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THE INS AND OUTS OF UNEMPLOYMENT IN A TWO-TIER LABOR MARKET *

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ABSTRACT: This paper aims to shed some light on the dynamics of the Spanish labor market, using data from the Spanish Labor Force Survey for the period 1987 to 2010. We examine transition rates in a three-state model and compare our results with those reported for the UK and the US. Explicitly introducing the employment duality present in the Spanish labor market, we study labor market dynamics in a four-state model set-up. We also analyze the behavior of these rates within two sub-periods of recession and a further two sub-periods of boom. We provide evidence of the cyclicality of the transition rates using unconditional and conditional correlations. Finally, we compute the contribution of the different transitions to unemployment rate volatility. Our over-all conclusion points out that the employment duality is the key to understand the unemployment volatility and the functioning of the Spanish labor market.

JEL Codes: E24, E32, J6

Keywords: Job finding rate, job separation rate, unemployment.

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1 Introduction

Changes in aggregate labor market outcomes (employment/unemployment) hide a large variation in gross worker flows.[1] In particular, the contribution of ins and outs of unemployment to the dynamics of unemployment has been debated since the eighties, initially in the US and subsequently in other developed countries. More recently, focusing on transition rates, Hall (2006) and Shimer (2012)[2] report that the job finding rate provides the key to understanding the fluctuations in the U.S unemployment rate. By contrast, Fujita and Ramey (2009) and Elsby et al. (2009) show that the separation rate accounts for almost half the variation in unemployment and leads to cyclical changes in unemployment. Drawing on data for three Western European countries, the findings reported by Petrongolo and Pissarides (2008) are in line with those reported in these last two papers. Specifically, using the Spanish Labor Force Survey (SLFS), they find that inflows and outflows of unemployment contribute in almost equal parts to the country's unemployment volatility. Smith (2011), exploiting the British Household Panel Survey and using a decomposition based on actual unemployment instead of steady state unemployment, finds that during recessions the separation rate drives unemployment. However, in periods of moderation, she finds that the role played by the job finding rate acquires greater relevance.

In common with many other European countries over the last few decades, Spain implemented a labor market reform (1984) that gave greater flexibility to the use of fixed-term contracts and maintained a relatively high level of employment protection for permanent employees. As a result, the Spanish labor market has been characterized by an intensive use of temporary work, which has in turn increased the volume of worker flows (via hiring and firing).

This paper aims to shed some light on the dynamics of the Spanish labor market, using data from the SLFS over the last twenty-three years (from the third quarter of 1987 to the second quarter of 2010). More specifically, our paper analyzes the dynamics of the Spanish labor market by explicitly considering this employment duality (fixed-term contracts, on the one hand, and permanent employment, on the other).

Our paper contributes to the literature in the following ways. First, we analyze the flow

[1] See for instance, Abowd and Zellner (1985), Blanchard and Diamond (1990) and Davies et al. (2006).
[2] The first version of this paper appears on 16 January 2005.

data from the SLFS by explicitly considering the employment duality in the Spanish labor market, which can be considered a useful point of reference for other dual labor markets. Second, the period of analysis considered here offers additional advantages to those provided in previous empirical studies of Spain (eg. Petrongolo and Pissarides, 2008). Specifically, our period covers two complete business cycles: two periods of expansion (1987-1992 and 1995-2007) and two of recession (1993-1994 and 2008-2010). Finally, as regards our analysis of the current downturn (the most severe recession in developed countries since World War II), the Spanish perspective is interesting given the different responses of the labor market outcomes compared to those in other European labor markets (see Bentolila et al., 2010).

For descriptive purposes, we first conduct a flow analysis of the Spanish labor market focusing on its gross worker flows. Then, in line with the most recent literature, we turn to examine transition rates. More specifically, we study the dynamics of the labor market in a three-state set-up (employment, unemployment and inactivity) and in a four-state set-up that takes into account the employment dualism of the Spanish labor market (employment - both permanent and temporary, unemployment and inactivity). Second, we compare the transition rates in Spain with those found in two more flexible labor markets, namely those in the United Kingdom (UK) and the United States (US). Third, to analyze business cycle behavior, we examine the comovement between GDP and the transition rates using both unconditional cross-correlations and conditional correlation coefficients of vector autoregression (VAR) forecast errors at different forecast horizons as proposed by den Haan (2000). Finally, we present a decomposition of the relative importance of the transition rates to equilibrium unemployment dynamics in a four-state set-up (i.e. explicitly considering the employment duality of the Spanish labor market) using two different methodologies.

All our analyses point to a broadly similar conclusion. The employment duality is the key to understanding the unemployment volatility and the functioning of the Spanish labor market. Specifically, we find that the predominance of employees with fixed-term contracts appears to account for the employment-unemployment movements. In general, Spain's transition rates are lower than those recorded in the UK and US. We also find a positive (negative) and strong relationship between economic activity and transition rates from unemployment to temporary employment (from temporary employment to unemployment) over the business cycle. These results are consistent with the fact that firms use fixed-term contracts as the

main channel for hiring and firing workers. Finally, we find that the transition rates involving temporary employment account for most of the fluctuations in the unemployment rate.

The rest of the paper is structured as follows. In section two, we introduce the database and explain the methodology. Section three presents our analysis of the transition rates. The business cycle properties of these transition rates are presented in section four. Section five considers a decomposition of unemployment fluctuations and section six concludes.

2 Database and Methodology

2.1 Database

2.1.1 Data: Labor Force Survey - Flows

The SLFS rotating quarterly survey is conducted by the Spanish National Statistical Institute (*Instituto Nacional de Estadstica*, INE). The sample size of the SLFS consists of approximately 65,000 households per period (about 180,000 adult individuals) drawn from the population living in family dwellings in the Spanish national territory. The main goal of the Survey is to reveal the characteristics of that population with regard to the labor market. The interviewers contact respondents either in person or by telephone. The total sample is divided into six sub-samples called rotation groups. Each household remains in the sample for six periods, and a sixth is renewed each quarter. This means that in any two consecutive quarters there are five overlapping rotation groups. In theory, owing to this rotation scheme, five sixths of the sample in any two consecutive quarters can be matched.

