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Paper by invitation

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How Do Institutions Affect Structural Unemployment in Times of Crises?

Summary: This paper examines the effect of economic crises on structural unemployment using an Autoregressive Distributed Lags model and accounting for the role of institutional settings on an unbalanced panel of 30 OECD economies from 1960 to 2006. We found that downturns have, on average, a significant positive impact on the level of structural unemployment rate. The maximum impact varies with the severity of the downturn. Institutions (such as employment protection legislation, average replacement ratio and product market regulation) influence both the extent of the initial shock and the adjustment pattern in the aftermath of an economic downturn.

Key words: Crisis, Structural unemployment, Institutions, Employment protection legislation.

JEL: E62, H10.

There is now a broad consensus that the financial crisis has severely affected economic growth and will continue to bear on prospects over the next few years. But the crisis is also likely to have long-lasting implications on productive capacity and factor inputs. Indeed, in past economic downturns the increase in cyclical unemployment has frequently led to higher structural unemployment, as defined as the unemployment rate consistent with price stability. At the same time, the resilience of countries both in terms of the initial impact of the shock on the economy and the speed of recovery varies importantly depending on institutional settings. While several European countries experienced sustained rises in structural unemployment during past economic crises, these developments were much less pronounced in Anglo-Saxon economies.

The purpose of this paper is to shed light on this issue through an empirical analysis covering Organisation for Economic Co-operation and Development (OECD) countries. The main contribution of this paper is to estimate the impact of the economic downturns on structural unemployment while accounting for the role of labour and product market institutions.

The main results of the paper are as follow:

i) Crises are found to have, on average, a significant positive effect on the level of structural unemployment. The maximum impact is found to vary with the severity of the economic downturn. It could reach almost 1.5 percentage points after five years in the case of very deep economic downturns, while it would be around 0.6 percentage points for crises of lower magnitude.

ii) The impact of banking and currency crises on structural unemployment does not appear to be fundamentally different from the effect of other economic downturns.

iii) Institutions alter the impact of crises on structural unemployment by influencing both the extent of the initial shock and the adjustment pattern in the aftermath of a crisis. This suggests that structural unemployment in countries with flexible labour and product markets is likely to be relatively untouched by economic downturns while some sizeable increases in structural unemployment could be observed in other economies.

iv) Countries where Employment Protection Legislation (EPL) is high are likely to experience a marked rise in structural unemployment in the short and medium term while low-EPL countries will see very little change. In particular, the effect of a crisis on structural unemployment is found to be very large in high-EPL countries when they are hit by extremely severe downturns (around 5 percentage points increase after five years). These findings appear to be mostly driven by the stringency of EPL for permanent contracts. Average replacement ratio and the index of product market regulation are also found to matter. In all cases, the impact of crises on structural unemployment appears to be significant only for countries with a more rigid economy than on average across OECD countries.

The remainder of the paper is structured as follows. Section 1 reviews the main channels through which crises influence structural unemployment developments and how institutional settings can affect these adjustments. Section 2 describes the empirical methodology and Section 3 the data. Sections 4 and 5 detail the main findings and the last section concludes.

1. Effect of Economic Crises on Structural Unemployment

The impact of economic downturns on structural unemployment will depend on the drivers of the crisis: while supply shocks should affect structural unemployment developments, the latter should stay unchanged to demand-driven shocks. Economic downturns can also lead to an increase in structural unemployment, through hysteresis effects whereby the path of actual unemployment influences structural unemployment (Olivier J. Blanchard and Lawrence H. Summers 1986; Laurence Ball 2009). However, by focusing on the direct impact of economic downturn on structural unemployment, the methodology adopted in this paper does not allow to distinguish between supply and demand driven downturns, or to identify hysteresis effects.

Institutional settings may magnify the impact of the downturn, or the adjustments that follow (Blanchard and Justin Wolfers 2000; Giuseppe Bertola, Francine D. Blau, and Lawrence M. Kahn 2001; Andrea Bassanini and Romain Duval 2006). Past evidence suggests that the rise in the unemployment rate experienced by many European countries in the 1970s was driven by the interaction of exogenous shocks and institutions (Blanchard 2006), among which EPL is likely to play a major role. On the one hand, stringent EPL could dampen the initial effect of a shock by providing job security. On the other hand, it hampers the reallocation of labour and lowers countries' ability to adjust to the shock. While there is only very mixed evidence on a direct and significant impact of EPL on aggregate unemployment (Stefano Scarpetta

1996; Jorgen Elmeskov, John P. Martin, and Scarpetta 1998; Julian Morgan and Annabelle Mourougane 2005; Bassanini and Duval 2006), stringent EPL is found to have robust, detrimental effects on the incidence of long-term unemployment or the resilience of labour markets to shocks (Bertola, Blau, and Kahn 2002; Duval, Jorgen Elmeskov, and Lukas Vogel 2007). As a strong EPL can also help to reduce uncertainties by insuring workers, the relationship between unemployment and employment protection could be highly non-linear (Christopher A. Pissarides 2001).

