DISCUSSION PAPER SERIES

IZA DP No. 5742

More Alike than Different: The Spanish and Irish Labour Markets Before and After the Crisis

Pablo Agnese
Pablo F. Salvador

May 2011

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

More Alike than Different: The Spanish and Irish Labour Markets Before and After the Crisis

Pablo Agnese
IESE Business School
and IZA

Pablo F. Salvador
CONICET
and Universidad Nacional de Cuyo

Discussion Paper No. 5742
May 2011

IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

IZA Discussion Paper No. 5742
May 2011

ABSTRACT

More Alike than Different: The Spanish and Irish Labour Markets Before and After the Crisis

This paper analyses the labour markets of Spain and Ireland, which have experienced a severe downturn in the recent global crisis as reflected by the largest increases in their unemployment rates among other developed economies. Spain and Ireland might seem at first to feature very different labour markets, which go from very tight to very flexible labour conditions. Our analysis, however, goes beyond this simplistic argument and brings to light the strong commonalities that seem to have been hidden underground. We estimate a dynamic multi-equation structural model for each country, and then offer two sets of dynamic simulations which account for the swings of the unemployment rates before and after the 2007 crisis. Our results suggest looking beyond the degree of flexibility of both labour markets, just to focus instead on other variables usually neglected by more conventional approaches. In particular, such variables as the growth of capital stock, the growth of labour productivity, and demographics, succeed in explaining a great part of the changes in unemployment in both countries.

JEL Classification: E24, J21, E22, C32

Keywords: unemployment dynamics, structural multi-equation models, chain reaction theory, simulations, PIGS

Corresponding author:

Pablo Agnese
IESE Business School
Center for Globalization and Strategy
Pearson Ave 21
Barcelona 08034
Spain
E-mail: pagnese@iese.edu

1 Introduction

The recent crisis of 2007 has left us with a whole series of qualms and controversies. Major economies have seen negative GDP growth rates in 2008 and 2009, just to experience positive rates again in 2010 and 2011. In the European setting, not all member states have been affected in the same way. For example, Germany, the UK, and France are now recovering at a reasonable pace –between 1.5 and 3.5 percent GDP growth rates in 2010 and 2011. The Nordic countries, in turn, yet not as severely hit as in the mid-1990s, seem to have learned from their previous experience and have quickly recovered with GDP growth rates of the order of 3.0 to 5.5 percent in the last two years. On the other hand, much of the discussion now taking place focuses on the less fortunate countries which have come to be known as PIGS (Portugal, Italy, Greece, and Spain, with Ireland joining the club right after the crisis).

The PIGS share a set of similar traits that make for a separate study apart from other large European economies, to wit: high unemployment rates, persistent fiscal imbalances, weakening financial sectors and credit rationing, severe after-effects of the housing boom, widespread corruption, and frequent strikes. However, when zooming in the picture we can get to see that not all PIGS are the same. For instance, while Greece, Ireland, and more recently Portugal, have received financial help from the European Union, Spain and Italy have not. Besides, two of these countries –Spain and Ireland– underwent major increases in unemployment, even when compared to the other PIGS. Moreover, the evolution of the unemployment rate in both countries has followed the same pattern in the last decades, although Spain displays much higher rates since the mid-1990s.

Our goal, then, is to study the trajectory of the unemployment rate of Spain and Ireland while highlighting the common drivers for the most part of the past decade and a half. We divide our analysis into two periods, before and after the 2007 crisis, which stretch between the major turning points of the unemployment rate in recent years. We estimate a dynamic labour market model for each country and perform a dynamic accounting exercise to examine how much of the unemployment variation in Spain and Ireland is attributable to the explanatory variables. Our results suggest that the two countries seem to have more similarities than differences –despite the clear contrast in the degree of flexibility of their labour markets.

The paper is structured as follows. Section 2 puts these two economies into context. Section 3 discusses the theoretical framework on which we base our empirical analysis. Section 4 shows the estimated models. Section 5 presents the contributions of the exogenous variables to the variation of unemployment, before and after the crisis. And finally, Section 6 concludes.

2 The two economies in context

To carry on with the analysis it is suitable now to look at how Spain and Ireland compare with other developed economies. Table 1 shows, for a selected group of countries, the average growth rate of GDP for the last decade and the unemployment rates (u) for the years after the crisis. A couple of facts are worth commenting upon. First, Spain and Ireland display average GDP growth rates that are consistently larger than in other parts of the developed world, especially during the years before the 2007 crisis (see the first two rows in Table 1). Second, it is to notice the important drop in these rates, both for Spain and Ireland, from pre to post-2007 averages (see second to third row in Table 1). Not only are these falls more pronounced there than in the major developed economies, but they are also different from the ones undergone by other similar geographies (e.g. the other 'PIGS'). And third, we should highlight the steep rise of both the Spanish and Irish unemployment rates –two and three-fold respectively– which stand out unambiguously from our group of selected countries (last three rows in Table 1).

We believe this deserves an explanation, preferably from the labour economics perspective. Arguably, this will help us determine not only why Spain and Ireland are different from other apparently similar countries (e.g. the PIGS), but also, to what extent they are more similar to each other than one is usually led to believe. This is precisely what we undertake to do in the following sections, after we briefly discuss the common trends of these two particular economies.

Table 1: Spain and Ireland in a worldwide context.

	SPA	IRE	POR	ITA	GRE	EU13	DE	FR	UK	US	JP
ΔGDP											
2000-09	2.6	3.6	0.9	0.5	3.3	1.3	0.8	1.5	1.7	1.9	0.7
2000-07	3.6	5.8	1.4	1.5	4.2	2.1	1.5	2.1	2.7	2.6	1.7
2008-09	-1.4	-5.2	-1.3	-3.3	0.01	-1.8	-2.0	-1.1	-2.3	-1.0	-3.3
u (%)											
2007	8.6	4.7	8.4	6.4	8.6	7.7	8.7	8.3	5.5	4.7	3.9
2009	19.9	12.5	10.0	8.2	9.9	9.8	7.7	9.5	7.9	9.8	5.2
Δ(p.p.)	11.3	7.8	1.6	1.8	1.3	2.1	-1.0	1.2	2.4	5.1	1.3

Source: OECD Economic Outlook no 87 (2010).

Seemingly, Spain and Ireland have lately evolved in a very similar way (see Table 2 more in detail). Both economies witnessed an economic boom in the mid-1990s that lasted until 2007. As a result, falling unemployment rates have characterised this

period,[1] allowing both countries to be counted among those OECD members where employment creation –led mostly by a booming housing market– was most significant (see, for example, Sexton, 2002; Walsh, 2006; and Bentolila *et al.*, 2010).

Spain and Ireland have also seen the largest migratory inflows among OECD countries in the pre-crisis era. This was motivated, first, by the good performance of these economies and their labour markets and, second, by the different reforms introduced by both governments (see Fitzgerald and Hore, 2002; Borjas, 2003; Barrett *et al.*, 2002, 2006 and 2011; Carrasco *et al.*, 2008; and González and Ortega, 2011).

Despite the similitudes, Spain and Ireland differ with respect to the flexibility of their labour markets (Dolado and Jimeno, 1997; Fitzgerald and Hore, 2002; and Bentolila and Jimeno, 2006). Traditionally, Spain has been always characterised by its very rigid labour market (although more flexibility was introduced in the 1990s), while Ireland's labour market has remained flexible for the most part of the last half-century. This has barely changed after the crisis.[2]

Table 2: Spain and Ireland at a glance

Common trends:	Pre-2007	Post-2007
GDP per capita	rising	falling
GDP growth rates	high	low/negative
Capital stock growth rates*	high	low/negative
Unemployment	falling	rising
Employment creation	high	negative
Construction sector (leading sector)	job creation	job destruction
Welfare entitlements*	falling	rising
Migratory flows	in	out
Housing market	boom	burst
Labour market conditions:		
Spain	tight	tight
Ireland	flexible	flexible

*: See also Appendix A (Figures i and iii).

The post-crisis years, 2007-2009, deviate from the high macroeconomic and labour market performance experienced by both economies in the preceding years (see Bentolila *et al.*, 2010, and Bergin *et al.*, 2010). Among other things, negative GDP growth rates, rising unemployment (more than two-fold for Spain and almost three-fold for Ireland), and an acute problem in the construction sector which led to massive layoffs,

[1] Spanish unemployment went down from a peak of 21.2 percent in 1994 to a trough of 8.6 percent in 2007, while Irish unemployment dropped from 17.4 percent in 1993 to 4.7 percent in 2007.

[2] According to OECD (2010), the overall index on the strictness of employment protection legislation between the mid-1990s and 2007 is (on average) 1.1 for Ireland and 3.0 for Spain. In addition, the Heritage Foundation publishes an index on economic freedom featuring Spain and Ireland's labour markets as, respectively, "repressed to mostly unfree" and "mostly free to free", over the period 2005-2011 (http://www.heritage.org/Index/).

characterise this downtrodden period (see Table 2). Moreover, this coincided with the bursting of the housing bubble, thus marking the end of the boom times.

3 Theoretical framework: The Chain Reaction Theory of unemployment

We base our empirical analysis on the Chain Reaction Theory (CRT), or prolonged adjustment view, of unemployment. The CRT, initially developed by Karanassou and Snower (1996), applies dynamic multi-equation systems with spillover effects to the labour market to explain how unemployment evolves. A main feature of this approach is that the labour market adjusts only slowly to external shocks because many labour market decisions are subject to adjustment costs. These lagged adjustment processes refer, among others, to: (i) employment adjustments arising from labour turnover costs (hiring, training, and firing costs), (ii) wage / price staggering, (iii) insider membership effects, (iv) long-term unemployment effects, and (v) labour force adjustments.[3] Thus, current decisions may depend on past labour market outcomes. Another striking feature is that, unlike single-unemployment rate models, CRT models can also include trended exogenous variables –imposing here that each growing endogenous variable should be balanced with its set of explanatory variables. In other words, the CRT claims that the time path of unemployment is driven by the interplay of the lagged adjustment processes and the spillover effects within the labour market system. Spillover effects arise when shocks to a specific equation feed through the labour market system. The label "shocks" refers to changes in the exogenous variables.

We show the workings of the CRT with the following model of labour demand, real wage, and labour supply equations, which we borrow from Karanassou *et al.* (2007):[4]

$$n_t = \alpha_1 n_{t-1} + \beta_1 k_t - \gamma_1 w_t \quad (1)$$

$$w_t = \alpha_2 w_{t-1} + \beta_2 x_t - \gamma_2 u_t \quad (2)$$

$$l_t = \beta_3 z_t + \gamma_3 w_t \quad (3)$$

where n_t, w_t, and l_t denote employment, real wage, and labour force, respectively; k_t is real capital stock, x_t represents a wage-push factor, and z_t is working-age population; the β's and γ's are positive constants. The autoregressive parameters α_1 and α_2 are positive and less than unity and represent the employment adjustment and wage/price

[3]These adjustment costs are well documented in the literature. See, for example, Nickell (1978), Sargent (1978), Taylor (1979), Lindbeck and Snower (1987), and Layard and Bean (1989).