Taking into account the structure of this database, we can obtain the gross labor market flows by calculating the quarter-on-quarter transitions made by individual workers between different labor market states. Specifically, we obtain the gross flows using a four-state model (permanent employment, temporary employment, unemployment, and inactivity).[3]

Our use of the survey data to construct these flows encounters two main problems. First, temporary or permanent attrition makes it impossible to match all individual workers across quarters (i.e. a margin of error) which leads to the omission of possible transitions from the survey data. For the SLFS, the unconditional non-responses vary from 7 to 17 percent in the first and sixth waves respectively.[4] We solve this problem using the missing-at-random

[3]Our definition of temporary employment consider all workers with a fixed-term contract. All other workers (including the self-employed) are included within permanent employees.

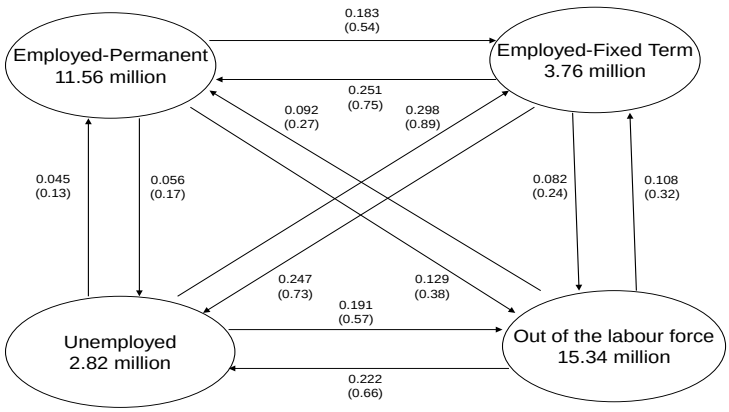
[4]For an in-depth analysis of sample attrition when using the SLFS, see Jimenez and Peracchi, 2002.

method which drops the missing observations and re-weights the measured transitions. The second problem concerns the point-in-time measurement of worker status, which fails to capture transitions within the period (quarters). For instance, if a worker is employed in the first month of the quarter, loses her job in the second and is reemployed in the third, our quarterly data do not detect any of those transitions. However, the multiple transitions within the period can be overcome by calculating the weekly transition rates from the observed quarterly rates (for details see sub-section 2.2).

2.1.2 Descriptive Analysis: Average Gross Flows

Figure 1 summarizes the quarterly average worker flows between the four labor market states temporary employment, permanent employment, unemployment and inactivity. The numbers within the circles indicate the stock of workers in each state; the numbers next to the arrows indicate the volume of the flows in millions of individuals and the corresponding percentage of the working-age population is given in parentheses.

Figure 1: Quarterly Average Gross Worker Flows, 1987:3-2010:2



Notes: The gross flows are expressed in millions of workers. Worker flows are expressed as a percentage of working age population in parentheses.
Source: Own elaboration based on Spanish Labor Force Survey (INE).

Over the whole period, net employment increased by an average of 0.028 million per quarter, representing 0.08 percent of the working-age population. Underlying this net increase in total employment were various flows that serve to describe the main characteristics of

the Spanish labor market (eg. the predominance of employees with fixed-term contracts in explaining unemployment movements, according to our calculations, almost 85 percent of worker flows, between employment and unemployment, involve a fixed-term contract).

Figure 1 also shows that every quarter an average of 0.3 million workers moved from unemployment to temporary employment and 0.25 million workers moved in the opposite direction. By contrast, the flows from unemployment to permanent employment were much lower, with an average of 0.056 million individuals moving each quarter to unemployment and 0.045 million moving in the other direction. In addition to these flows between unemployment and both types of employment, a significant number of workers also moved between temporary and permanent employment. Specifically, an average of 0.25 million workers moved each quarter from temporary to permanent employment, while the flows in the opposite direction reached 0.18 million. The relative magnitude of these transitions from unemployment to both types of employment and between the two employment states gives us an idea of how the Spanish labor market creates employment and, in particular, permanent employment. Most firms hire workers initially on fixed-term contracts and some of these subsequently become permanent. This indirect way of obtaining a permanent job can be directly related to some of the policy measures included in the labor market reforms carried out before and during our period of study. After the 1984 reform (which introduced differences in the hiring and firing costs of fixed-term and permanent contracts), the subsequent labor market reforms (1997, 2001 and 2006) sought to provide more stable employment by reducing the proportion of temporary contracts. To achieve this, successive governments have used tax incentives (rebates on social security contributions) and reductions in firing costs (permanent employment promotion contract with low severance pay for unfair dismissals) as the main instruments for promoting the conversion of fixed-term into permanent contracts.

The flexibility of the temporary margin, however, seems to have had relatively less impact on the relationship between employment and inactivity since only 46.2 percent of the flows between these two states involved fixed-term contracts. In terms of gross flows, an average of 0.092 million workers moved each quarter from inactivity to permanent employment and 0.129 million workers moved in the opposite direction. From inactivity to temporary employment and vice versa, gross flows were 0.108 and 0.082 respectively (see Figure 1).

This descriptive analysis of gross worker flows serves to highlight the relative importance

of employment duality in the overall dynamics of the Spanish labor market.

2.2 Methodology: Dual Labor Market Dynamics

Labor market dynamics and, in particular, the flows between different labor market states have been studied by using to two main approaches: first, by analyzing gross worker flows (Abowd and Zellner (1985), Blanchard and Diamond (1990), Davies et al. (2006)) and, second, by focusing specifically on transition rates (Hall (2006), Elsby et al. (2009), Fujita and Ramey (2009), Smith(2011) and Shimer (2012)). Here, following the approach adopted by most recent studies, we focus our study on transition rates.