Other institutions are also likely to affect developments in structural unemployment. Higher unemployment benefits, especially when available for a long duration, improve the fallback position of workers in the event that they lose their jobs. Such benefits may also reduce the search effectiveness of those already unemployed, and lower their incentives to put downward pressure on wages by competing with those currently employed. Either way, more generous unemployment benefits may be expected to lead to upward wage pressure and thereby to a rise in structural unemployment.

Finally, flexibility on product markets can facilitate the restructuration process including the creation and destruction of new firms following an economic downturn. Product market reforms may also help to loosen employment protection legislation through their direct positive impact on overall employment, which reduces incentives for incumbent to request strict employment protection legislation (Winfried Koeniger and Andrea Vindigni 2003; Giuseppe Nicoletti and Scarpetta 2005). In addition, product market reforms increase the marginal employment gains that can be expected from a reduction in employment protection (Adriana Kugler and Giovanni Pica 2003).

2. Empirical Methodology

In order to analyse the effects of economic downturns on structural unemployment a two-step approach is adopted. In a first step, an Autoregressive Distributive Lag model (ARDL) has been estimated on an unbalanced panel of annual data for 30 OECD countries over the period 1960-2006. The sample period has been restricted to 2006 in order to exclude the ongoing current crisis. Including only the first years of the current crisis would likely bias the impact estimates downward, as it will take time until the full effect of structural unemployment can be visible.

The reduced-form approach used in the paper is similar to the one adopted by Valeire Cerra and Sweta C. Saxena (2008), Davide Furceri and Mourougane (2012) to assess the impact of financial crises on output and potential output, but applied to structural unemployment:

$$\Delta u_{it}^{*} = a_i + \gamma_t + \sum_{j=1}^{8} \beta_j \Delta u_{it-j}^{*} + \sum_{j=0}^{8} \delta_j DOWNTURN_{i,t-j} + \varepsilon_{it} \quad (1)$$

where u^* is structural unemployment, *DOWNTURN* is a dummy variable which is equal to 1 at the start of an economic downturn (see below for its construction), and a_i and γ_t are country and time fixed effects to capture country specific characteristics and common shocks over time. The coefficients β_j and δ_j represent the persistence of structural unemployment and the direct effect of downturns on the structural un-

employment, respectively. Given the very limited degrees of freedom the coefficients β_j and δ_j are assumed to be the same across all countries. Impulse response functions (IRFs) are obtained by simulating a shock on the downturn dummy. The shape of these response functions depends on the value of the δ_j and β_j. For instance, the simultaneous response will be δ_0, the one-year ahead cumulative response will be $\delta_0 + (\delta_1 + \beta_0\delta_0)$, etc. In order to compute Impulse Response Functions (IRFs) over the medium term up-to 8 years, the number of the lags has been selected equal to 8. Confidence bands at 90% are derived from Monte-Carlo simulations to assess the significance of the results.

Since the dependent variable is non-observable and estimated through econometric techniques, the regression residuals can be thought of as having two components. The first component is the sampling error (the difference between the true value of the dependent variable and its estimated value). The second component is the random shock that would have been obtained even if the dependent variable was directly observed as opposed to estimated. This would lead to an increase in the standard error of the estimates and a decrease in the t-statistics. This means that any correction to the presence of this un-measurable error term will increase the significance of our estimates. In most of the estimations reported, heteroscedasticity turns out not to be a problem. When it does, we correct using White standard errors. Finally, as structural unemployment is likely to be highly persistent, autocorrelation could be an issue. This problem is addressed by including the autoregressive terms in the estimation.

In a second step, we test whether the response of structural unemployment to economic downturns differs significantly depending on institutional settings: EPL, average replacement ratio and product market regulation. This is done by using a dummy (D^H_{INST}) which splits observations depending on whether the examined institutional variable is greater than the over time and over country average or not. More precisely the following equation has been estimated:

$$\begin{aligned}\Delta u^*_{it} = {} & a_i + \gamma_t + \vartheta D^{INST}_{i,t} \\ & + \sum_{j=1}^{8} \beta_j D^{INST}_{i,t-j} \Delta u^*_{it-j} + \sum_{j=1}^{8} \theta_j \left(1 - D^{INST}_{i,t-j}\right) \Delta u^*_{it-j} \\ & + \sum_{j=0}^{8} \delta_j D^{INST}_{i,t-j} DOWNTURN_{i,t-j} \\ & + \sum_{j=0}^{8} \varphi_j \left(1 - D^{INST}_{i,t-j}\right) DOWNTURN_{i,t-j} + \varepsilon_{it} \\ & + \sum_{j=0}^{8} \varphi_j (1 - D^{INST}_{i,t}) DOWNTURN_{i,t-j} + \varepsilon_{it}\end{aligned} \tag{2}$$

