

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

This equation shows that the threshold productivity ε^d is an increasing function of labour market tightness, θ, and a decreasing function of the firing cost, f.[28] The intuition for the first relationship is that a tighter labour 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

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

[28] 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 $(\partial\varepsilon^d/\partial\sigma) = \mathrm{sign}(rU - \underline{\varepsilon} - rf)$. 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).

of reducing the propensity to destroy jobs, implying that less productive jobs remain operative.

Moreover, (11) implies that

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

and then,

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

Evaluation of both (21) and (18) at $\bar{\varepsilon}$ yields $S_t(\bar{\varepsilon})$ and $S_0(\bar{\varepsilon})$, respectively, which can be then used to rewrite the overall job creation equation (JC) out of the free-entry rule (16) as follows:

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

By replacing ε^c by ε^d in equation (JC), using (17), it is easy to show that, along the JC locus, labour tightness θ is a decreasing function of the job destruction productivity cut-off 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.[29] Firms unambiguously fire less permanent workers (lower ε^d), transform temporary contracts into permanent ones less frequently (higher ε^c) and reduce labour 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 labour 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 will be shown in more detail below.

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

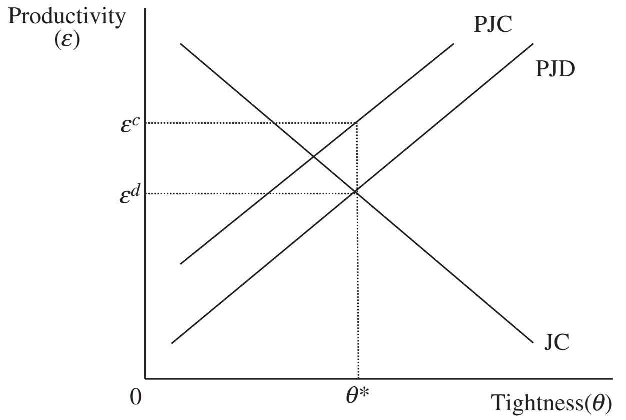

Fig. 3. *Labour Market Equilibrium*

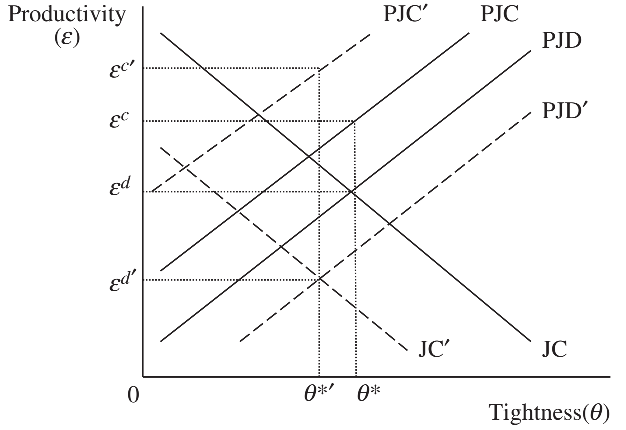

Fig. 4. *Effects of an Increase in the Firing Cost (f)*

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, as 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 cut-off 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.

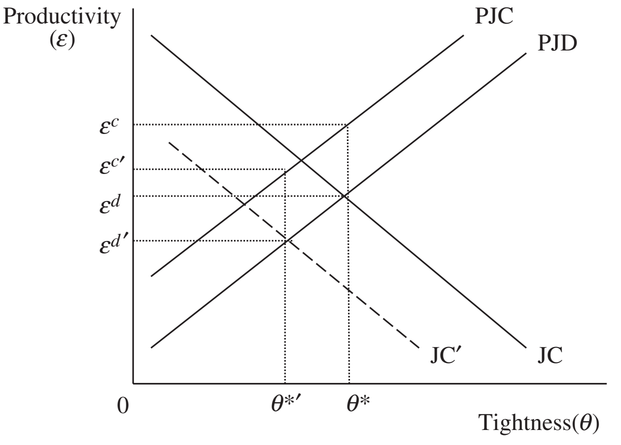

Fig. 5. *Effects of a Reduction in the Proportion Hires on Temporary Contracts (p)*