Below we present the fundamental expressions that describe the dynamics of the Spanish labor market. In addition to the states of unemployment (U) and inactivity (or out of the labor force) status (I), we explicitly consider the two-tier structure of Spain's labor market in these equations. Two types of contract characterize this duality: fixed-term (E^f) and permanent (E^p).[5] Thus, the dynamics of this four-state model, as a function of the transition rates Λ_t^{X-Y}, evolve according to the following difference equations:

$$
\begin{aligned}
U_t - U_{t-1} &= -(\Lambda_t^{U-E^p} + \Lambda_t^{U-E^f} + \Lambda_t^{U-I})U_{t-1} + \Lambda_t^{E^p-U}E_{t-1}^p + \Lambda_t^{E^f-U}E_{t-1}^f + \Lambda_t^{I-U}I_{t-1}, && (1)\\
E_t^p - E_{t-1}^p &= \Lambda_t^{U-E^p}U_{t-1} && (2)\\
&\quad -(\Lambda_t^{E^p-U} + \Lambda_t^{E^p-E^f} + \Lambda_t^{E^p-I})E_{t-1}^p + \Lambda_t^{E^f-E^p}E_{t-1}^f + \Lambda_t^{I-E^p}I_{t-1},\\
E_t^f - E_{t-1}^f &= \Lambda_t^{U-E^f}U_{t-1} && (3)\\
&\quad +\Lambda_t^{E^p-E^f}E_{t-1}^p - (\Lambda_t^{E^f-U} + \Lambda_t^{E^f-E^p} + \Lambda_t^{E^f-I})E_{t-1}^f + \Lambda_t^{I-E^f}I_{t-1},\\
I_t - I_{t-1} &= \Lambda_t^{U-I}U_{t-1} + \Lambda_t^{E^p-I}E_{t-1}^p + \Lambda_t^{E^f-I}E_{t-1}^f - (\Lambda_t^{I-U} + \Lambda_t^{I-E^p} + \Lambda_t^{I-E^f})I_{t-1}, && (4)
\end{aligned}
$$

where Λ_t^{X-Y} represents the transition rate from state X in period $t-1$ to state Y in period t.[6] These transition rates (between period $t-1$ and t) are calculated as a fraction of the flows from X to Y and the number of individuals in state X at $t-1$. For instance, the transition rate between unemployment and temporary employment $\Lambda_t^{U-E^f}$ is calculated as $N_t^{U-E^f}/U_{t-1}$.

[5] See Bentolila et al. (2008) and Cebrian et al. (2011) for a detailed description of the duality of the labor market in Spain.

[6] When we refer to $X-Y$, we are in fact referring to the transition from state X in period $t-1$ to state Y in period t, where X and $Y \epsilon \{E^p, E^f, U, I\}$.

As discussed above, these transition rates may present time aggregation bias since they fail to capture the presence of multiple transitions within a period. To overcome this problem, we calculate the weekly transition rates from the observed quarterly rates in our four-state model.[7] More specifically, we first compute the monthly (m) transition rates using the unadjusted quarterly transition rates and the system of equations described in 5. Then, using these monthly transition rates and the system of equations described in equation 6, we compute the weekly (w) transition rates.[8] Once we have the weekly transition rates, we multiply them by 12 (4×3) to obtain the corrected quarterly transition rates.[9][10]

$$\Lambda_{q,t}^{ij} = \sum_k \sum_l \Lambda_{m,t}^{ik} \Lambda_{m,t}^{kl} \Lambda_{m,t}^{lj}, \quad i,j,k,l \epsilon \{E^p, E^f, U, I\} \tag{5}$$

$$\Lambda_{m,t}^{ij} = \sum_k \sum_l \sum_n \Lambda_{w,t}^{ik} \Lambda_{w,t}^{kl} \Lambda_{w,t}^{ln} \Lambda_{w,t}^{nj}, \quad i,j,k,l,n \epsilon \{E^p, E^f, U, I\} \tag{6}$$

3 Worker Transitions in the Spanish Labor Market

Bellow we analyze the dynamics of the Spanish labor market using transition rates in a four-state set-up, focusing above all on the behavior of these transition rates during the current economic crisis.

Labor market outcomes are not constant over time (see Figure 2). In particular, the current economic crisis has led to a significant deterioration in Spain's labor market conditions. While the real GDP in Spain fell 4.3 percent from the second quarter of 2008 to the second quarter of 2010, unemployment more than doubled and employment was down by almost 10 percent. Specifically, the number of unemployed workers increased by more than 2.2 million from the beginning of the recession to the second quarter of 2010 and employment fell by 1.9

[7] We thank Pedro Gomes for providing us with his MATLAB codes for the analysis of the UK labor market in a three-state model.

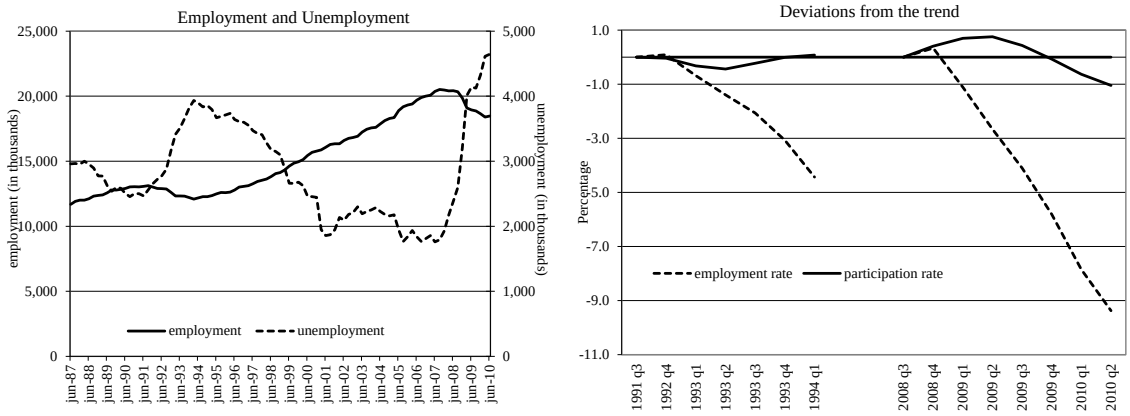
[8] We are assuming that status does not change within a week. This assumption is consistent with the Spanish Statistics Office definition that defines an individual's status in the labor market according to the status reported in a given week.

[9] In addition, we calculate the continuous time transition rates (or hazard rates) by applying the discrete correction several times. That is, for each iteration we divide time by one third until the series converge to a constant value (after ten interactions). Likewise, when we corrected the aggregation bias using the continuous time correction proposed by Shimer (2012) and the results were practically the same. The average correlation between rates was 0.99 and the means were not statistically significant different. Since the difference between the corrected transition rates and the hazard rates, obtained using both continuous corrections, was negligible, we opted to use the former.