A positive θ_j implies that changes in the NAIRU are more persistent for country with a relatively higher level of institution. Similarly a positive φ_j means that the

direct impact of a downturn on changes in the NAIRU is larger for country with a relatively higher level of institution. An alternative approach to test non-linearity in the effect of downturn to the NAIRU would have been to introduce interaction terms between the value of institutions and respectively the dummies or the autoregressive terms. This would have allowed to account for the information contents of institutional series, but the extremely high correlation between institutions and interactions and between current and lagged terms prevents the implementation of this approach.

3. Data

Dummies corresponding to the start of the economic downturn have been constructed based on cumulative output gaps to identify major economic downturns. They are constructed as follows:

$$DOWNTURN_{i,t}^{s} = 1 \text{ if } GAP_{i,t} < -1\% \text{ and } \sum_{\tau=t}^{T} GAP_{i,\tau} < s,$$

$$\text{where } GAP_{T+1} > 0 \text{ ,}$$

$$DOWNTURN_{i,t}^{s} = 0 \text{ otherwise,}$$

where *DOWNTURN* is the crisis dummy, GAP is the OECD measure of output gap (based on a production function approach, see Pierre-Olivier Beffy et al. 2006), and *s* is a measure of the economic downturn severity captured through output losses. In practice, three values have been examined: s = 10, 15 and 20%.

The choice of these thresholds provides a balanced number of episodes between moderate downturns (downturns with cumulated decrease in output gap of 10% or lower) and severe and very severe downturns (downturns with cumulated decrease in output gap of at least 15%). In particular, using this definition, 32 episodes corresponding to losses of at least 10 % have been identified, among which 16 episodes for losses of at least 15% (8 episodes for losses of more than 20%). While any choice on the value of *s* involves some arbitrary judgement, most of the severe and very severe downturns can be recognised as episodes when either the global economy was in recession (in the yearly 1970s or 1980s following oil price shocks), or when individual economies were experiencing idiosyncratic recessions (such as the Nordic banking crises) (Figure 1). Overall, the results are qualitatively robust to reasonable changes in the thresholds that allow to identify a meaningful number of downturn episodes for the estimation.

The construction of start-of-the-crisis dummies has two main advantages. First, starting dates of economic downturns can be thought of as independent from structural unemployment developments, limiting the risk of endogenous bias in the estimation (by contrast measures based on cumulative GDP growth or output gap would be highly endogenous and resulting estimates would likely to be biased). The hypothesis of exogeneity has nonetheless been tested (see below). Second, it is possible to differentiate among crises depending on their degree of severity.

As a robustness check, a crisis dummy based on financial crises dates taken from Luc Laeven and Fabian Valencia (2008) has also been used. The dummy codes

the starting dates of currency and banking crises which occurred over the period 1970 to 2006. The idea is to investigate whether financial and banking crises have a different impact on structural unemployment than economic downturns in general.

Data for structural unemployment is proxied by NAIRU estimates from the OECD Economic Outlook database. They are derived from a Kalman filter approach using a price Phillips curve (Pete Richardson et al. 2000). The method combines the use of a price Phillips curve, an autoregressive process of order two for the unemployment gap and a random walk process for structural unemployment. NAIRU and structural unemployment are arguably different concepts. By construction NAIRU are related to inflation developments, while structural unemployment can be reconstructed from institutional data. However, in practise, both measures they tend to exhibit similar trend (Mourougane and Vogel 2009). The empirical analysis nonetheless focuses on NAIRU estimates which are available on a longer time period than structural unemployment series.

As for other economic research dealing with institutional data, this analysis has to cope with serious data limitations, in particular their lack of reliability and of variability over time. For this reason, the analysis has been restricted to some institutions. Data for employment protection are taken from the OECD Employment Protection Database. The employment protection legislation index is available for most OECD countries over a relatively long time span. It is a composite indicator ranging from 0 (less restrictive) to 6 (more restrictive). In practise, however, all OECD countries exhibit EPL indices below 4. In our sample, a downward trend in EPL values is observed over time (Figure 2), with a move toward more flexible labour markets in Europe particularly after 1995. This has reflected reforms for atypical contracts, while permanent contract legislation has remained unchanged. Despite the convergence in aggregate EPL, EPL in Anglo-Saxon economies has remained on average lower than in continental European countries (Figure 3). Most recent data point to a stabilisation or a fall in EPL from 2006 to 2008 in most OECD countries. Exceptions are Hungary, Italy and Slovakia which exhibited a rise.