3.5. *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, denoting by $\dot{X}$ the (continuous) time change of variable X, 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:

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

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

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

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

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

Solving (22), (25) and (26) for the unemployment rate in steady state yields:

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

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 cut-off 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, $\bar{f}$, such that, for $f > \bar{f}$, u^* will unambiguously 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.[30]

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 $-\lambda F(\varepsilon^c)[\sigma + \mu F(\varepsilon^d)]$, 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 will be shown in the simulations Section, the fact that Spain has both a large fraction of temporary workers (p) and that firing-cost gap (f) is high imply that the joint surplus of a match is lower in this country, so that unemployment becomes very responsive to adverse shocks.

3.6. *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:

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

$$(1-\beta)[W_0(\varepsilon) - U] = \beta[J_0(\varepsilon) - V], \quad (29)$$

$$(1-\beta)\left[W_p(\varepsilon) - W_a\right] = \beta\left[J_p(\varepsilon) - J_a\right]. \quad (30)$$

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

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

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

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

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

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), $w_p(\varepsilon) = w_t + \beta[rf - (\bar{\varepsilon} - \varepsilon)]$, 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.

Lastly, to compute the average wage in steady state, $\bar{\varpi}$, let us denote by N_0 the number of permanent 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:

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

so that their steady-state values become:

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

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

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

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

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

4. Accounting for the Impact of the Crisis

In this Section, we first describe how a number of key parameters in the model are calibrated. Next, we 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 strikingly different evolution of their respective unemployment rates during the crisis.

4.1. *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 labour 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, in line with most of the literature (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 set at 0.5.

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 that the marginal cost of a layoff is on average about one quarter in terms of wages for an individual dismissal and about 10 months for a collective one. As most layoffs are individual in France, the approximately right order of magnitude is one quarter, out of which, according to these authors, one third corresponds to red-tape cost. Thus, we set f in France equal to one-third. For Spain, we have that the weighted average of the marginal cost for individual and collective dismissals is about 160 days of wages.[31] Applying the same proportion as in France, it implies 80 days of red tape, namely a value of f equal to 1.11 quarters. Thus, the value of f for Spain is more than three times the value in France. In contrast, the average advance notice period ($1/\sigma$) is longer in France than in Spain. For the former, we set it to last 4 months ($\sigma = 0.75$), whereas the latter is set at 3 weeks ($\sigma = 4.3$).[32]

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 Social Security quarterly data in both cases). 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

[31] From the *Muestra Continua de Vidas Laborales* for permanent contracts over 2005–7.

[32] In France, the advance notice period is 2 months, but it increases to 3 months in many collective agreements and it 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, as discussed in Section 2.1, from 2002 to 2012 the law suppressed advance notice for individual dismissals for disciplinary reasons (by far the largest share of individual dismissals), though it was still in place for collective dismissals.

Table 2

*Calibrated and Estimated Parameters**

		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 replacement rate	b	0.55	0.58
Severance pay for permanent employees	f	0.33	1.11
Advance notice rate	σ	0.75	4.30
Dual labour 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	1.53	2.33
Matching efficiency level in recession	m_0'	1.53	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	0.89	0.85

*Reference period: 2005:1–2007:4, save for m_0', for which it is 2008:1–2009:4.

Spain before the crisis, in line with information drawn from LFS and Social Security records.

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 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 labour market variables related to temporary and permanent jobs and the overall unemployment rate. The first equation refers to the destruction rate of permanent jobs, which is defined (in steady state) by

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

The corresponding target rates rate are obtained from Social Security administrative data (*Déclarations des Mouvements de Main-d'Œuvre*/DMMO in France and *Muestra Continua de Vidas Laborales*/MCVL in Spain). Second, the steady-state share of temporary jobs in the stock of jobs is given by

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

Lastly, we use the steady-state unemployment rate given in (27). Targeted data for these two rates are obtained from the LFS for both countries. The calibrated values of h and m_0 during the expansion are lower and higher, respectively, in Spain than in France, reflecting that the leading sectors in the former were low-value-added ones with vacancies which were easier to fill but also subject to higher frequency shocks, as reflected by the larger value of μ in Spain.