[10] For a discussion of the pros and cons of employing discrete or continuous time correction for time aggregation bias, see sub-section I.C. in Elsby et al. (2009).

million workers in the same period. The panel on the right-hand side of Figure 2 shows the relative importance of the current downturn (via the cumulative deviations in the employment and participation rates from their respective trends), comparing behavior during the current downturn and that of the nineties. Figure 2 also shows that the increase in unemployment in both recessions was mirrored by a fall in employment. However, we observe a different trend in the labor force participation rate. Specifically, at the beginning of the crisis of the nineties the participation rate fell (exhibiting pro-cyclicality), while at the beginning of the current crisis the labor force participation increased. Our subsequent analysis seeks to understand the transitions between the different labor market states underlying these large aggregate changes.

Figure 2: Employment and Unemployment, 1987:2-2010:2 and The Cumulative Deviations of the Employment and Participation Rates from their Respective Trends (1991:3-1994:1 and 2008:3-2010:2)



Note: We use a Hodrick-Prescott filter with the smoothing parameter 1600 to obtain the trend of the series.
Source: Own elaboration from Spanish Labor Force Survey (INE).

Table 1 shows the transition rates over the entire period and also for the last two periods of expansion (1987:3-1992:1 and 1995:1-2008:1) and the last two recessions (1992:2-1994:4 and 2008:2-2010:2). Over the whole period, the transition rates that include temporary employment and unemployment are highest (U-E^f and E^f-U). By contrast, the rates that include permanent employment and unemployment are among the lowest ones (E^p-U and U-E^p).

The transition rates also differ markedly across the periods. Our calculations show that

during the current recession the transition rate from permanent employment to unemployment more than doubled with respect to the previous period of economic expansion (from 0.35 to 0.85) and increased 47 percent with respect to the rate recorded during the crisis of the nineties (0.58 and 0.85). The destruction of fixed-term contracts shows a similar trend in these two periods; the transition rate rose from 7.21 (1995:1-2008:1) and from 9.49 (1992:2-1994:4) to 11.17 in the current period of recession.

Table 1: Transition Rates

Quarterly Average 1987:3-2010:2 (in percentages)

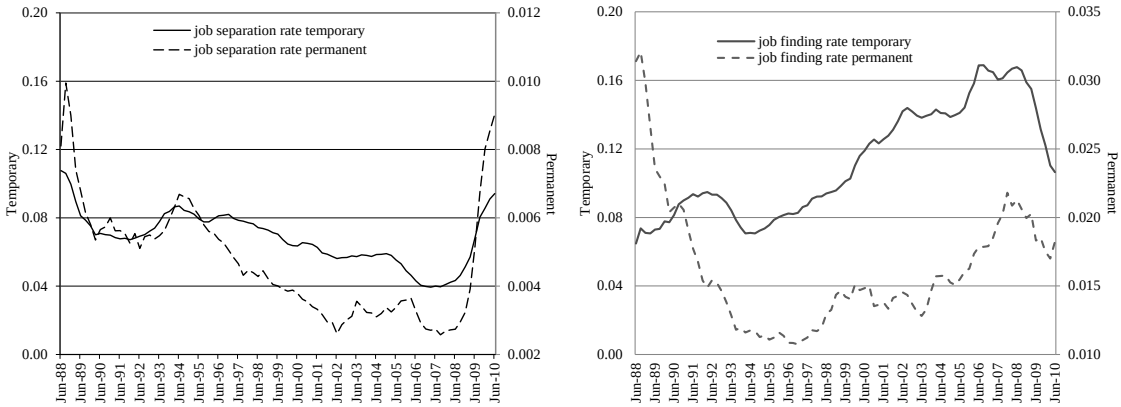
	Ep-U	Ep-I	U-Ep	U-I	I-Ep	I-U	Ep-Ef	Ef-Ep	U-Ef	Ef-U	I-Ef	Ef-I
Average	0.48	1.08	1.33	8.02	0.58	1.60	1.70	7.56	13.60	8.28	0.66	1.99
87:3-92:1	0.58	0.99	1.76	4.35	0.52	1.03	2.49	11.70	10.06	9.22	0.45	1.78
92:2-94:4	0.58	1.05	1.02	6.19	0.44	1.67	1.63	5.92	8.73	9.49	0.35	1.48
95:1-08:1	0.35	1.04	1.21	9.35	0.57	1.59	1.45	6.21	15.67	7.21	0.78	2.05
08:2-10:2	0.85	1.55	1.49	10.19	0.97	2.82	1.58	8.85	14.81	11.17	0.80	2.72

Notes: Ep represents permanent employment; U unemployment; I Inactivity and; Ef temporary employment. When we refer to $X - Y$, we are in fact referring to the transition from state X to state Y. We divide the period into two sub-periods of expansion (1987:3-1992:1 and 1995:1-2008:1) and two of recession (1992:2-1994:4 and 2008:2-2010:2). All transition rates are corrected for time aggregation bias using the discrete method presented in section 2.2
Source: Own elaboration using Spanish Labor Force Survey (INE).

The dynamics of the transition rates between permanent employment, temporary employment and unemployment can be seen in Figure 3. This Figure shows the evolution of the job separation and job finding rates for both, permanent and temporary employment. Despite the different impact that these two rates can have on unemployment, at the beginning of the crisis separation rates began to grow, while a few quarters later the job finding rates fell. This behavior was observed in both the crisis of the nineties as well as the current crisis. In addition, the magnitude of these changes was much greater among temporary jobs than it was among permanent posts.

Based on our results of the evolution in the ins and outs of unemployment, it would seem that the rise in aggregate unemployment (and the decline in aggregate employment) during the last two labor market crises might be explained both by a rise in separations and a fall in the number of workers being hired.

Figure 3: Job Separation and Job Finding Rates from Permanent and Temporary Jobs



Source: Own elaboration from Spanish Labor Force Survey (INE).