[4]The labour market model (1)-(3) is compatible with standard microeconomic foundations. See, for example, Karanassou, Sala and Snower (2007).

staggering effects, respectively. All variables are in logs and we ignore the error terms for ease of exposition. The unemployment rate (not in logs) can be approximated by:

$$u_t \simeq l_t - n_t \tag{4}$$

We refer to lags of the endogenous variables in the labour market model as the "lagged adjustment processes". Furthermore, the γ's generate spillover effects, since changes in an exogenous variable –say the capital stock– can also affect the real wage and labour supply equations. Thus, in the presence of spillover effects, the short-run elasticities of the dependent variables to the exogenous ones are no longer captured by the β's. In other words, when γ is zero in the model (1)-(3), labour market shocks do not spillover from labour supply to labour demand and vice versa and the influence of the exogenous variables (k_t and z_t) on unemployment can be measured through individual analysis of the labour demand and supply equations. The existence of spillover effects in a multi-equation model renders our interactive approach.

Let us rewrite the demand, wage, and supply equations (1)-(3) as

$$\begin{aligned}
(1-\alpha_1 B)(1-\alpha_2 B)\, n_t &= \beta_1 (1-\alpha_2 B)\, k_t - \gamma_1 (1-\alpha_2 B)\, w_t && (5)\\
(1-\alpha_2 B)\, w_t &= \beta_2 x_t - \gamma_2 u_t && (6)\\
(1-\alpha_1 B)(1-\alpha_2 B)\, l_t &= \beta_3 (1-\alpha_1 B)(1-\alpha_2 B)\, z_t + && (7)\\
&\quad \gamma_3 (1-\alpha_1 B)(1-\alpha_2 B)\, w_t
\end{aligned}$$

where B is the backshift operator, and by substituting (6) into (5) and (7) we get the employment and labour force equations, respectively:

$$\begin{aligned}
(1-\alpha_1 B)(1-\alpha_2 B)\, n_t &= \beta_1 (1-\alpha_2 B)\, k_t - \gamma_1\beta_2 x_t + \gamma_1\gamma_2 u_t && (8)\\
(1-\alpha_1 B)(1-\alpha_2 B)\, l_t &= \beta_3 (1-\alpha_1 B)(1-\alpha_2 B)\, z_t + && (9)\\
&\quad \gamma_3\beta_2 (1-\alpha_1 B)\, x_t - \gamma_3\gamma_2 (1-\alpha_1 B)\, u_t
\end{aligned}$$

Finally, we derive the *reduced form*[5] equation of the unemployment rate by inserting the above equations into (4):

$$\begin{aligned}
\left[(1-\alpha_1 B)(1-\alpha_2 B) + \gamma_3\gamma_2 (1-\alpha_1 B) + \gamma_1\gamma_2\right] u_t &= -\beta_1 (1-\alpha_2 B)\, k_t && (10)\\
&\quad +\gamma_3\beta_2 (1-\alpha_1 B)\, x_t + \gamma_1\beta_2 x_t\\
&\quad \beta_3 (1-\alpha_1 B)(1-\alpha_2 B)\, z_t
\end{aligned}$$

[5]The term "reduced form" means that the parameters of the equation are not estimated directly, instead, they are some nonlinear function of the parameters of the underlying labour market system (1)-(3).

Equation (10) is the univariate representation of unemployment, since no other endogenous variables feature into the equation.[6] Observe that if $\gamma_2 = 0$, changes in capital stock (k_t) and working-age population (z_t) do not spillover in the labour market system.[7] Therefore, the effects of these variables on unemployment can be adequately captured by the labour demand (1) and supply (3) equations, respectively. If, on the other hand, $\gamma_2 \neq 0$ but either $\gamma_1 = 0$ or $\gamma_3 = 0$, any change in the exogenous variables will still generate spillover effects –the reduced form unemployment rate equation (10) takes these effects into account. However, when $\gamma_2 \neq 0$ and $\gamma_1 = \gamma_3 = 0$, there are *no* spillover effects in the system. In this case, x_t cannot influence unemployment and the unemployment equation (10) becomes redundant.

If we reparameterise the univariate representation of the unemployment rate (10) as

$$\begin{aligned} u_t &= \phi_1 u_{t-1} - \phi_2 u_{t-2} - \theta_k k_t + \theta_x (\gamma_1 + \gamma_2) x_t + \theta_z z_t + \\ &\quad \alpha_2 \theta_k k_{t-1} - \alpha_1 \gamma_3 \theta_x x_{t-1} - (\alpha_1 + \alpha_2) \theta_z z_{t-1} + \alpha_1 \alpha_2 \theta_z z_{t-2} \end{aligned} \tag{11}$$

where $\phi_1 = \frac{\alpha_1+\alpha_2+\alpha_1\gamma_2\gamma_3}{1+\gamma_1\gamma_2+\gamma_2\gamma_3}$, $\phi_2 = \frac{\alpha_1\alpha_2}{1+\gamma_1\gamma_2+\gamma_2\gamma_3}$, $\theta_k = \frac{\beta_1}{1+\gamma_1\gamma_2+\gamma_2\gamma_3}$, $\theta_x = \frac{\beta_2}{1+\gamma_1\gamma_2+\gamma_2\gamma_3}$, and $\theta_z = \frac{\beta_3}{1+\gamma_1\gamma_2+\gamma_2\gamma_3}$ we can observe the following key elements of the CRT. First, the autoregressive coefficients ϕ_1 and ϕ_2 represent the interactions of the employment adjustment (α_1) and wage-price staggering (α_2) processes. Second, the short-run coefficients of the exogenous variables embody the feedback mechanisms built in the system, since they are a function of the short-run elasticities/slopes of the individual equations (1)-(3), e.g. the β's and the spillover effects (γ's). Third, the interplay of the employment adjustment and wage-price staggering effects, on the one hand, and the spillover effects, on the other, gives rise to the lags of the exogenous variables (these lags can also be seen as moving-average terms in (11)). Fourth, the capital stock, a trended variable, appears as a driving force of the unemployment rate, a stationary variable –capital stock initially enters the system as a determinant of employment, a trended variable.

Finally, the labour demand (1) is a balanced equation since it is dynamically stable ($|\alpha_1| < 1$). Similarly, the trended labour force is driven by the working-age population (also a trended variable), and the static labour supply (3) is itself a balanced equation. According to (8)-(9), the labour demand and supply equations remain balanced once the wage (2) has been substituted into them. Therefore, the "reduced" unemployment rate equation is itself balanced, since (by (4)) it is given by the difference of the dynamically

[6] Notice that (10) is dynamically stable since (i) products of polynomials in B which satisfy the stability conditions are stable, and (ii) linear combinations of dynamically stable polynomials in B are also stable.

[7] This is because labour demand and labour supply are linked via wages. If changes in the capital stock and working-age population do not influence wages ($\gamma_2 = 0$) they cannot spillover to the system. The individual labour demand and supply equations can sufficiently capture their effects on unemployment.

stable labour supply and demand equations.

4 Two macro labor models

4.1 Data and methodology

The dataset is obtained from the OECD Economic Outlook and the sample period of our analysis is 1967-2009 for Spain and 1974-2009 for Ireland. Table 3 gives the definitions of the variables included in the selected equations.[8]

Table 3: Definitions of variables.

n	total employment (log)	c	private consumption (% of GDP)
l	total labour force (log)	fd	exports-imports (% of GDP)
w	real compensation per employee (log)	b	social security benefits (% of GDP)
u	unemployment rate ($\simeq l - n$)	τ^i	indirect taxes (% of GDP)
		po	total population (log)
k	real capital stock (log)	z	participation rate $\left(\frac{\text{labour force}}{\text{working-age pop.}}\right)$
pr	real labour productivity (log)	d^{96}	dummy (1 in 1996-2008; 0 other)
r	real long-term interest rate	d^{00}	dummy (1 in 2000-2008; 0 other)

Source: OECD Economic Outlook no 87 (2010) and AMECO database (2010).

The estimation strategy involves the Autoregressive Distributed Lagged (ARDL) approach developed by Pesaran (1997), Pesaran and Shin (1999), and Pesaran, Shin and Smith (2001). The justification of this choice can be summarised as follows. It has been shown that the ARDL yields consistent estimates both in the short- and long-run, and can be reliably used in small samples for hypothesis testing irrespective of whether the regressors are I(1) or I(0). Therefore, the ARDL offers an alternative that avoids the pretesting problem implicit in other popular cointegration techniques –the Johansen maximum likelihood, and the Phillips-Hansen semi-parametric, fully-modified OLS procedures. Furthermore, Pesaran and Shin (1999) argue that the Phillips-Hansen and ARDL approaches are directly comparable, and the estimator of the former is outperformed by the ARDL estimator, especially when the sample size is relatively small (as in our case).

[8] We have also experimented with other exogenous variables –social security contributions, measures of competitiveness, financial wealth, and real money balances– but these were found to have no explanatory power.

Our dynamic labour market model comprises labour demand, wage setting, and labour supply equations:[9]

$$\mathbf{A}_0\mathbf{y}_t = \sum_{i=1}^{2} \mathbf{A}_i\mathbf{y}_{t-i} + \sum_{i=0}^{2} \mathbf{D}_i\mathbf{x}_{t-i} + \boldsymbol{\varepsilon}_t, \tag{12}$$

where $\mathbf{y}_t$ is a vector of endogenous variables (employment, real wage, and labour force), $\mathbf{x}_t$ is a vector of exogenous variables, the $\mathbf{A}_i$'s and $\mathbf{D}_i$'s are coefficient matrices, and $\boldsymbol{\varepsilon}_t$ is a vector of strict white noise error terms.

Each equation of the labour market system (12) is estimated following the ARDL approach and the selected specifications pass a battery of diagnostic tests for serial correlation, linearity, normality, heteroskedasticity and autoregressive conditional heteroskedasticity, and structural stability. Finally, to account for potential endogeneity and cross-equation correlation we estimate the labour market model for each country with 3SLS. These estimated equations, together with the definition in (4), are then used to obtain the "reduced form" unemployment rate equation underlying the rest of our empirical analysis.

In what follows we discuss our estimation results and provide an overall evaluation of the selected labour market models.[10]

4.2 Estimated models

4.2.1 Labour demand

Table 4 shows the 3SLS estimates of the employment equation for Spain and Ireland. Both countries display a high degree of employment persistence. The coefficient is lower in Spain, 0.62, than in Ireland, 0.78, indicating a quicker speed of adjustment to economic disturbances in the former country. Karanassou and Sala (2009) find a similar level of employment persistence for the Spanish labour demand, 0.66. In the study of Benito and Hernando (2003) this coefficient ranges between 0.77 and 0.86; in Bande and Karanassou (2009 and 2010) employment persistence is somewhat smaller, 0.52. In the case of Ireland, employment persistence is in the range of Görg *et al.* (2009) –between 0.68 and 0.77.

These results may be at first surprising, given the known flexibility of the Irish labour market.[11] Spain is characterised by very rigid labour market laws that make the

[9] The dynamic system (12) is stable if, for given values of the exogenous variables, all the roots of the determinantal equation

$$\left|\mathbf{A}_0 - \mathbf{A}_1 B - \mathbf{A}_2 B^2\right| = 0$$

lie outside the unit circle. Note that the estimated equations given below satisfy this condition.

[10] Tables 4-6 below only give the 3SLS results, while the OLS estimates are available upon request.