Once the model has been calibrated to reproduce the stylised 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 the degree of mismatch. The simulations are obtained for a specification of the average wage, applied in computing the firing cost and the unemployment benefit during the recession, where $\bar{\omega}$ takes its previously calibrated value in the good state. This is meant to mimic the fact that, in reality, unemployment benefits and firing cost are linked to workers' previous experience and tenure, respectively.[33]

4.2. *Simulation Results*

In this subsection, we summarise the main results of several simulation exercises. We present targets (actual data) and outcomes (simulated data) for both countries in the boom and the recession.

Table 3 displays the data and the simulated steady-state values of the unemployment rate, the permanent job destruction rate, and the share of temporary contracts during the expansion (2005:1–2007:4) and the recession (2008:1–2009:4).[34] 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 the chosen targets fairly well during the reference expansion. Concerning the non-targeted moment, we obtain a slight underestimation of the conversion rate in France and a slight overestimation in Spain during the expansion. However, the calibrated model is consistent with the conversion rate being lower in Spain than in France, thus leading to higher share of temporary employment in the latter.

Table 3
Simulation Results

	Unemployment rate	Perm. jobs destruction rate	Temporary employment rate	Transition temp. to permanent
France – Expansion				
Data	0.0850	0.0390	0.1260	0.1152
Model	0.0850	0.0319	0.1170	0.0849
France – Recession				
Data	0.0980	0.0370	0.1250	0.1014
Model	0.0980	0.0319	0.1181	0.0826
Spain – Expansion				
Data	0.1030	0.0623	0.3330	0.0381
Model	0.1029	0.0714	0.3154	0.0679
Spain – Recession				
Data	0.1790	0.0604	0.2700	0.0763
Model (1)	0.1789	0.0708	0.3502	0.0443
Model (2)	0.1790	0.0680	0.2815	0.0866

[33] Simulation results hold qualitatively when the average wage, applied in computing the firing cost and the unemployment benefit during the recession, adjusts fully endogenously to the shocks.
[34] Given the trending behaviour 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.

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 controlling the severity of the productivity shock. This is captured 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 parameter γ, so that its support shrinks from [0, 1] in the boom to $[0, \gamma]$ during the recession, with $\gamma \in (0, 1)$ being calibrated to match the required targets during the latter phase, under the assumption that the shock is permanent and unanticipated.

Table 3 (row 4) shows that, in this simulation, we match the targets for France during the recession fairly well with a value of γ equal to 0.89, namely a 11% adverse shift in average productivity. Notice, however, that this exercise only makes sense if the unemployment rate reaches its steady-state value fast enough. As we will argue in the next subsection, this is indeed the case: the speed of adjustment of the unemployment rate is high (about 6 months) in both France and Spain.[35] Accordingly, comparing steady states in the expansion and the recession allows us to account well for changes in the unemployment rates in both countries.[36]

As regards Spain, Table 3 (row 8) shows that a calibrated value of $\gamma = 0.78$ (a much more adverse shock than in France) matches the value of the unemployment rate well during the recession. However, it fails badly in matching the share of temporary jobs. This has fallen from 33.3% to 27%, whereas the simulation yields an increase to 35%. Given this result and the discussion in Section 2.4 on the rise in mismatch following the aggregate shock in Spain, we perform an *alternative* simulation where, besides the severity of the productivity shock captured by γ, we allow for another model parameter to change, namely m_0. As discussed earlier, this is a shortcut to allow for the higher degree of mismatch induced by the collapse of the construction industry in Spain.

The new simulation yields a reduction of m_0 from its initial value of 2.33 to 1.50 (i.e. close the French value of 1.53) and a similar value of γ to that obtained for France, namely $\gamma = 0.85$. Since the outward shift in the Beveridge curve illustrated in Figrue 2 reflects reallocation distortions rather than aggregate shocks, the correct interpretation of the recession in Spain would be a combination of both types of shocks. In line with our previous arguments, 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

[35] The dynamics are easy to compute because the core of the model is forward looking. As soon as the economy is hit by an unfavourable shift in the distribution of productivity, the thresholds and the labour 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 productivity thresholds.