Having presented the results for Spain, it is of interest to compare these figures with empirical evidence from other countries. To put our calculations in context, Table 2 compares our transition rates results with the empirical evidence for the UK and the US.[11]

As expected, most of the transition rates are greater in labor markets with a higher levels of overall flexibility. Specifically, the transition rate between unemployment and employment is much lower for Spain than it is for the UK and the US (14.5, 34.6 and 32.4 percent, respectively). Similarly, the average quarterly transition rates between employment and inactivity are lower in Spain than they are in the UK and the US (1.8, 2.6 and 9.6 percent of the working age population, respectively). The exception is the transition rate between employment and unemployment. Table 2 shows that this rate is higher in Spain than it is in the UK and the US (2.2 and 1.8 percent, respectively). This higher transition rate can be accounted for primarily by the prevalence of temporary contracts - specifically, while the transition from permanent employment to unemployment is low (0.4 percent), the transition from temporary employment to unemployment is one of the highest (8.0 percent).[12]

As discussed above, for the unemployed in Spain finding a job is much more difficult than it is for their counterparts in both the UK and the US (the transition rate from U to E in Spain is 14.5 percent while in the UK and the US it is 34.6 and 32.4 percent, respectively). In our analysis, we differentiate therefore between transitions that involve temporary and

[11]This comparison is limited to the period 1993 to 2010.

[12]Temporary employment represents almost 25 percent of Spain's total employment.

permanent employment. Table 2 shows that the transition rates from unemployment to employment is largely explained by the transition rates from unemployment to temporary employment. Specifically, the transition rate from unemployment to temporary employment (14.7 percent) is much higher than that from unemployment to permanent employment (1.2 percent).

Table 2: Transition Rates, Spain, UK and US

Quarterly Average 1993-2010 (in percentages)

	Spain	UK	US
$E-U$	2.2	1.8	1.8
$U-E$	14.5	34.6	32.4
$E-I$	2.0	1.9	2.7
$I-E$	2.1	5.6	4.3
$U-I$	9.0	24.2	29.1
$I-U$	1.7	7.1	3.5
$Ep-U$	0.4		
$Ep-I$	1.1		
$U-Ep$	1.2		
$I-Ep$	0.6		
$Ep-Ef$	1.5		
$Ef-Ep$	6.5		
$U-Ef$	14.7		
$Ef-U$	8.0		
$I-Ef$	0.7		
$Ef-I$	2.1		

Source: For Spain, own elaboration using SLFS. The transition rates for the UK were taken from data constructed by Pedro Gomes and, those for the US, from the data available at the Robert Shimer's web page. For additional details, see Gomes (2012) and Shimer (2012).

A further finding of interest for the Spanish case is the relatively low transition rate from unemployment to finding oneself out of the labor force (9.0 percent compared to 24.2 percent in the UK and 29.1 percent in the US). This result, combined with the fact that the U to E transition rate is also lower in Spain, is one of the elements that might explain the high persistence of Spain's unemployment rate.

Finally, in line with the transition from unemployment to employment, the transition rate from inactivity to employment is higher in the UK and in the US (5.6 and 4.3 percent for the UK and the US and 2.1 percent for Spain). However, the transition rate in the opposite

direction is similar in Spain and the UK (around 2 percent) but somewhat higher in the US (2.7 percent).

4 Business Cycle Properties of Transition Rates

Having presented the results of the gross worker flows and the transition rates, in this section we assess the properties of these transition rates at business cycle frequencies. First, we calculate unconditional cross correlations with output at four leads and lags. Second, we analyze the dynamics of the transition rates in different time periods, and calculate conditional correlations of VAR forecast errors at different horizons.

4.1 Unconditional Correlations

Table 3 shows the cyclical correlation of transition probabilities between unemployment, employment and inactivity with Gross Domestic Product (GDP) at leads and lags of up to four quarters. We obtain the cyclical component of the series, which has been logged previously, using a HodrickPrescott (HP) filter with a standard smoothing parameter of 1600 for quarterly data. Thus, when we refer to a variable x, we actually refer to its cyclical component as just defined.

First, our results show that GDP leads the cyclical behavior in most of the transition rates, given that their correlations reach their maximum (in absolute values) at lags. This result suggests that the labor market trails the business cycle.

Second, special attention should be paid to the correlations between GDP and the transitions from unemployment to both types of employment (temporary and permanent). The correlation between the transition rate from unemployment to temporary jobs ($U - E^f$) and GDP peaks at 0.678 at a lead of one quarter, while the correlation between the transition rate from temporary jobs to unemployment $E^f - U$ and GDP peaks at -0.724 at a lag of two. These correlations point to the pro-cyclicality of the $U - E^f$ transition rate and the counter-cyclicality of the $Ef - U$ transition rate. As for the correlation between the transition rate from permanent jobs to unemployment $E^p - U$ and GDP, we also found a counter-cyclical behavior with a maximum of -0.641 at one lag. However, the correlation coefficient between the transition rate from unemployment to permanent employment ($U - E^p$) and GDP it is non significant. These results are coherent with the fact that, in most cases, firms use

Table 3: Cross-correlations GDP and Transition Rates
Quarterly Average 1987:3-2010:2

	$GDP(t \mp i)$								
	$t-4$	$t-3$	$t-2$	$t-1$	t	$t+1$	$t+2$	$t+3$	$t+4$
$Ep-U$	-0.464^*	-0.574^*	-0.627^*	-0.641^*	-0.607^*	-0.447^*	-0.304^*	-0.161	-0.0149
$Ep-I$	0.130	0.108	0.089	0.063	0.066	0.093	0.079	0.089	0.065
$U-Ep$	0.029	0.012	-0.055	-0.062	-0.120	-0.145	-0.121	-0.146	-0.127
$U-I$	-0.100	-0.018	0.052	0.100	0.159	0.237^*	0.242^*	0.238^*	0.183
$I-Ep$	0.164	0.182	0.213^*	0.216^*	0.219^*	0.213^*	0.161	0.105^*	0.013^*
$I-U$	-0.440^*	-0.496^*	-0.505^*	-0.494^*	-0.449^*	-0.291^*	-0.198	-0.109	-0.029
$Ep-Ef$	0.346^*	0.404^*	0.448^*	0.474^*	0.455^*	0.397^*	0.293^*	0.181	0.048
$Ef-Ep$	0.282^*	0.330^*	0.384^*	0.379^*	0.386^*	0.340^*	0.241^*	0.183	0.047
$U-Ef$	0.388^*	0.536^*	0.639^*	0.678^*	0.649^*	0.589^*	0.415^*	0.257^*	0.054
$Ef-U$	-0.669^*	-0.717^*	-0.724^*	-0.667^*	-0.566^*	-0.336^*	-0.156	-0.014	0.113
$I-Ef$	0.567^*	0.662^*	0.684^*	0.645^*	0.538^*	0.436^*	0.232^*	0.087	0.079
$Ef-I$	0.237^*	0.230^*	0.217^*	0.181	0.098	0.088	0.037	-0.018	-0.037

Notes: E^p represents permanent employment; U unemployment; I inactivity and; E^f temporary employment. $X-Y$ refers to the transition rate from state X to state Y. * indicates statistical significance at 5 percent level. Standard deviation of each time series is presented in parentheses in column one.
Source: Own elaboration using Spanish Labor Force Survey (INE).

fixed-term contracts as the main mechanism for creating employment. The two transition rates (between permanent and temporary jobs) move in the same direction as that of the business cycle, indicating that these job-to-job transition rates are pro-cyclical.