[11] Labour market flexibility goes beyond the speed of adjustment of labour demand to shocks. Just

Spanish labour market quite inflexible, although more flexibility has been introduced in the 1990s (see, for example, Dolado and Jimeno, 1997; Fitzgerald and Hore, 2002; and Bentolila and Jimeno, 2006).

Table 4: Labour demand equations, 3SLS.

Dependent variable: n_t					
Spain, 1967-2009:			Ireland, 1974-2009:		
	coefficient			coefficient	
$cnt.$	2.27	[0.000]	$cnt.$	1.19	[0.010]
n_{t-1}	0.62	[0.000]	n_{t-1}	0.78	[0.000]
Δn_{t-1}	0.28	[0.016]			
w_t	-0.40	[0.000]	w_t	-0.12	[0.101]
k_t	0.26	[0.000]	k_t	0.13	[0.020]
Δk_t	1.70	[0.000]	Δk_t	1.53	[0.000]
			Δk_{t-1}	-0.76	[0.001]
			τ^i	-0.78	[0.010]
c_t	1.35	[0.000]			
fd_t	0.69	[0.000]			
Δfd_t	-0.48	[0.005]			
$\overline{r}^2$		0.997			0.996
$s.e.$		0.010			0.014
LL		143.01			105.70

Note: p-values in brackets; Δ is the difference operator; $\overline{r}^2$ the adjusted r-squared; $s.e.$ the standard error of regression; and LL the log likelihood.

The effect of capital stock is significant in both economies, with a long-run elasticity of 0.68 in Spain (e.g. a 1% rise in k boosts employment by 0.68%) and 0.6 in Ireland. Karanassou and Sala (2009) and Bande and Karanassou (2009 and 2010) find similar results for Spain. In the former study, the authors restrict the long-run impact of capital stock to unity, whereas in the latter two, this impact is 0.52. According to Benito and Hernando (2003), the long-run impact of capital stock on the Spanish labour demand lies between 0.55 and 0.65. In the Irish case, capital stock is significant in the studies of Fitzgerald and Hore (2002) and Bergin *et al.* (2010).

Employment is also sensitive to wage variations – with a long-run elasticity close to negative unity in Spain and -0.54 in Ireland. According to Karanassou and Sala (2009), real wages impact the Spanish labour demand with a negative unit elasticity in the long-run, while this impact falls to -0.67 in Bande and Karanassou (2009 and 2010). Benito and Hernando (2003) find a lower long-run wage elasticity, -0.37, while in the study of Bentolila and Saint-Paul (1992) this value is -1.86, yet the authors consider it

remember that, as per our model, other channels do exist –that of real wages and the labour force. In fact, Ireland's own flexibility is ranked 9^{th} in the world (see World Competitiveness Yearbook 2010). See also Kiander and Virén (2001) and Rodgers (2007) for different measures of flexibility, and the OECD report (2010) for an overall index on the strictness of employment protection legislation.

to be quite high relative to previous studies. According to Görg *et al.* (2009) the long-run impact of wages on the Irish labour demand lies between -0.19 and -0.31. Wages are also significant in the studies of Barrett *et al.* (2006) and Barrett and Bergin (2009).

Besides the common determinants we have also identified other idiosyncratic influences: private consumption and foreign demand in Spain, and indirect taxes in Ireland. Karanassou and Sala (2009) find these same idiosyncratic variables in the case of Spain, whereas indirect taxes exert an important influence on the Irish labour market according to Decoster *et al.* (2009).

4.2.2 Wage-setting

Table 5 presents the estimates of the real wage equation for the two countries. The quicker adjustment takes place in Ireland now, where the inertia coefficient is 0.65, compared to the more sluggish response in Spain, 0.76. The latter coefficient is in line with the studies of Bande and Karanassou (2009 and 2010), and higher than the one found in Karanassou and Sala (2009 and 2010).

Table 5: Wage-setting equations, 3SLS.

Dependent variable: w_t					
Spain, 1967-2009:			Ireland, 1974-2009:		
	coefficient			coefficient	
cnt.	0.67	[0.019]	*cnt.*	1.97	[0.000]
w_{t-1}	0.76	[0.000]	w_{t-1}	0.65	[0.000]
Δw_{t-1}	0.29	[0.020]	Δw_{t-2}	-0.42	[0.000]
u_t	-0.42	[0.000]	u_t	-0.21	[0.010]
pr_t	0.16	[0.006]	pr_t	0.15	[0.003]
b_t	0.97	[0.003]	b_t	0.57	[0.030]
d_t^{00}	-0.03	[0.001]	d_t^{96}	-0.02	[0.070]
$\overline{r}^2$		0.996			0.990
$s.e.$		0.013			0.017
LL		130.31			100.41

Note: p-values in brackets; Δ is the difference operator; $\overline{r}^2$ the adjusted r-squared; $s.e.$ the standard error of regression; and LL the log likelihood.

Further, the wage equation has the same determinants in both countries. Real wages are influenced by unemployment, labour productivity, unemployment benefits, and a dummy variable that considers the important influence of immigration in the last years.[12] The long-run elasticities of real wages to labour productivity are 0.67 for Spain and 0.43 for Ireland.

[12]In Ireland, the variable takes the value 1 in the period 1996-2008, representing the extraordinary reversal of the migratory flows in this country in the last years. The marked inflows began in the mid-1990s and accelerated in 2004 with the enlargement of the EU; however, in 2009 the net migratory flows became negative (see, for example, Barrett, 2009; Barrett and Kelly, 2010, and OECD, 2009). In the case of Spain the variable takes the value 1 in the period 2000-2008, when this economy experienced

All variables, except for immigration, are also important determinants of the Spanish wage formation in the works by Karanassou and Sala (2009 and 2010) and in the studies of Bande and Karanassou (2009 and 2010) and Bande *et al.* (2008). There, the long-run elasticity of real wages with respect to productivity ranges between 0.52 and 0.85. According to Fitzgerald and Hore (2002), unemployment, labour productivity, and immigration determine both the Irish and Spanish wage setting equations. The negative impact of immigration on Irish wage setting is well documented in the works by Borjas (2003) and Barrett *et al.* (2002, 2006 and 2011), while Carrasco *et al.* (2008) examine this impact on Spanish wages.

4.2.3 Labour force

Table 6 shows the two labour supply equations. Here the labour supply in Spain features the higher persistence. Note also that, in Ireland, the persistence in labour supply decisions does not differ substantially from that of the wage setting, 0.6. As in Karanassou and Sala (2009), the Spanish labour supply shows the highest persistence of the three estimated equations, 0.92.[13]

The role of wages and unemployment in the labour supply decisions of the two countries is as expected. Wages exert an overall positive influence with a long-run impact of 0.5 in Spain and 0.32 in Ireland, while unemployment has a negative effect –in Spain via a discouraged workers effect and in Ireland through the level of unemployment (see Leschke and Watt, 2010). According to Karanassou and Sala (2009), wages influence labour supply decisions with a 0.43 long run elasticity and the effect of unemployment is also measured through the discouraged worker effect. However, Bande and Karanassou (2009 and 2010) find a smaller impact of wages on the labour supply. In the case of Ireland, wages play an important role in the works of Barrett and Bergin (2009) and Bergin *et al.* (2010).

It is through the participation rate and total population, respectively, that we capture demographic influences on the labour supply movements in Spain and Ireland. Population is an important determinant affecting the Irish labour supply according to Barrett *et al.* (2006), Barrett and Bergin (2009), and Bergin *et al.* (2010).

an immigration boom that lasted until 2008. In 2009, Spain has seen a large decrease of net migration. Since the end of 2008, the Spanish government has implemented a series of measures to revert the migratory inflows (e.g. in September 2008 it introduced a voluntary return programme for non-EU migrants, the Royal Decree 4/2008 of 19 September). Although there is not yet a clear evidence of the impact of these measures, there is some support that immigrants are leaving Spain (see, for example, Leschke and Watt, 2010 and OECD, 2009).

[13]The Spanish labour force series comes from the OECD Economic Outlook 87, but only for years 1977-2009. To stretch the series back to 1967 we resort to the AMECO (2010) database of the European Commission; we use the growth rate of the AMECO series into the original OECD series for 1967-1976.

Table 6: Labour force equations, 3SLS.

Dependent variable: l_t					
Spain, 1967-2009:			Ireland, 1974-2009:		
	coefficient			coefficient	
cnt.	0.71	[0.112]	*cnt.*	-2.20	[0.096]
l_{t-1}	0.92	[0.000]	l_{t-1}	0.60	[0.000]
			Δl_{t-2}	0.21	[0.104]
w_t	0.04	[0.053]	w_t	0.13	[0.001]
Δw_t	-0.13	[0.061]			
z_t	0.32	[0.009]	po_t	0.43	[0.012]
			u_t	-0.27	[0.001]
Δu_t	-0.25	[0.000]	Δu_t	0.28	[0.012]
r_t	0.14	[0.000]			
d_t^{00}	0.01	[0.026]	d_t^{96}	0.03	[0.000]
$\overline{r}^2$		0.999			0.996
$s.e.$		0.007			0.012
LL		159.12			113.71

Note: p-values in brackets; Δ is the difference operator; $\overline{r}^2$ the adjusted r-squared; $s.e.$ the standard error of regression; and LL the log likelihood.

In Spain, labour supply decisions are also found to be dependent on the ups and downs of the interest rate. This is not surprising, given the high level of indebtedness of the Spanish families that were caught up by the housing bubble in recent years. What is more, spiralling increases in house prices have been combined with increases in home ownership (see Garriga, 2010), making the situation the more unbearable in terms of mortgage obligations. Recent increases in the interest rate will definitely force those under financial stress to participate in the labour market more eagerly.

Finally, we measure the significant impact of immigration in both labour markets by including a positive and significant dummy variable. Fitzgerald and Hore (2002) and Barrett *et al.* (2006) find a significant impact of immigration on the Irish labour supply, while Karanassou and Sala (2009) and Palma and Martín (2010) show this impact for Spain.

4.3 Evaluation of the models

4.3.1 Fitted values and diagnostic tests

Here we check the models' ability to replicate the actual patterns of the unemployment rates. As Figure 1 shows, the estimated labour market models manage to track the actual patterns at a very close range in the two countries. This is so in spite of having estimated the unemployment rates while making use of a model of equations and not a single-equation model. Do observe that the fit is slightly better for Spain (the sample, too, is somewhat larger in this case).

Figure 1. Unemployment rate: Actual and fitted values.

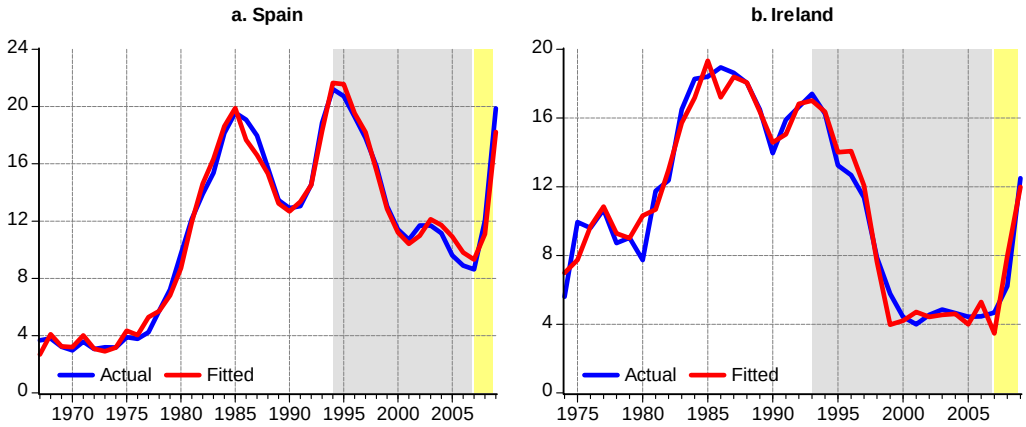


Table 7: Diagnostic tests.