[36] Fast convergence to steady state also allows us also to ignore different developments in the growth rate of the labour 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 (Bentolila *et al.*, 2008*a*). The reason is that unemployment rates are independent from the size of the labour force in steady state. Nonetheless, it 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 study.

matching the target for temporary work (27%), while the unemployment rate and the other targets remain satisfactorily reproduced.

4.3. *Counterfactual Simulations: Spain with French EPL*

Once we have managed to get a satisfactory calibration in both the good and bad states, the next step is to use this model to run counterfactual simulations. They are 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 about to start.[37]

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 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. Second, we allow only for a reduction of f to the French value, leaving p unchanged.

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, 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, 7.57 p.p., the change predicted had Spain shared the French parameters, namely 4.16 p.p. The implication is that the recession would have raised the unemployment rate in Spain by 3.41 p.p. less (i.e. about 45% of the actual increase),

Table 4

*Recession-Induced Differential Increase in Unemployment Explained by Institutional Differences. 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	7.57	4.16	3.41
(*b*) Spain with French EPL: f	7.57	5.94	1.63
	Δu_{FR}	$\Delta u_{FR}(SP)$	$\Delta u_{FR} - \Delta u_{FR}(SP)$
(*c*) France with Spanish EPL: f and p	1.30	3.23	−1.93

*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 $\Delta u_{FR}(SP)$.

[37] 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.

had Spain adopted French EPL at the start of the recession, rather than kept its own. Likewise, under the narrow interpretation of EPL, the reduction in the Spanish unemployment rate would have been 1.63 p.p., namely about 21% less than its actual rise.

Next, 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 preceding expansion rather than when the recession started.[38] In other words, denoting the Spanish unemployment rate with Spanish regulations in state $i(i = \textit{expansion, recession})$ as $u_{SP}(f - p_{SP}, i)$ and with French regulation as $u_{SP}(f - p_{FR}, i)$, we can break down the simulated increase in unemployment, Δu_{SP}, into the following three different terms:

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

$$+[u_{SP}(f - p_{FR}, \textit{recession}) - u_{SP}(f - p_{FR}, \textit{expansion})] \qquad \text{(II)}$$

$$+[u_{SP}(f - p_{FR}, \textit{expansion}) - u_{SP}(f - p_{SP}, \textit{expansion})], \qquad \text{(III)}$$

where $\Delta u_{SP} = 7.57$ p.p., (I) = 3.41 p.p. (both from Table 4), (II) = 6.09 p.p. and (III) = −1.93 p.p. In this fashion, we can interpret these results as implying that the higher depth of the recession in Spain than in France [term (II)] has been responsible for an increase of 6.09 p.p. in its unemployment rate.[39] Comparison of terms (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 p.p.) than in booms (1.9 p.p.).

Regarding the dynamics, Figure 6 depicts three transition paths of the Spanish unemployment rate during the recession. Instead of depicting the unemployment rate in levels, we plot here the deviations of the unemployment rate from the steady-state value in the good state, i.e. $u = 10.3\%$ (see the third panel in Table 3), following the recession. The horizontal axis represents number of weeks. 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. Two findings stand out. First, as can be observed, the speed of adjustment of the unemployment rate to the new steady state following the adverse shocks is rather fast (about 25 weeks or 6 months). Second, the transitional dynamics in the counterfactual scenario exhibit an overshooting of about 1 p.p. in the short run after the adverse shocks hit the economy. The reason is that a reduction in the EPL gap, affecting both firing costs and the use of

[38] For brevity, the results are only reported for the case of regulations understood in a broad sense. For the narrow-sense case, they are available on request.