Third, the correlation coefficients between GDP and the transition rates related to inactivity show mixed results. On the one hand, the correlation between GDP and transition rate between permanent employment and inactivity are much lower and, in most cases, non significant, suggesting a-cyclical behavior as regards inactivity. On the other hand, the most interesting cases concerning inactivity are the correlations between GDP and transition rates from inactivity to unemployment and inactivity to temporary employment, with maximum coefficients of -0.505 and 0.684, respectively. These two results indicate the pro- and counter-cyclical behavior of these two transition rates.

4.2 Conditional Correlations

In this sub-section, we analyze the comovement between GDP and the transition rates using the conditional correlation coefficients of VAR forecast errors at different forecast horizons as proposed in den Haan (2000). This methodology has three essential advantages over the

unconditional correlation coefficients presented above. First, it can be used for stationary as well as integrated series, so no detrending of the series is required. Second, there is a direct relation between den Haan's methodology and the impulse response function, although it requires no identification restrictions as in the standard VAR approach. Finally, the examination of conditional correlations provides more information about the dynamics of the comovement of variables at different horizon periods.

From a set of estimated bivariate VARs between GDP and the transition rates, we construct time series for the forecast errors using the difference between subsequent realizations and their forecasts. These time series are then used to generate the correlation coefficients. The series are again expressed in logs but are not filtered. The VARs are estimated without imposing the unit-root restriction and by considering linear and quadratic trends when necessary. The lag length in the VAR and the deterministic components were chosen using the Akaike Information Criterion (AIC). Table 4 displays the correlation coefficients for a forecast horizon of up to five years ($J = 1, 2, ..., 20$). We also calculate bootstrapped standard errors based on 1000 replications to infer 95 percent confidence intervals.

Table 4: Correlation Coefficients between J-quarter-ahead Forecast Errors of GDP and Transition Rates.

Quarterly Average 1987:3-2010:2

J	Ep-U	Ep-I	U-Ep	U-I	I-Ep	I-U	Ep-Ef	Ef-Ep	U-Ef	Ef-U	I-Ef	Ef-I
1	−.359*	−.048	.173	.164	.050	−.357	.189	.147	.472*	−.334*	.065	.072
2	−.502*	−.023	.120	.257*	.151	−.388*	.309*	.244	.701*	−.456*	.402	.250*
3	−.579*	.008	.119	.343*	.219	−.434*	.385*	.313	.797*	−.485*	.536*	.327*
4	−.622*	.034	.085	.405*	.259	−.450*	.434*	.362*	.842*	−.582*	.654*	.363*
5	−.649*	.052	.063	.448*	.280	−.437*	.466*	.394*	.865*	−.612*	.656*	.375*
6	−.665*	.064	.036	.475*	.289	−.457*	.486*	.416*	.877*	−.650*	.644*	.375*
7	−.677*	.072	.015	.492*	.291	−.519*	.499*	.430*	.883*	−.682*	.651*	.368*
8	−.683*	.078	−.004	.502*	.290	−.558*	.507*	.439*	.885*	−.715*	.632*	.258*
12	−.696*	.088	−.049	.503*	.276	−.555*	.520*	.455*	.873*	−.709*	.640*	.321
16	−.701*	.091	−.068	.498*	.268	−.475*	.524*	.460*	.860*	−.707*	.663*	.302
20	−.704*	.092	−.077	.503*	.264	−.470*	.527*	.463*	.858*	−.720*	.623*	.296

Notes: * indicates statistical significance at 5 percent level. E^p represents permanent employment; U unemployment; I inactivity and; E^f temporary employment. When we refer to $X-Y$, we actually refer to the transition rate from state X to state Y.
Source: Own elaboration using Spanish Labor Force Survey (INE).

First, the signs of the conditional correlation coefficients are consistent with those of the unconditional correlations presented in Table 3. Second, the signs of the correlation coefficients between GDP and each of the labor market transition rates also remain unchanged at

different horizons, indicating a stable relationship between the economic activity and these transition rates over the business cycle. Third, most of these correlation coefficients increase with the forecast horizon, suggesting a persistent labor market adjustment in response to economic innovations.

Table 4 also reveals higher coefficients in the correlations that involve states of employment (permanent and temporary) and unemployment. Thus, as discussed above, the cyclical behavior of the transition rates between employment (in particular, temporary) and unemployment is more pronounced than that of the transition rates between inactivity and the two employment states. Moreover, the transition rate from unemployment to permanent employment ($U - E^p$) shows a non significant conditional correlation coefficient with GDP (-0.077 after 20 forecast horizons) while the correlation coefficient between GDP and the transition rate from unemployment to temporary employment ($U - E^f$) is positive and high in absolute terms (0.858 after 20 forecast horizons). In turn, the transition rate from inactivity to employment records maximum correlation coefficients of 0.623 from I to E^f and of 0.264 (non significant) from I to E^p. These results are also consistent with the fact that firms use fixed-term contracts as their main mechanism for creating jobs. As for the process of job destruction, we observe a similar correlation for the transition rates from temporary and permanent employment to unemployment with maximum correlation coefficients of -0.720 for $E^f - U$ and -0.704 for $E^p - U$ after 20 quarters. This last result is evidence of the fact that during recessions firms destroy not only temporary positions but also permanent jobs.