Spain:	LD	WS	LF
Misspecification tests			
SC$[\chi^2(1)]$	3.11 [0.078]	0.02 [0.902]	0.97 [0.325]
LIN$[\chi^2(1)]$	0.28 [0.599]	5.37 [0.021]	0.51 [0.474]
NOR$[\chi^2(2)]$	1.66 [0.436]	1.97 [0.373]	3.89 [0.143]
HET$[\chi^2(1)]$	0.40 [0.530]	4.12 [0.042]	2.20 [0.138]
ARCH$[\chi^2(1)]$	0.92 [0.338]	1.14 [0.285]	0.00 [0.992]
Stability tests (5% signif.)			
Cusum	✓	✓	✓
Cusum^2	✓	✓	✓
Ireland:	LD	WS	LF
Misspecification tests			
SC$[\chi^2(1)]$	0.57 [0.451]	0.16 [0.688]	1.20 [0.273]
LIN$[\chi^2(1)]$	2.67 [0.102]	1.99 [0.158]	0.25 [0.617]
NOR$[\chi^2(2)]$	0.74 [0.690]	4.34 [0.114]	0.23 [0.893]
HET$[\chi^2(1)]$	0.00 [0.999]	0.30 [0.587]	0.01 [0.930]
ARCH$[\chi^2(1)]$	0.57 [0.451]	1.03 [0.310]	0.11 [0.746]
Stability tests (5% signif.)			
Cusum	✓	✓	✓
Cusum^2	✓	✓	✓

Note: LD is labour demand, WS wage-setting, and LS labour supply; and 5% critical values are: $\chi^2(1) = 3.84$; $\chi^2(2) = 5.99$.

Table 7 shows the misspecification and stability tests for both systems of equations. Selected misspecification tests are: heteroskedasticity (HET) and conditional

heteroskedasticity ($ARCH$) tests; Lagrange multiplier test for serial correlation (SC); Ramsey's linearity test (LIN); and Jarque-Bera test for normality (NOR). All tests are distributed as $\chi^2(1)$ with the exception of the Jarque-Bera test, which is distributed as a $\chi^2(2)$. Selected stability tests are the Cusum and Cusum^2, which ensure that the estimated equations are structurally stable. As seen from Table 7, almost all equations pass the tests easily. Remember that the best specifications for the equations were selected on the basis of the standard selection criteria (Akaike Information Criterion and Schwarz Bayesian Criterion). For each country, these equations were then re-estimated as a system by the three-stage least squares method (3SLS), so as to address the endogeneity and cross-equation correlation problems.

4.3.2 The ARDL approach and the Johansen method

To further check the validity of the estimated models we perform a second control. We want to test whether the long-run relationships implied by our estimations are statistically no different from those obtained by Johansen's method. The Johansen method for cointegration outperforms other conventional techniques (e.g. Engle-Granger) in that it allows for a complete identification of the number of cointegrating vectors. In general, for a given number of growing variables n we can only expect to have up to $n-1$ long-run relationships.[14] Therefore, by relying on Johansen's method whenever $n > 2$, we avoid assuming the existence of a unique cointegrating vector (CV) when there are actually more than one. In other words, while Johansen's multivariate method can deliver all possible cointegrating vectors r, other single-equation methods –like Engle-Granger– would only produce a linear combination of all those long-run relationships.

For all three equations in each of our two models we estimate a VAR featuring the same variables, lag order, and sample period, as those used before in the ARDL approach. In order to determine the number of cointegrating vectors r Johansen (1988) proposes two likelihood ratio (LR) tests –trace and maximum eigenvalues. In turn, the optimal model selection for the VARs in relation with the deterministic components (e.g. intercepts or trends, both restricted and unrestricted, or any possible combination) is done by following the Pantula principle. The Pantula principle (Johansen, 1992; Pantula, 1989) involves estimating a series of VARs specifications while moving from the most restrictive to the least restrictive of them (Johansen, 1995). This would enable us to select the correct deterministic specification and the order of the cointegration rank.

The results of this analysis are summarised in Table 8, which compares the CVs resulting from our previous ARDL estimations and the Johansen method. A LR test,

[14] At this stage we only consider the $I(1)$ variables in our models: n_t, w_t, l_t, k_t, pr_t, and po_t. For the sake of exposition unit root tests are not reported (but are available on request).

distributed as a $\chi^2(q)$ –with q the number of restrictions– restricts Johansen's CVs to the corresponding long-run ARDL values. On the last column we can see that none of the restrictions can be rejected at conventional critical values, indicating cointegration among the growing variables of each equation. Finally, notice that each of the ARDL equations can be reparameterised into an ECM; this provides a further indication of cointegration since the error correction term turns out negative and significant in all cases (first column).

Table 8: Validity of the long-run relationships.

ARDL		**Johansen**		**LR test**
ecm_{t-1}	CV	r	CV	
$[LD]$	$(\ n \quad w \quad k\ )$		$(\ n \quad w \quad k\ )$	
Spain:				
-0.34 (0.000)	$(\ 1 \quad -1.06 \quad 0.69\ )$	2	$(\ 1 \quad -1.20 \quad 0.80\ )$	$\chi^2(2) = 3.52\ [0.172]$
Ireland:				
-0.20 (0.029)	$(\ 1 \quad -0.62 \quad 0.65\ )$	2	$(\ 1 \quad -0.59 \quad 0.61\ )$	$\chi^2(1) = 1.63\ [0.201]$
$[WS]$	$(\ w \quad pr\ )$		$(\ w \quad pr\ )$	
Spain:				
-0.22 (0.000)	$(\ 1 \quad 0.66\ )$	1	$(\ 1 \quad 2.89\ )$	$\chi^2(1) = 0.50\ [0.480]$
Ireland:				
-0.32 (0.003)	$(\ 1 \quad 0.41\ )$	1	$(\ 1 \quad 0.35\ )$	$\chi^2(1) = 2.67\ [0.125]$
$[LF]$	$(\ l \quad w \quad po\ )$		$(\ l \quad w \quad po\ )$	
Spain:				
-0.09 (0.074)	$(\ 1 \quad 0.44 \quad\ )$	1	$(\ 1 \quad 0.68 \quad\ )$	$\chi^2(2) = 4.30\ [0.116]$
Ireland:				
-0.34 (0.006)	$(\ 1 \quad 0.31 \quad 1.09\ )$	1	$(\ 1 \quad 2.85 \quad 0.40\ )$	$\chi^2(2) = 0.24\ [0.889]$

Notes: CV = cointegrating vector; r = number of CVs; p-values in parentheses; moreover, LD is labour demand, WS is wage-setting, and LF is labour force; 5% critical values for the LR test are: $\chi^2(1) = 3.84$; $\chi^2(2) = 5.99$.

5 Counterfactual experiments: How different, how similar?

We use the estimated systems of Section 4.2 to perform a dynamic accounting exercise and examine how much of the unemployment variation in Spain and Ireland is attributable to the explanatory variables. We evaluate both the common variables –capital stock, labour productivity, unemployment benefits and demographics– and those that are not.

We consider two periods, before and after the recent crisis of 2007, stretching between the major turning points of the unemployment rate in recent years. The first turning points are 1994 for Spain and 1993 for Ireland, when unemployment started a downward trend in both countries that stabilized between 2005 and 2007 (this is our pre-2007 analysis). This period coincides with the extraordinary economic performance of both economies (see, for example, Bentolila *et al.*, 2010, for Spain and Barrett *et al.*, 2011, for Ireland). Unemployment rates then started to rise abruptly in both countries during 2007,[15] thus making for our second period of analysis (or post-2007 analysis).

The methodology underlying the CRT has been widely used in several places in the literature to see how much of the changes in the unemployment rate can be explained by changes in the exogenous variables of the model.[16] The procedure is the following. First, we assess the impact of the exogenous variables individually by fixing one of them to a certain point in time, thus creating a new (virtual) path of the unemployment rate over a specific period. We then contrast the actual and simulated unemployment series –the difference being the dynamic contribution of each exogenous variable. Next, we set all the explanatory variables simultaneously to certain date and create the virtual path of the unemployment rate for all the exogenous variables taken together.

5.1 Pre-2007 analysis

The analysis takes us now to the years right before the recent crisis of 2007, where both economies were faced with a prospective future. Figure 2 illustrates the actual and simulated trajectories of the unemployment rates of Spain and Ireland in the more than ten year-period that preceded the global meltdown. Notice the similitudes between Figures 2a and 2b: (i) the actual rates of unemployment (blue lines) went sharply down in both countries (from 21.2 to 8.6 percent in Spain and from 17.4 to 4.7 percent in Ireland); and (ii) the simulated ones (red lines) remained almost unaltered, implying that for both models all the exogenous variables get to explain the whole of the change in unemployment. That is, both unemployment rates would have remained nearly the same had all the exogenous variables been kept fixed at their original values (1994 for Spain and 1993 for Ireland).

This golden era of unparalleled high performance is very well documented.[17] In particular for the interlude years of 2005-2007 in Spain, a one-digit unemployment rate

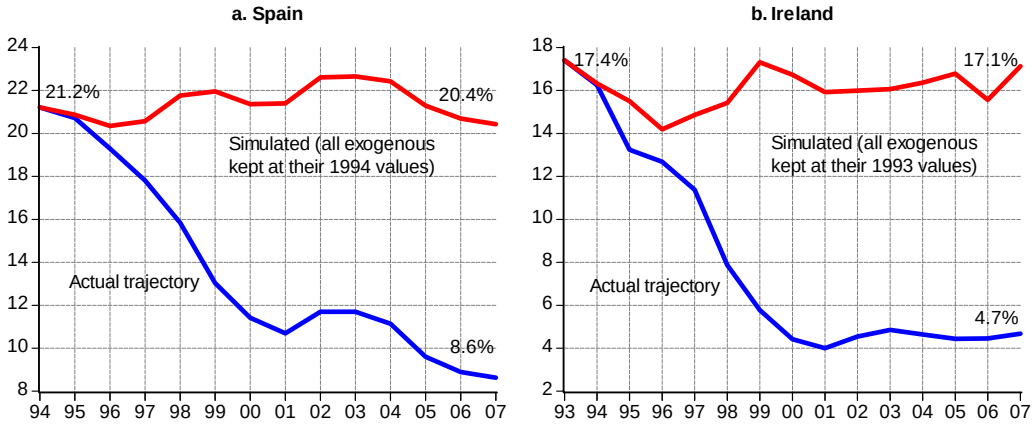
[15] Spanish and Irish unemployment rates started to climb, respectively, in May and August 2007 (see Eurostat, 2011).