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

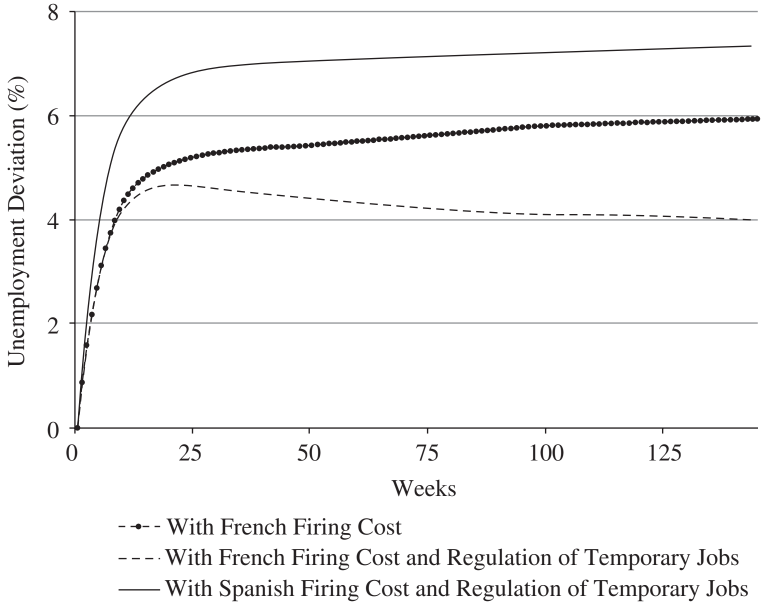

Fig. 6. *Change in Unemployment Rate in Spain with Spanish EPL, with French Firing Costs, and with French EPL*

temporary contracts, exacerbates job destruction in the short run during the recession by making layoffs less expensive. Specifically, an increase in the productivity cut-off for job destruction, ε^d, from 0.77 to 0.87 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 3.41 p.p. lower had Spain adopted French EPL rather than kept his own EPL.

Next, the second row of 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 dark dots in Figure 6 depicts the transitional dynamics of the unemployment rate in this case. Now, the counterfactual differential increase in Spanish unemployment is significantly smaller than before. This result stresses the importance of the regulation of temporary jobs, especially because, as stressed in Section 2.4, we believe that there should be a close link between changes in f and p. Endogenising 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.

Lastly, for completeness, in the third row of Table 4, we address 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 1.3 p.p., the French unemployment rate would have risen by 3.2 p.p., that is 1.9 p.p. more than with their own regulations. 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.

5. Conclusions

In this article, we explore how much of the strikingly 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 argue that a relevant share of this differential response is due to a combination of the larger gap between the dismissal costs of workers with permanent and temporary contracts and the laxer rules on the use of temporary contracts in Spain than in France.

To carry out that task, inspired by previous work by Blanchard and Landier (2002) and Cahuc and Postel-Vinay (2002), we use 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 labour market magnitudes for the expansion (2005–7) and recession periods (2008–9), where the latter is triggered by either adverse productivity shocks (France) or a mix of those disturbances and reallocation shocks (Spain).

Subsequently, we undertake several counterfactual exercises involving the key parameters capturing the gap in employment protection between both types of workers and restrictions on the use of temporary jobs. Imputing the French-economy values of these parameters to the Spanish labour market 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 p.p. on average between 2005–7 and 2008–9) 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, to the extent that, 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 would 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 labour contract with severance pay that is increasing with seniority in the job.[40] Among these proposals are those of Blanchard and Tirole (2004) and Cahuc and Kramarz (2005) for France, Boeri and Garibaldi (2008) and Ichino (2009) for Italy and a manifesto signed by 100 academic economists, see Andrés *et al.* (2009), for Spain. While not identical in their details, all these proposals highlight the negative effects induced by the permanent–temporary contract divide. The finding in this article of a sizable impact of dual employment protection on the rise in unemployment during the recent crisis provides some support for this diagnosis.

[40] 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 as of 2009

	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 (20% of wage) + 4 days if seniority > 10 years (2/15 of monthly wage)	3 days
2. Personal reasons (before July 2008)	Minimum seniority: 1 year 3 days (10% of wage) + 2 days if seniority > 10 years	
Observations	Personalised 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 Max. seniority coverage: 12 months	8 days (0 in some cases) (45 days if terminated before expiry)
Observations	Collective dismissal requires administrative approval	Max. duration: 24 months Restricted to 4 cases
2. Unfair dismissal	45 days (33 in employment promotion contracts) Maximum: 42 months†	

Note. 'Days' should be understood as days of wages per year of service throughout. †In employment promotion contracts, the maximum is 24 months. This Table does not contain the changes included in the 2010, 2011 and 2012 Spanish labour market reforms.