5 Contributions to fluctuations in unemployment in dual labor market

Below we analyze the contribution of the various transition rates to the cyclical behavior of the equilibrium unemployment rate. Several studies, including Elsby et al. (2009), Fujita and Ramey (2009) and Shimer (2012) for the US and Petrongolo and Pissarides (2008), Smith (2011) and Gomes (2012) for European countries, have computed the relative contributions of job separation and job finding rates to unemployment rate variability. The aforementioned studies all calculate the contribution to this volatility by considering transitions in two-state (employment and unemployment) or three-state models (employment, unemployment and inactivity). In our analysis of the contribution of the transition rates to the dynamics of

the unemployment rate, we use a four-state model. Specifically, we take into account the employment duality of the Spanish labor market, distinguishing between the transition rates that involve temporary employment and those that involve permanent employment.

Using equations (1)-(4), we compute the steady-states for E^p, E^f, U, I in each period by solving the following equation system as a function of the transition rates, Λ_t^{X-Y}.[13]

$$
\begin{aligned}
-(\Lambda_t^{U-E^p} + \Lambda_t^{U-E^f} + \Lambda_t^{U-I})U_t^{ss} + \Lambda_t^{E^p-U}E^{p}{}_t^{ss} + \Lambda_t^{E^f-U}E^{f}{}_t^{ss} + \Lambda_t^{I-U}I_t^{ss} &= 0, \quad (7)\\
\Lambda_t^{U-E^p}U_t^{ss} - (\Lambda_t^{E^p-U} + \Lambda_t^{E^p-E^f} + \Lambda_t^{E^p-I})E^{p}{}_t^{ss} + \Lambda_t^{E^f-E^p}E^{f}{}_t^{ss} + \Lambda_t^{I-E^p}I_t^{ss} &= 0, \quad (8)\\
\Lambda_t^{U-E^f}U_t^{ss} + \Lambda_t^{E^p-E^f}E_{t-1}^{p} - (\Lambda_t^{E^f-U} + \Lambda_t^{E^f-E^p} + \Lambda_t^{E^f-I})E^{f}{}_t^{ss} + \Lambda_t^{I-E^f}I_t^{ss} &= 0, \quad (9)\\
\Lambda_t^{U-I}U_t^{ss} + \Lambda_t^{E^p-I}E^{p}{}_t^{ss} + \Lambda_t^{E^f-I}E^{f}{}_t^{ss} - (\Lambda_t^{I-U} + \Lambda_t^{I-E^p} + \Lambda_t^{I-E^f})I_t^{ss} &= 0. \quad (10)
\end{aligned}
$$

Figure 4 compares the steady state unemployment rate u_t^{ss} with the actual unemployment rate u_t. This comparison suggests that both rates followed fairly similar paths throughout the period. The largest deviations occurred when actual unemployment underwent marked and rapid rises. Specifically, this behavior was recorded at the beginning of the last two labor market crises, in the second quarter of 1992 and in the fourth quarter of 2008. Despite these discrepancies, the steady state and the actual unemployment rates show a very high correlation (0.94).

Based on this strong correlation, between the actual and the steady state unemployment rates, we first approximate the contributions of the various transition rates to fluctuations in unemployment using the previously calculated equilibrium unemployment rate. Following Shimer (2012), we isolate the effect of each individual transition rate on steady state unemployment by constructing counterfactual values for $E^{p}{}_t^{ss}, E^{f}{}_t^{ss}, U_t^{ss}$ and I_t^{ss}. In order to calculate these counterfactuals, we allow movements over time in just one transition rate and assume that the remaining rates are fixed at their average values ($\overline{\Lambda}^{X-Y}$). More specifically, we compute the contribution of each transition rate through the coefficient from a regression of each detrended counterfactual unemployment rate on the detrended equilibrium unemployment rate. Table 5 shows the contribution of each transition rate to unemployment volatility in two different scenarios: i) when not considering the employment duality (column one) and ii) in a four-state labor market model, which explicitly takes into account the employment

[13]For the three-state model, we calculate the steady-state for total employment $E = E^p + E^f$.

Figure 4: Actual and Steady State Unemployment Rates

Note: The steady state unemployment rate is calculated from the steady state of unemployment, fixed-term and permanent employment ($u_t^{ss} = \frac{U_t^{ss}}{(E^{f}{}_t^{ss} + E^{p}{}_t^{ss} + U_t^{ss})}$).
Source: Own elaboration from Spanish Labor Force Survey (INE).

duality in Spain's labor market (column two).

In order to increase the robustness of our results, we also present the results of a decomposition that extends the methodology proposed by Fujita and Ramey (2009) to a four-state model. More specifically, we decompose the equilibrium unemployment rate by taking a first-order Taylor expansion around the HP-filter trend values of the hazard rates ($\overline{\Lambda}_t^{X-Y}$) instead of around the constant means ($\overline{\Lambda}^{X-Y}$). From the first-order Taylor expansion we obtain the following expression:

$$\Delta u_t^{ss} = \frac{u_t^{ss} - \overline{u}_t^{ss}}{\overline{u}_t^{ss}} \quad = \quad \sum_{X-Y} \beta_t^{X-Y} \left(\frac{\Lambda_t^{X-Y} - \overline{\Lambda}_t^{X-Y}}{\overline{\Lambda}_t^{X-Y}} \right) + \varepsilon_t, \tag{11}$$

where $\beta_t^{X-Y} = \frac{\partial \overline{u}_t^{ss}}{\partial \overline{\Lambda}_t^{X-Y}} \frac{\overline{\Lambda}_t^{X-Y}}{\overline{u}_t^{ss}}$ is the elasticity of the HP trend equilibrium unemployment rate with respect to the HP trend value of the hazard rate and ε_t is an error term.[14] Defining the factor $\Delta u_t^{ss}(\Lambda_t^{X-Y})$ as the contribution of the hazard rate Λ_t^{X-Y} to fluctuations in the equilibrium unemployment rate, the decomposition proposed in (11) makes possible a quantitative assessment of unemployment variability in terms of the separate contributions of each hazard rate, which in turn can be expressed as a proportion of total variation.