[16] Some examples can be found in Henry *et al.* (2000) for the UK, Agnese and Sala (2009) for Japan, Karanassou and Sala (2009) for Spain, Karanassou and Sala (2010) for Australia, and Pehkonen *et al.* (2011) for Finland and Sweden.

[17] See, for instance, Estrada *et al.* (2009), Karanasou and Sala (2009), and Bentolila *et al.* (2010), for Spain, and Fitzgerald and Hore (2002), Sexton (2002), and Barrett *et al.* (2011), for Ireland. See also the OECD Economic Surveys for Spain (2007) and Ireland (2006).

can be observed for the very first time in the country's short democratic history –which succeeded Franco's dictatorship (1939-1975) and the so-called transition years (1976-1982). Ireland, on the other side, which enjoyed a much freer hand on economic matters than Spain –especially after her recognition by Britain through the Ireland Act of 1949–, came to be known as the Celtic tiger (see Walsh, 2006, and Barrett and Bergin, 2009). This is in allusion to the great economic expansion experienced during 1995-2007, which reminisces that of the East Asian tigers a few decades earlier.

Figure 2. Unemployment rate: Joint dynamic contributions, pre-2007.



To see both the differences and similitudes of both countries' experiences we need to delve deeper. For this, let us first review all the exogenous variables that are common to both systems of equations. For the ease of presentation we also group the variables into: growth (capital and labour productivity), welfare (social security benefits), demographics (participation rates, population, and a dummy variable for immigration), and other (those variables which are not common).

Figure 2 can be further broken down into the individual contributions of each exogenous variable. This is what we do in Table 9 for the two models. There, it can be seen how all variables changed in the pre-2007 period (Δ) (see also Appendix A). Notice on the first row that both unemployment rates went down on approximately the same absolute value (around 13 percentage points). Next to the changes in the variables we can read the individual contribution of each particular variable (Δu) to the change in the unemployment rate and, to the end of the table, the sum of all contributions –or what is nearly the same, the joint contribution. In addition, in the bottom-side of the table we arrange the contributions by groups –as defined in the previous paragraph.

The first striking feature arising from the table is the notorious contribution of capital accumulation to the fall of the unemployment rates. For Ireland, in particular, this individual contribution more than doubled that of Spain in absolute values: -24.1 and -

9.2 percentage points, respectively.[18] Along this contribution we should mention that of labour productivity. As can be seen from our systems of equations in Section 4, labour productivity is only entertained in the wage-setting equation.[19] Therefore, its contribution in terms of unemployment should be understood as the result of productivity-led wage effects (e.g. higher wages leading to higher unemployment). This means that, for our simulations, labor productivity and unemployment always move in the same direction.[20]

Table 9: Changes in variables and contributions, pre-2007.

	Actual values:			**cont.:**		**Actual values:**			**cont.:**
	1994	2007*	$\Delta^{\dagger}$	$\Delta u^{\dagger}$		1993	2007*	$\Delta^{\dagger}$	$\Delta u^{\dagger}$
Spain:					Ireland:				
u	21.2	8.6	**-12.6**	-	u	17.4	4.7	**-12.7**	-
Δk	3.7	5.5	1.8	-9.2	Δk	1.4	5.8	4.4	-24.1
Δpr	3.1	-0.1	-3.2	-9.9	Δpr	1.2	2.9	1.7	3.8
b	14.2	11.6	-2.6	-4.1	b	12.7	10.3	-2.4	-1.9
z	58.9	73.1	14.2	9.1	Δpo	0.4	1.4	1.0	7.9
d^{00}	0	1	-	-2.0	d^{96}	0	1	-	1.4
c	60.3	60.3	0.0	-0.5	τ^{i}	13.0	13.3	0.3	0.6
fd	0.1	-10.4	-10.5	6.7					
r	6.2	1.1	-5.1	-2.0					
			Joint contributions:‡	**-11.8**				**Joint contributions:**‡	**-12.5**
			Growth:	-19.1				Growth:	-20.3
			Welfare:	-4.1				Welfare:	-1.9
			Demographics:	7.1				Demographics:	9.3
			Other:	4.2				Other:	0.6

*: For differences $(\Delta k, \Delta pr, \Delta po)$, avg. growth in 1993/4-2007; †: in percentage points;

‡: Also, approximately the sum of all individual contributions.

For Spain, the productivity-led fall in real wages results in a contribution of -9.9 percentage points, while for Ireland, the productivity-led increase in real wages determines a 3.8 percentage points contribution to unemployment. When we group these

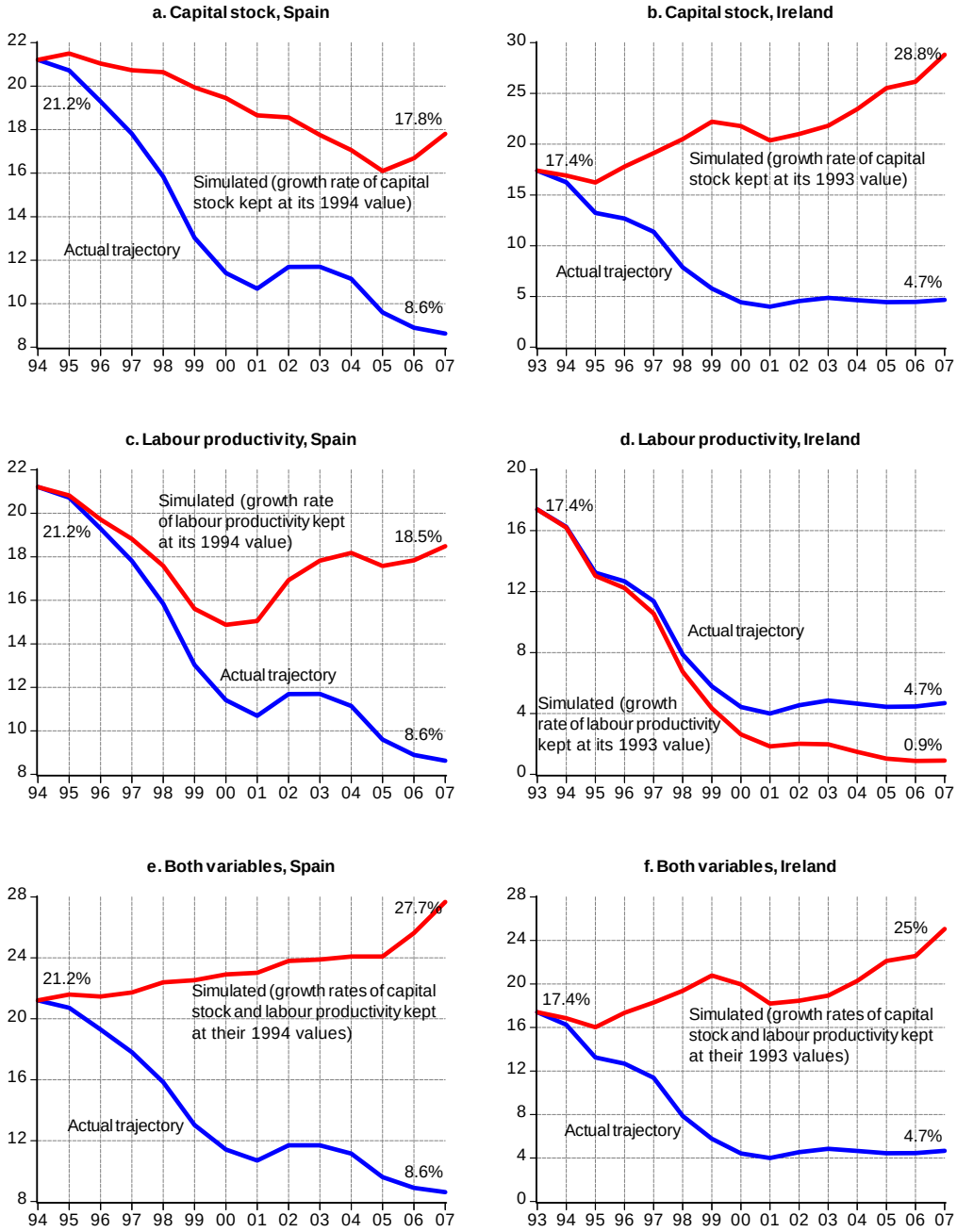
[18] Bande and Karanassou (2009) and Karanassou and Sala (2009) also find that capital accumulation is the most important determinant of Spanish unemployment, while Pehkonen *et al.* (2011) obtain this same result for two Nordic countries, Finland and Sweden.

[19] Strong multicollinearity would prevent us to introduce the labour productivity variable into the labour demand equations due to the presence of capital stock.

[20] A further exercise, which is left for future research, concerns the endogenization of labour productivity by way of adding a production function into the systems above. Remember here that we define labour productivity as the ratio of output to labour input.

two contributions though, the differences disappear (see the row labelled as 'Growth' at the bottom of Table 9).

Figure 3. Unemployment rate: Contribution of growth variables, pre-2007.

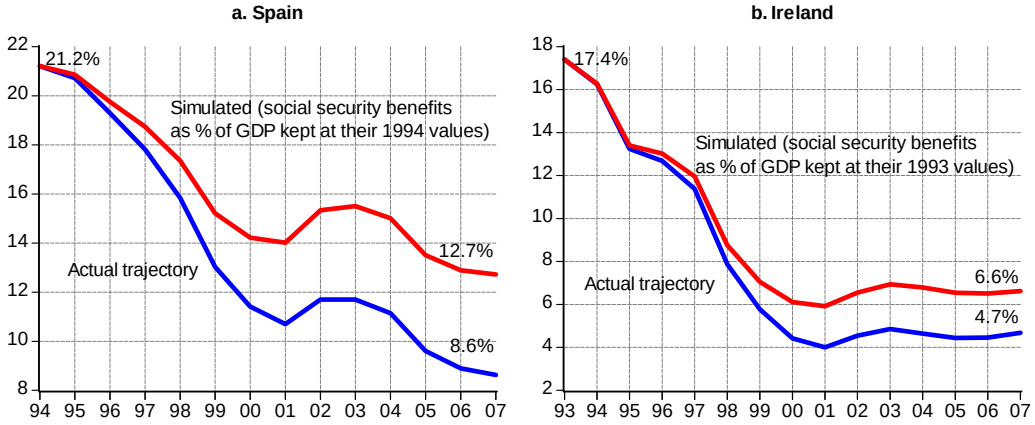


As seen more clearly in Figure 3, the contributions of the capital stock were very significant in both cases but noticeably larger in Ireland (Figures 3a and 3b). Moreover, labour productivity went in opposing directions in Spain and Ireland and so did the contributions to unemployment. However, the contribution for Spain was more than twice that for Ireland (Figures 3c and 3d). Despite the differences, the net contribution

of the growth variables turns out to be quite similar in both countries (Figures 3e and 3f).

Another variable of concern, especially when it comes to discussing the current extent of the welfare state in developed economies, is the social security benefits paid by governments (as percent of GDP). As can be seen from Table 9, both countries experienced a reduction in their welfare entitlement programs that has clearly contributed to reduce unemployment levels (see Benito and Hernando, 2003, and Karanassou and Sala, 2009, for Spain, and Grubb *et al.*, 2009, for Ireland). According to our simulations, the contribution for Spain is as twice as large as the one for Ireland: -4.1 and -1.9 percentage points, respectively (row labelled as 'Welfare' at the bottom of Table 9). Figure 4 shows the simulations of the unemployment rates fixing the social benefits at their start-of-the-sample values.