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References

Andrés, J, Bentolila, S., Dolado, J.J. and Felgueroso, F. (2009). 'Propuesta para la reactivaci ón laboral en España', *El País*, 26 April p.20.

Antolín, P. and Bover, O. (1997). 'Regional migration in Spain: the effect of personal characteristics and of unemployment, wage and house price differentials using pooled cross-sections', *Oxford Bulletin of Economics and Statistics*, vol. 59, pp. 215–35.

Barceló, C. (2006). 'Housing tenure and labour mobility: a comparison across European countries', Working Paper No. 0603, Banco de España.

Becker, S.O., Bentolila, S., Fernandes, A. and Ichino, A. (2010). 'Youth emancipation and perceived job insecurity of parents and children', *Journal of Population Economics*, vol. 23, pp. 1047–71.

Bentolila, S. and Dolado, J.J. (1991). 'Mismatch and internal migration in Spain, 1962–1986', in (F. Padoa Schioppa, ed.), *Mismatch and Labour Mobility*, pp. 182–236, Cambridge: Cambridge University Press.

Bentolila, S., Dolado, J.J. and Jimeno, J.F. (2008*a*). 'Does immigration affect the Phillips Curve? some evidence for Spain', *European Economic Review*, vol. 52, pp. 1398–423.

Bentolila, S., Dolado, J.J. and Jimeno, J.F. (2008*b*). 'Two-tier employment protection reforms: the Spanish experience', *CESifo DICE Report*, vol. 6, pp. 49–56.

Bentolila, S. and Ichino, A. (2008). 'Unemployment and consumption near and far away from the Mediterranean', *Journal of Population Economics*, vol. 21, pp. 255–80.

Bentolila, S. and Jimeno, J.F. (2006). 'Spanish unemployment: the end of the wild ride?' in (M. Werding, ed.), *Structural Unemployment in Western Europe. Reasons and Remedies*, pp. 317–43, Cambridge, MA: MIT Press.

Bentolila, S. and Saint-Paul, S. (1992). 'The macroeconomic impact of flexible labor contracts, with an application to Spain', *European Economic Review*, vol. 36, pp. 1013–47.

Blanchard, O.J. and Landier, A. (2002). 'The perverse effects of partial labor market reform: fixed duration contracts in France', Economic Journal, vol. 112, pp. 214–44.

Blanchard, O.J. and Tirole, J. (2004). 'Contours of employment protection reform', in (J.-P. Fitoussi and K. Velupillai, eds.), *Macroeconomic Theory and Economic Policy: Essays in Honor of Jean-Paul Fitoussi*, pp. 48–87, London: Routledge.

Boeri, T. (2010). 'Institutional reforms and dualism in European labor markets', in (O. Ashenfelter and D. Card, eds.), *Handbook of Labor Economics*, vol. 4B, ch. 13, pp. 1173–236, Amsterdam: Elsevier.

Boeri, T. and Garibaldi P. (2007). 'Two tier reforms of employment protection legislation. A honeymoon effect?' Economic Journal, vol. 117, pp. F357–85.

Boeri, T. and Garibaldi P. (2008). *Un Nuovo Contratto per Tutti*, Torino: Chiarelettere.

Bouvet, F. (2012). 'The Beveridge curve in Europe: new evidence using national and regional data', *Applied Economics*, vol. 44, pp. 3585–604.

Cahuc, P. and Carcillo, S. (2006). 'The shortcomings of a partial release of employment protection laws: the case of the 2005 French reform', IMF Working Paper No. 06/301.

Cahuc, P., Charlot, O. and Malherbet, F. (2012). 'Explaining the spread of temporary jobs and its impact on labor turnover', IZA Discussion Papers No. 6365.

Cahuc, P. and Kramarz, F. (2005). *De la précarité à la mobilité, vers une sécurité sociale professionnelle*, Paris: La documentation Française.

Cahuc, P. and Postel-Vinay, F. (2002). 'Temporary jobs, employment protection and labor market performance', *Labor Economics*, vol. 9, pp. 63–91.