[14] Let us define $\overline{u}_t^{ss}(\Lambda_t^{X-Y})$ as the quarterly deviation in the equilibrium unemployment rate with respect to its HP trend when the transition rate Λ_t^{X-Y} is also deviated from its trend and the rest of transition rates remain at their HP trend values, then $\frac{\partial \overline{u}_t^{ss}}{\partial \overline{\Lambda}_t^{X-Y}} = \frac{\overline{u}_t^{ss}(\Lambda_t^{X-Y}) - \overline{u}_t^{ss}}{\Lambda_t^{X-Y} - \overline{\Lambda}_t^{X-Y}}$.

$$\chi^{X-Y} = \frac{cov(\Delta u_t^{ss}, \Delta u_t^{ss}(\Lambda_t^{X-Y}))}{var(\Delta u_t^{ss})}. \tag{12}$$

The contributions of the different transition rates to unemployment volatility, using the second methodology, in the scenario of employment duality, are presented in column 3 of Table 5.

Table 5: Unemployment Decompositions: Spain 1987-2010

Shimer				Fujita and Ramey
Three States		Four States		Four States
E-U	0.334			
		$Ep - U$	0.168	0.176
		$Ef - U$	0.264	0.293
U-E	0.349			
		$U - Ep$	-0.006	-0.005
		$U - Ef$	0.278	0.286
E-I	-0.041			
		$Ep - I$	-0.012	-0.062
		$Ef - I$	-0.005	-0.016
I-E	0.113			
		$I - Ep$	0.066	0.102
		$I - Ef$	0.046	0.055
I-U	0.131	*I-U*	0.102	0.108
U-I	0.072	*U-I*	0.065	0.089
		$Ep - Ef$	-0.180	-0.219
		$Ef - Ep$	0.177	0.216

Notes: We first calculate the covariance between the steady state unemployment rate u_t^{ss} and the counterfactual unemployment rate assuming that all transition rates, except one, were always at their sample average (columns 1 and 2) or at their HP trend values (column 3). We then divide each covariance by the variance of u_t^{ss}. The series are detrended using a HodrickPrescott filter with the standard quarterly smoothing parameter of 1600.
Source: Own elaboration from Spanish Labor Force Survey (INE).

In the three-state model, fluctuations in the transition rate from unemployment to employment ($U - E$) account for about 35 percent of the fluctuations in the unemployment rate. A similar contribution to movements in the unemployment rate id derived from the employment to unemployment ($E - U$) transition rate (33 percent). Thus, our results imply that both the job finding and job separation rates are important in accounting for the volatility in the Spanish equilibrium unemployment rate, which is in line with the findings

of Petrongolo and Pissarides (2008). The other transition rates (those involving inactivity) make a quantitatively minor contribution to the fluctuations in unemployment.

As can be seen in columns 2 and 3 of Table 5, the results for the four-state model are very similar when applying both methodologies. Specifically, the contribution of the $E - U$ transition rate increases as the contribution of the $U - E$ transition rate decreases. Thus, the contribution of the separation rate is much more important than that of the job finding rate in accounting for fluctuations in Spain's unemployment rate. Moreover, and as with the three-state set-up, the transition rates that involve inactivity make a quantitatively minor contribution to unemployment rate volatility. The employment duality of the Spanish labor market is evident when we consider the transitions in the different types of employment (permanent and temporary) and unemployment. Specifically, almost 80 percent of movements between unemployment and employment involve fixed-term contracts. Furthermore, our findings show that the transition rate from unemployment to temporary employment ($U - E^f$) accounts for all of the contribution of the aggregate job finding rate to fluctuations in the unemployment rate. Moreover, the transition rate from temporary jobs to unemployment is responsible for more than 60 percent of the fluctuations in the aggregate job-separation rate. Thus, transition rates involving temporary employment are much more important for explaining the cyclical movement in unemployment than are the rates involving permanent jobs. Despite this finding, our results confirm that temporary employment plays a more important role in job creation than in job destruction. Finally, we find that the positive contribution of the transition rate from temporary to permanent jobs ($E^f - E^p$) to unemployment fluctuations fluctuations is cancelled out by the transition rate from permanent to temporary jobs ($E^p - E^f$).

6 Final Remarks

In this paper, we have studied the trends in the aggregate labor market outcomes for the Spanish economy, from the third quarter of 1987 to the second quarter of 2010. We have computed gross worker flows and transition rates between different states, explicitly considering the two-tiered nature of the Spanish labor market. We found that 84.4 percent of gross flows between employment and unemployment involve temporary contracts. While both sides (the ins and outs) are important for explaining the dynamics of unemployment, at the outset of

periods of economic crisis the separation rate rises while a few quarters later the job finding rate is seen to fall. This behavior is present in both the current crisis and in that of the nineties. Moreover, the magnitude of these changes is much greater in temporary jobs than it is in permanent positions. A comparison of our results for Spain with evidence from the UK and the US shows that transition rates from unemployment to employment and those that include unemployment and inactivity are lower in Spain. By contrast, the transition rate from employment to unemployment is higher in Spain than it is in the UK and the US. This result would seem to reflect the relatively high overall flexibility of UK and US labor markets, but at the same time it also captures the high flexibility for those in the temporary employment in Spain.

As for the business cycle properties of the transition rates, we find a strong and positive (negative) relationship between and transition rates from unemployment to temporary employment (from temporary employment to unemployment) over the business cycle. These results are consistent with the fact that firms use fixed-term contracts as the main mechanism for hiring and firing workers.

In the three-state set-up, we find that fluctuations in the transition rates from unemployment to employment and from employment to unemployment account for roughly 35 and 33 percent of the fluctuations in the unemployment rate, respectively. As such, our results indicate that both sides (creation and destruction) are important when explaining unemployment rate volatility. When we explicitly consider the employment duality (four-state set-up), we find that almost 80 percent of movements between unemployment and employment involve a transition to temporary employment. More specifically, our findings show that the transition rate from unemployment to temporary employment accounts for all of the contribution of the aggregate job finding rate to the fluctuations in the unemployment rate. Moreover, the transition rate from temporary jobs to unemployment is responsible for more than 60 percent of the fluctuations in the aggregate job separation rate. Thus, transition rates that include temporary employment seem to hold the key to understanding the cyclical movement in Spain's unemployment rate.

Our study provides empirical evidence of worker flows in a two-tier labor market. Specifically, it stresses the importance of transition rates that involve temporary jobs, as it is these that seem to account for unemployment volatility. To some extent, our results could be con-

sidered a point of reference for researchers who seek to explain unemployment fluctuations in similar dual labor markets.

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