Figure 4. Unemployment rate: Contribution of welfare entitlements, pre-2007.



The next set of variables deserving examination has to do with demographics. Here we make use of two variables: one which is broadly descriptive of the people taking part of labour market relations –participation rates for Spain and total population for Ireland–, and the other, which refers to the important immigration flows to both economies in very recent years. For both countries the increase of participation rates or population has brought about large effects in terms of unemployment. Here, contributions stand, respectively, at 9.1 and 7.9 percentage points for Spain and Ireland. After taking account of immigration, the total contribution of demographics still remains of rather similar magnitude in the two countries (see the row 'Demographics' in Table 9). Unfortunately, it is not possible at this point to produce an intuitive graphical comparison.[21]

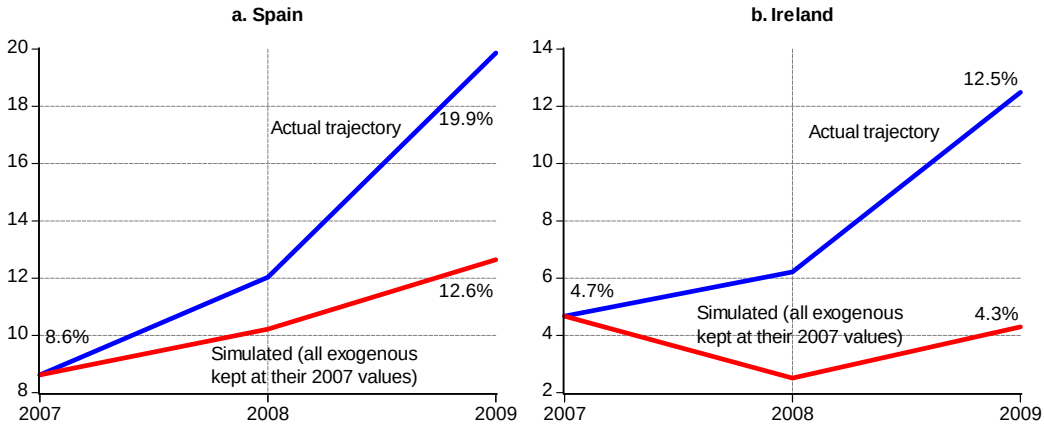
[21] The unemployment rate would approach zero much too early in the simulation for Ireland (year 2000), and it would indeed be negative for the following years up to 2007 (the ending point of the simulation).

Finally, there are yet some other variables that enter our models and should be briefly discussed. These are private consumption, foreign demand, and the real interest rate for Spain, and indirect taxes for Ireland. Fiscal reforms, low interest rates and rising real wages are behind the marked increased in Spanish private consumption (see, for example, Karanassou and Sala, 2009, and Eurofound, 2010). The sharp contraction of Spain's foreign demand can be ascribed to the loss of competitiveness after the entrance into the European Monetary Union (1999). That, and the huge misallocation of resources that followed, seem to have had a serious effect in terms of unemployment (6.7 percentage points).[22] In contrast, the European Central Bank's relaxed monetary policy contributed to reducing Spain's unemployment (by 2 percentage points), although arguably at the cost of a generalized bubble-like expansion –primarily focused on the construction sector– which is underway for the last couple of decades (see Eironline, 2008, and Eurofound, 2010).

5.2 Post-2007 analysis

We now shift our attention to the events that marked the evolution of the unemployment trajectories in Spain and Ireland during the post-crisis years. In spite of the sample's short length for this second dynamic accounting exercise, we still believe that it can be revealing when it comes to retrieving the differences and similarities between the two countries. Again, we are able to identify two common features for our joint simulations in Figures 5a and 5b: (i) the steep rise of both unemployment rates (blue lines) in the lapse of a very few years –more than two-fold for Spain and almost three-fold for Ireland–; and (ii) the relevance of all exogenous variables in explaining the whole of the change in unemployment (the outcome is not as good as before for Spain though).

Figure 5. Unemployment rate: Joint dynamic contributions, post-2007.



[22] According to Karanassou and Sala (2009), had foreign demand remained at its 1994 value, Spanish unemployment would have been 5.8 percentage points higher in 2007.

The short span of 2007-2009 is certainly in stark contrast to the preceding years of high labour market performance in both countries under scrutiny.[23] Table 10 goes over the individual and joint contributions for this period and, just as before, arranges them into groups as to allow for comparisons more directly. Notice on the first row that the Spanish unemployment went up by 11.3 percentage points, whereas the Irish unemployment rate increased by 7.8 percentage points.

Table 10: Changes in variables and contributions, post-2007.

	Actual values:			**cont.:**		**Actual values:**			**cont.:**
	2007	2009*	$\Delta^{\dagger}$	$\Delta u^{\dagger}$		2007	2009*	$\Delta^{\dagger}$	$\Delta u^{\dagger}$
Spain:					Ireland:				
u	8.6	19.9	**11.3**	-	u	4.7	12.5	**7.8**	-
Δk	6.2	5.0	-1.2	4.7	Δk	6.6	2.9	-3.7	13.4
Δpr	0.5	1.7	1.2	0.2	Δpr	2.3	0.5	-1.8	-0.4
b	11.6	14.6	3.0	1.0	b	10.3	15.3	5.0	0.9
z	73.1	74.5	1.4	0.5	Δpo	2.4	1.6	-0.8	-1.1
d^{00}	1	0	-	-0.1	d^{96}	1	0	-	-2.6
c	60.3	58.7	-1.6	2.2	τ^{i}	13.3	11.0	-2.3	-2.1
fd	-10.4	-5.3	5.1	-1.6					
r	1.1	3.8	2.7	0.3					
	Joint contributions:‡			**7.2**		**Joint contributions:**‡			**8.2**
			Growth:	4.9				Growth:	13.0
			Welfare:	1.0				Welfare:	0.9
			Demographics:	0.4				Demographics:	-3.7
			Other:	0.9				Other:	-2.1

*: For differences $(\Delta k, \Delta pr, \Delta po)$, avg. growth in 2007-2009; †: in percentage points;

‡: Also, approximately the sum of all individual contributions.

As in the previous analysis, the growth in the capital stock is to be seen as the major force behind the changes in the unemployment rates (see, among others, Karanassou *et al.*, 2008, Bande and Karanassou, 2009, and Karanassou and Sala, 2009). This time, however, because of the drop in the variable the effect on unemployment is just the opposite. Once again, the individual contribution of capital accumulation for Ireland more than doubles the one found for Spain in absolute values: 13.4 and 4.7 percentage points, respectively. The contributions of the growth rate of productivity are this time

[23] See especially Bentolila *et al.* (2010), and Bergin *et al.* (2010). Also to notice are the OECD Economic Surveys for Spain (2008, 2010) and Ireland (2009).

trivial (for the joint contribution of capital and productivity see the row labelled as 'Growth' at the bottom of Table 10).

Figure 6. Unemployment rate: Contribution of growth variables, post-2007.

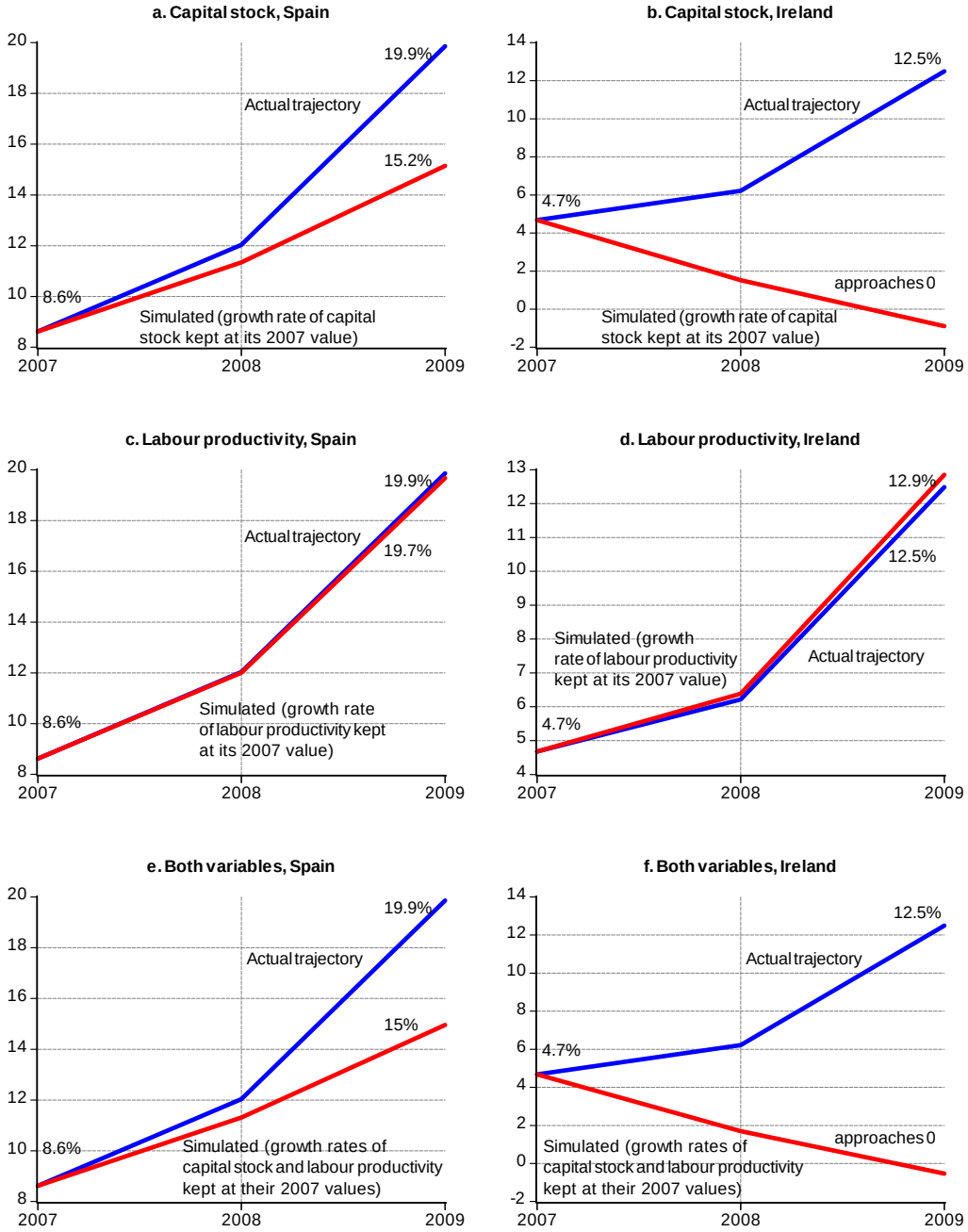
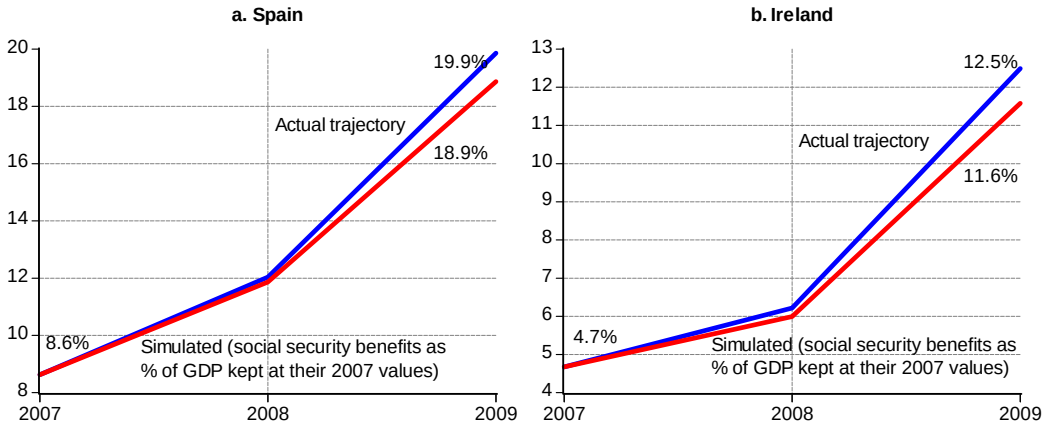


Figure 6 shows the individual and joint contributions of the growth variables for 2007-2009. Here we can see, very clearly, the differences in the contributions of capital accumulation for both countries (Figures 6a and 6b), the non-significant effect of productivity rates in both cases (Figures 6c and 6d), and the joint contribution of growth variables (Figures 6e and 6f). Notice how the unemployment rate would have reached

a near-zero value in Ireland had capital stock kept accruing at the higher rate of 2007 (Figure 6b and 6f).