Cahuc, P., Postel-Vinay, F. and Robin, J.M. (2006). 'Wage bargaining with on-the-job search: a structural econometric model', *Econometrica*, vol. 74, pp. 323–64.

Costain, J., Jimeno J.F. and Thomas, C. (2010). 'Employment fluctutations in a dual labor market', Working Paper No. 1013, Banco de España.

García-Pérez, J.I. and Osuna, V. (2011). 'The effects of introducing a single open-ended contract in the Spanish labour market', mimeo, Universidad Pablo de Olavide.

Garibaldi, P. (1998). 'Job flow dynamics and firing restrictions', *European Economic Review*, vol. 42, pp. 245–75.

Ichino, P. *et al.* (2009). '*Disegno di legge per la transizione a un regime di flexicurity, n. 1481*', 25 March. Roma: Senato della Repubblica.

Ichino, A. and Riphahn, R. (2005). 'The effect of employment protection on worker effort – a comparison of absenteeism during and after probation', *Journal of the European Economic Association*, vol. 3, pp. 120–43.

Kramarz, F. and Michaud, M.L. (2010). 'The shape of hiring and separation costs', *Labour Economics*, vol. 17, pp. 27–37.

L'Haridon, O. and Malherbet, F. (2009). 'Employment protection reform in search economies', *European Economic Review*, vol. 53, pp. 255–73.

Layard, R., Nickell, S. and Jackman, R. (1991). *Unemployment. Macroeconomic Performance and the Labor Market*, Oxford: Oxford University Press.

Lazear, E. (1990). 'Job security provisions and employment', *Quarterly Journal of Economics*, vol. 105, pp. 699–726.

Ljungqvist, L. (2002). 'How do layoff costs affect employment?' Economic Journal, vol. 112, pp. 829–53.

López-García, M.A. (2004). 'Housing, prices and tax policy in Spain', *Spanish Economic Review*, vol. 6, pp. 29–52.

Malcomson, J. M. (1999). 'Individual employment contracts', in (O. Ashenfelter and D. Card, eds.), *Handbook of Labor Economics*, vol. 3, ch. 35, pp. 2291–372, Amsterdam: Elsevier.

Mortensen, D.T. and Pissarides, C.A. (1994). 'Job creation and job destruction in the theory of unemployment', *Review of Economic Studies*, vol. 61, pp. 397–415.

Organisation for Economic Cooperation and Development (2004). *Employment Outlook*, Paris: OECD.

Organisation for Economic Cooperation and Development (2005). *Employment Outlook*, Paris: OECD.

Oswald, A.J. (1999). 'The housing market and Europe's unemployment: a non-technical paper', mimeo, University of Warwick.

Petrongolo, B. and Pissarides, C.A. (2001). 'Looking into the black box: a survey of matching functions', *Journal of Economic Literature*, vol. 39, pp. 390–431.

Pissarides, C.A. (2000). *Equilibrium Unemployment Theory*, 2nd edn, Cambridge, MA: The MIT Press.

Rupert, P. and Wasmer, E. (2012). 'Housing and the labor market: time to move and aggregate unemployment', *Journal of Monetary Economics*, vol. 59, pp. 24–36.

Saint-Paul, G. (1996). *Dual Labor Markets*, Cambridge MA: The MIT Press.

Saint-Paul, G. (1997). 'Is labour rigidity harming Europe's competitiveness? the effect of job protection on the pattern of trade and welfare', *European Economic Review*, vol. 41, pp. 499–506.
Saint-Paul, G. (2000). *The Political Economy of Labour Market Institutions*, Oxford: Oxford University Press.
Sala, H., Silva, J.I. and Toledo, M.E. (forthcoming).'Flexibility at the margin and labor market volatility in OECD countries', *Scandinavian Journal of Economics*.
Vandenbrande, L. *et al.* (2006). *Mobility in Europe*, Luxembourg: Office for Official Publications of the European Union.
Venn, D. (2009). 'Legislation, collective bargaining and enforcement: updating the OECD employment protection indicators', Employment and Migration Working Papers No. 89, OECD Social.
Visser, J. (2011). *Data Base on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts, 1960–2010 (ICTWSS)* Amsterdam: University of Amsterdam.