As a direct consequence of the 2007 crisis welfare entitlements showed a tendency to rise in most developed countries. Spain and Ireland were certainly no exceptions (see Grubb *et al.*, 2009, the OECD Economic Survey, 2009, for Ireland, and the OECD Economic Outlook, 2011, for Spain and Ireland). As expected, the effects on unemployment levels went now in the other direction and were of very similar magnitudes (see also the row 'Welfare' at the bottom of Table 10). Figure 7 provides the graphical comparison.

Figure 7. Unemployment rate: Contribution of welfare entitlements, post-2007.



Beyond the effects of the crisis on decreasing capital accumulation and the enlargement of the welfare state, we ought to consider now the change on the dynamics of demographics and its contribution to unemployment. Here, our quantitative variables - participation rates and total population - show a modest (Spain) or negative (Ireland) change during this period. The total effects are now rather different. Whereas the contribution for Spain is positive and small (0.4 percentage points), for Ireland is negative and significantly larger (-3.7 percentage points).

We should now spend a final word on the additional variables entering both models. In Spain, the crisis has brought private consumption down and this can be reflected in a contribution of 2.2 percentage points to unemployment (see Eurofound, 2010). However, this effect has been somehow compensated by an increase of foreign demand, which reduced unemployment by 1.6 percentage points. On Ireland, it should be noted the important easing effect the reduction in indirect taxes has brought into the economy, which accounted for a drop in the unemployment rate of the order of 2.1 percentage points.

6 Conclusions

In this paper we lay out a dynamic labour market model for two of the so-called PIGS countries: Spain and Ireland. Following the Chain Reaction Theory (CRT) of unemployment we estimate a labour demand, labour supply, and wage setting equation model for each case, while allowing for spillover effects among the equations and, therefore, for the interplay between growing exogenous variables and lagged adjustment processes. We then centre our attention on the main determinants of unemployment before and after the recent crisis of 2007, and discover some common characteristics of both labour markets.

Our estimates show that the high growth rates of capital stock during the 1990s contributed to the significant decline in unemployment in Spain and Ireland. Inversely, the lower rates of capital accumulation in 2008 and 2009 led to the steep rise of the unemployment rates in both countries. In particular, the total individual contribution of capital stock in Ireland more than doubles that of Spain. To a lesser extent, other common drivers of unemployment are labour productivity, demographics, and social benefits. Moreover, some idiosyncratic variables –private consumption, foreign demand, and the interest rate in Spain, and indirect taxes in Ireland– are found to influence the trajectory of the unemployment rates.

When it comes to labour market performance, Spain and Ireland have evolved in a very similar way since the mid-1990s. Indeed, both economies witnessed an economic boom that led to falling unemployment rates and high rates of employment creation. They also underwent the largest migratory inflow among OECD countries in the pre-crisis era and an important outflow right afterwards. On the other hand, Spain and Ireland do differ with respect to the flexibility of their labour markets, but this argument loses strength when trying to rationalize what has happened in recent times. Under the disequilibrium approach adopted in this paper, Spain and Ireland appear to be not that different after all.

References

[1] Agnese, P. and H. Sala (2009): The Fading 1990s in Japan: Driving Forces behind the Unemployment Upsurge, *International Review of Economics & Finance*, 18 (3), 428-439.

[2] Bande, R. and M. Karanassou (2009): Labour Market Flexibility and Regional Unemployment Rate Dynamics: Spain 1980-1995, *Papers in Regional Science*, 88 (1), 181-207.

[3] Bande, R. and M. Karanassou (2010): Spanish Regional Unemployment Revisited: The Role of Capital Accumulation, *IZA Discussion Paper* No. 5012.

[4] Bande, R., M. Fernández and V. Montuenga (2008): Regional Unemployment in Spain: Disparities, Business Cycle and Wage Setting, *Labour Economics*, 15 (5), 885-14.

[5] Barrett, A. (2009): EU Enlargement and Ireland's Labour Market, in: M. Kahanec and K. F. Zimmermann (eds.), EU Labor Markets after Post-Enlargement Migration, Springer: Berlin 2009, 145-161.

[6] Barrett, A. and A. Bergin (2009): Estimating the Impact of Immigration in Ireland, *Nordic Journal of Political Economy*, 35 (2).

[7] Barrett, A. and E. Kelly (2010): The Impact of Ireland's Recession on the Labour Market Outcomes of its Immigrants, *IZA Discussion Paper* No. 5218.

[8] Barrett, A., J. Fitzgerald and B. Nolan (2002): Earning Inequality, Returns to Education and Immigration into Ireland, *Labour Economics*, 9 (5), 665-680.

[9] Barrett, A., A. Bergin and D. Duffy (2006): The Labour Market Characteristics and Labour Market Impacts of Immigrants in Ireland, *Economic and Social Review*, 37 (1), 1-26.

[10] Barrett, A., A. Bergin and E. Kelly (2011): Estimating the Impact of Immigration on Wages in Ireland, *Economic and Social Review*, 42 (1), 1-26.

[11] Benito, A. and I. Hernando (2003): Labour Demand, Flexible Contracts and Financial Factors: New Evidence from Spain, *Banco de España Working Papers* 0312, Banco de España.

[12] Bentolila, S. and J. F. Jimeno (2006): Spanish Unemployment: The End of the Wild Ride?, in M. Werding (ed.), Structural Unemployment in Western Europe, Reasons and Remedies, MIT Press.

[13] Bentolila, S. and G. Saint-Paul (1992): The Macroeconomic Impact of Flexible Labor Contracts with an Application to Spain, *European Economic Review*, 36, (5), 1013-1047.

[14] Bentolila, S., P. Cahuc, J.J. Dolado and T. Le Barbanchon (2010): Two-Tier Labor Markets in the Great Recession: France vs. Spain, *IZA Discussion Paper* No. 5340.

[15] Bergin, A., T. Conefrey, J. Fitzgerald and I. Kearney (2010): Fiscal Policy for Recovery: The Case of Ireland, EUROFRAME Conference, Amsterdam, 11th June 2010.

[16] Borjas, G.J. (2003): The Labor Demand Curve Is Downward Sloping: Re-examining the Impact of Immigration on the Labor Market, *Quarterly Journal of Economics*, 118 (4), 1335-1374.

[17] Carrasco, R., J. Jimeno and A. Ortega (2008): The Effect of Immigration on the Labor Market Performance of Native-born Workers: Some Evidence for Spain, *Journal of Population Economics*, 21 (3), 627-648.

[18] Decoster, A., J. Loughrey, C. O'Donoghue and D. Verwerft (2009): Incidence and Welfare Effects of Indirect Taxes, European Measures of Income and Poverty: Lessons for the U.S. - *International Policy Exchange Series*.

[19] Dolado, J. and J. F. Jimeno (1997): The Causes of Spanish Unemployment: A Structural VAR Approach, *European Economic Review*, 41 (7), 1281-1307.

[20] Eironline (2008): Sharp Downturn in Construction Sector (Juan Arasanz Díaz, 14.11.2008), `http://www.eurofound.europa.eu/eiro/2008/10/articles/es0810039i.htm`

[21] Estrada, Á., J. F. Jimeno and J. L. Malo de Molina (2009): The Spanish Economy in EMU: The First Ten Years, *Documentos Ocasionales* No. 0901, Banco de España.

[22] Eurofound (2010): Spain: A Country Profile, Eurofound, `http://www.eurofound.europa.eu/pubdocs/2010/08/en/1/EF1008EN.pdf`

[23] Eurostat (2011): Impact of the economic crisis on unemployment, Statistics Explained (2011/5/4) `http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Impact_of_the_economic_crisis_on_unemployment`

[24] Fitzgerald, J. and J. Hore (2002): Wage Determination in Economies in Transition: Ireland, Spain and Portugal, *ESRI Working Paper* No. 147.

[25] Garriga, C. (2010): The Role of Construction in the Housing Boom and Bust in Spain, *FEDEA Working Papers*, 2010-09.

[26] González, L. and F. Ortega (2011): How Do very Open Economies Adjust to Large Immigration Flows? Evidence from Spanish Regions, *Labour Economics*, 18 (1), 57-70.

[27] Görg, H., M. Henry, E. Strobl and F. Walsh (2009): Multinational Companies, Backward Linkages, and Labour Demand Elasticities, *Canadian Journal of Economics*, 42 (1), 332-348.

[28] Grubb, D., S. Singh and P. Tergeist (2009): Activation Policies in Ireland, *OECD Social, Employment and Migration Working Papers* No. 75, OECD Publishing.

[29] Henry, B., M. Karanassou and D.J. Snower (2000): Adjustment Dynamics and the Natural Rate: An Account of UK Unemployment, *Oxford Economic Papers*, 52 (1), pp. 178-203.

[30] Johansen, S. (1988): Statistical Analysis of Cointegrating Vectors, *Journal of Economic Dynamics and Control*, 12, 231-254.

[31] Johansen, S. (1992): Determination of Cointegration Rank in the Presence of a Linear Trend, *Oxford Bulletin of Economics and Statistics*, 54 (3), 383-97.

[32] Johansen, S. (1995): Likelihood-based Inference in Cointegrated Vector Auto-regressive Models, Oxford University Press, Oxford.

[33] Karanassou, M. and D.J. Snower (2004): Unemployment Invariance, *German Economic Review*, 5 (3), 297-317.

[34] Karanassou, M., H. Sala and D.J. Snower (2007): The Macroeconomics of the Labor Market: Three Fundamental Views, *Portuguese Economic Journal*, 6 (3), 151–180.

[35] Karanassou, M. and H. Sala (2009): The Rise and Fall of Spanish Unemployment: A Chain Reaction Theory Perspective, published in: Philip Arestis and Malcolm Sawyer (eds.), International Papers in Political Economy, Palgrave-Macmillan.

[36] Karanassou, M. and H. Sala (2010): The Wage-Productivity Gap Revisited: Is the Labour Share Neutral to Employment?, *IZA Discussion Paper* No. 5092.

[37] Karanassou, M., H. Sala and P.F. Salvador (2007): Capital Accumulation and Unemployment: New Insights on the Nordic Experience, *IZA Discussion Paper* No. 3066.

[38] Karanassou, M., H. Sala and P.F. Salvador (2008): Capital Accumulation and Unemployment: New Insights on the Nordic Experience, *Cambridge Journal of Economics*, 32 (6), 977-1001.

[39] Karanassou, M. and D.J. Snower (1996): Explaining Disparities in Unemployment Dynamics, in Baldassari, M., L. Paganetto and E. Phelps (eds.), The 1990's Slump: Causes and Cures, Macmillan Press, London.

[40] Kiander, J. and M. Virén (2001): Measuring Labour Market Flexibility in the OECD Countries, *Empirica*, 28, 187–201.

[41] Layard, R. and C. Bean (1989): Why Does Unemployment Persist?, *The Scandinavian Journal of Economics*, 91 (2), 371-396.

[42] Leschke, J. and A. Watt (2010): How Do Institutions Affect the Labour Market Adjustment to the Economic Crisis in Different EU Countries?, *ETUI Working Paper* 2010.04, Brussels.

[43] Lindbeck, A. and D.J. Snower (1987): Union Activity, Unemployment Persistence, and Wage-employment Ratchets, *European Economic Review*, 31 (1-2), 157-167.

[44] Nickell, S. (1978): Fixed Costs, Employment and Labour Demand over the Cycle, *Economica*, 45 (180), 329-345.

[45] OECD (2006, 2009), OECD Economic Surveys: Ireland, OECD, Paris.

[46] OECD (2007, 2008, 2010), OECD Economic Surveys: Spain, OECD, Paris.

[47] OECD (2009), OECD International Migration Outlook 2009, OECD, Paris.

[48] OECD Economic Outlook No. 89 (25 May 2011).

[49] OECD (2010): Employment Protection Legislation: Strictness of Eemployment Protection Legislation: Overall, OECD Employment and Labour Market Statistics (database). doi: 10.1787/data-00317-en

[50] Palma, M.L. and J.L Martín (2010): Globalization And Migration Flows. Some Effects Of Immigration On The Spanish Labour Market in the Last Decade, Analele Stiintifice ale Universitatii "Alexandru Ioan Cuza" din Iasi - Stiinte Economice, 2010SE, 273-290.

[51] Pantula, S.G. (1989): Testing for Unit Roots in Time Series Data, *Econometric Theory*, vol. 5 (2), 256-71.

[52] Pesaran, M.H. (1997): The Role of Economic Theory in Modelling the Long-run, *The Economic Journal*, 107 (440), 178-191.

[53] Pesaran, M.H. and Y. Shin (1999): An Autoregressive Distributed-lag Modelling Approach to Cointegration Analysis, 371-413, in Strom, S. (ed), Econometrics and Economic Theory in the Twentieth Century: The Ragnar Frisch Centennial Symposium, Cambridge University Press, Cambridge.

[54] Pesaran, M.H., Y. Shin and R.J. Smith (2001): Bounds Testing Approaches to the Analysis of Level Relationships, *Journal of Applied Econometrics*, 16 (3), 289-326.

[55] Pehkonen, J., H. Sala and P.F.Salvador (2011): The Nordic Experience Revisited: Labour Market Booms and Slumps since the 1990s in Finland and Sweden, *Journal of Economic Studies*, 38 (1), 52-65.

[56] Rodgers, G. (2007): Labour Market Flexibility and Decent Work, *DESA Working Paper* No. 47.

[57] Sargent, T. (1978): Estimation of Dynamic Labor Demand Schedules under Rational Expectations, *Journal of Political Economy*, 86 (6), 1009-1044.

[58] Sexton J. J. (2002): Interpreting Recent Developments in the Economy and Labour Market, *ESRI Quarterly Economic Commentary: Special Articles*, 2002 (1-Spring), 1-13.

[59] Talyor, J. (1979): Staggered Wage Setting in a Macro Model, *The American Economic Review*, 69 (2), 108-113.

[60] The Heritage Foundation (2011): `http://www.heritage.org/Index/`

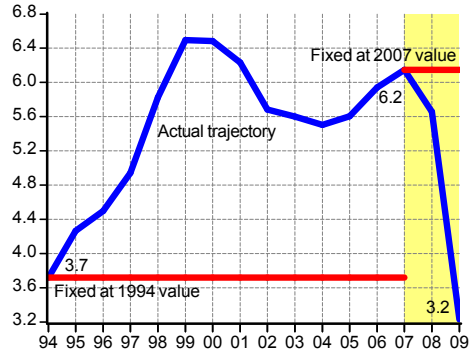
[61] Walsh, B. (2006): Labour Market Adjustment in the Irish Regions, 1988-2005, *ESRI Quarterly Economic Commentary*, 2006 (3-Autumn), 80-99.

[62] World Competitiveness Yearbook (2010): `https://www.worldcompetitiveness.com/OnLine/App/Index.htm`

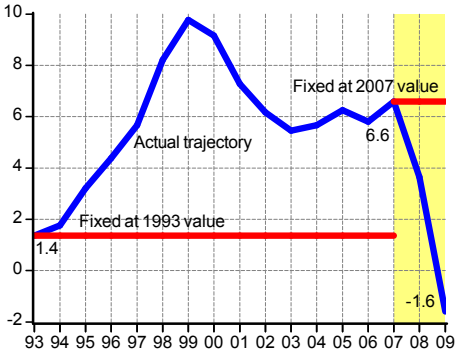
Appendix A. Actual and simulated trajectories of the exogenous variables.

i. Capital stock (growth rate in %)

a. Spain

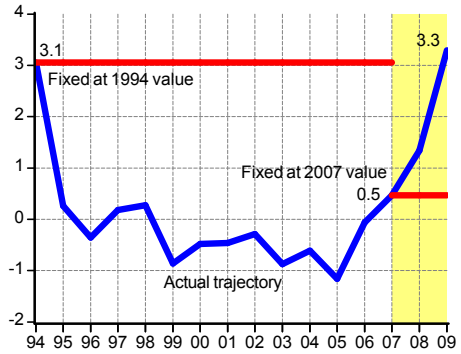


b. Ireland

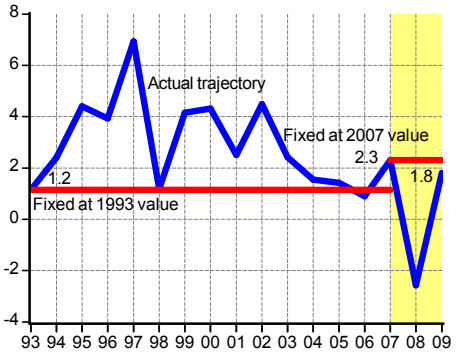


ii. Labour productivity (growth rate in %)

a. Spain

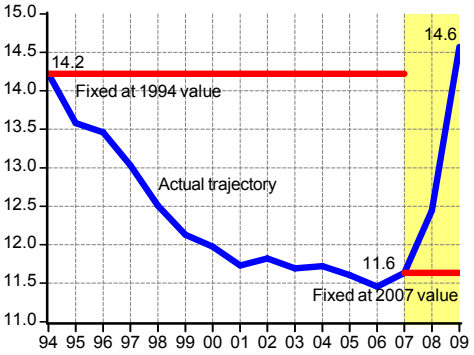


b. Ireland

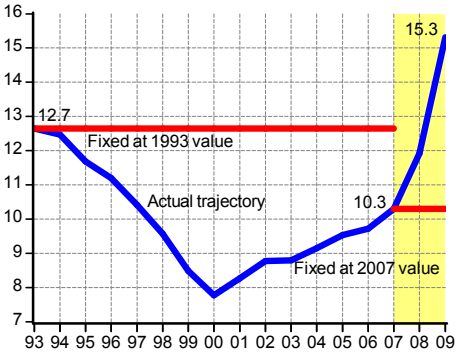


iii. Social security benefits (% GDP)

a. Spain

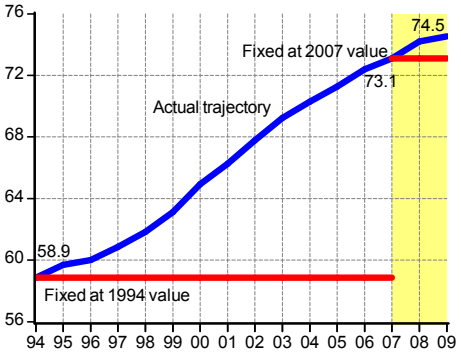


b. Ireland

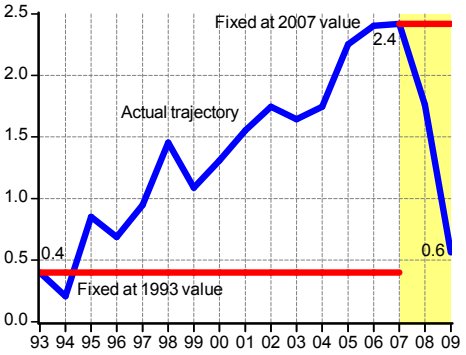


iv. Demographics

a. Participation rate (%), Spain

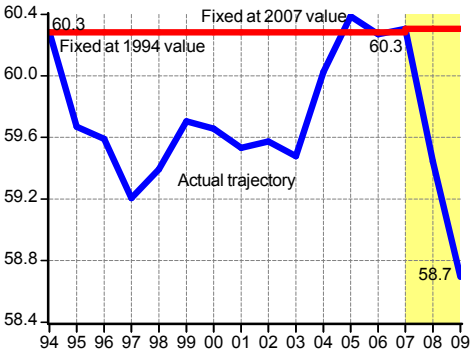


b. Population (growth rate in %), Ireland

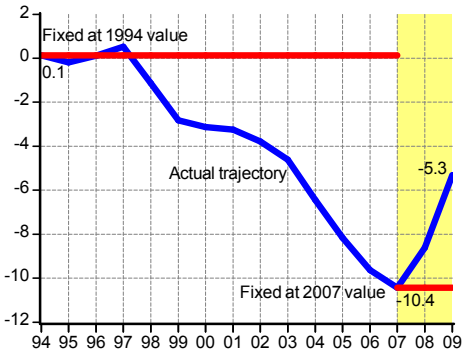


Other:

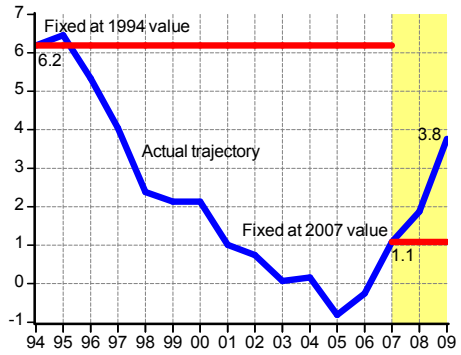
a. Private consumption (% of GDP), Spain



b. Foreing demand (% of GDP), Spain



c. Real interest rate (%), Spain



d. Indirect tax rate (% of GDP), Ireland