The average replacement ratios are gross replacement rates and are taken from the OECD Benefit and Wages Statistics. Data are available for uneven years from 1961 to 2007 and have been interpolated for even years. In general, countries experienced declines in the replacement rates over the years, one notable exception was Italy which increased unemployment replacement rate by half in 2005 (Tito Boeri and Pietro Garibaldi 2009). Indicators of product market regulations are constructed for the network industries. Like EPL, these have been derived from a bottom-up approach, by aggregation of several institutional features. The indices range from 0 (more flexible markets) to 6 (less flexible markets). Their construction is detailed in Anita Wölf et al. (2009).

4. Evidence of a Significant Effect of Crises on Structural Unemployment

Descriptive analysis suggests that past economic downturns have affected structural unemployment developments. Two points are worth noting.

First, although two-thirds of the episodes were characterised by a rise in structural unemployment, the remaining one-third were surprisingly followed by a fall in structural unemployment. This could be explained either by measurement error in the structural unemployment rate, or lagged effects of reforms implemented before the start of the economic crisis, which could have diminished the decline in structural unemployment following a downturn. Another explanation could be that the crisis triggered an impetus for structural reforms which succeeded to lower structural unemployment (Duval and Elmeskov 2005).

Second, steep increases in structural unemployment have been observed in the majority of episodes during which structural unemployment rose. In particular structural unemployment rose by 4.7 percentage points in Finland following the 1991 crisis and by 3.9 percentage points in Spain after the 1979 downturn (Table 1).

Moving to inferential analysis, OLS was used to estimate equation (1) on an unbalanced panel of OECD countries over the period 1960-2006. Time and country fixed effects which capture shocks are found to be significant and the large R^2 suggests that bias from the omission of variables is not an issue (Table 2). Removing time fixed effects from the estimations would not significantly alter the results (see Table A1).

The results point to a positive and significant average impact of economic downturns on structural unemployment. The impulse reaction function derived from a one-period shock to the downturn dummy suggests that the effect would be maximal four to five years after the start of the crisis (Figure 4). The estimates are statistically significant at a 90% confidence level for most periods. The amplitude of the effects depends on the severity of the downturns ranging from a peak of 0.4 to 0.6 percentage points in the case of mild crises to 1.5 percentage points for extremely severe downturns with output loss greater than 20 percentage points (Figure 5 and Table 2). In the latter case, economic crises are estimated to increase structural unemployment by about 1 percentage point in the long run, after accounting for the autoregressive structure of structural unemployment. Another interesting result is that the crisis contemporaneous effect is statistically significant at a 5% level only for extremely severe crises. This suggests that changes in structural unemployment will only be visible after some period of time in the event of mild crises.

Endogeneity could be a potential serious issue, biasing OLS estimates. Indeed the causality between structural unemployment and the occurrence of an economic downturn could go in both directions. Weak labour market performance, reflecting high structural unemployment, could trigger or be the outcome of an economic downturn. A linear probability model linking structural unemployment to the probability of a crisis has been estimated to investigate whether the explanatory variable was indeed endogenous:

$$P(DOWNTURN_{it} = 1) = F(consant + \sum_{j=1}^{8} \rho_j DOWNTURN_{it-j} + \sum_{j=0}^{8} \theta_j \Delta u^*_{it-j} + \omega_{it}) \quad (3)$$

Past values of the changes in structural unemployment are not found to affect the occurrence probability of a downturn (Table 3). The exogeneity assumption of the downturn dummy to changes in structural unemployment thus appears to be warranted.

Another possible source of bias in the estimation of equation 1 is the omission of non-related crisis shocks which could impinge on structural unemployment. To tackle this issue, equation (1) has been re-estimated accounting for oil prices (Figure 6 and Table A1, column 2). The results seem to be robust both in terms of the point estimates magnitude and in terms of significance. The inclusion of different institutions, namely EPL, product market regulation and the average replacement ratio has also been examined. The impact of downturns on structural unemployment remains significant, but none of the examined institutions are.

A final test has been to check whether the result still holds when crisis episodes are restricted to banking and currency crises, as proxied by the financial dummy constructed by Laeven and Valencia (2008). The immediate impact of banking crises on structural unemployment is found to be significant (Figure 6 and Table A1, column 4). Its amplitude is stronger than the effect of mild crises but smaller than the impact of deep economic downturns. Overall, although some differences are visible, the effect of financial crisis on structural unemployment is not significantly different from those of economic downturns in general.

5. Effects of Institutions on Structural Unemployment's Adjustment to an Economic Downturn

The influence of institutional settings is introduced in the framework by allowing the dynamics and the direct impact of the economic downturn to be different whether institutions are more or less rigid than in the average of OECD countries. The chosen threshold corresponds to the observed average of institution data across countries and time. This corresponds to a value of 30% for the average replacement ratio and 2 for the product market regulation indicator and EPL. The use of different thresholds of the same order of magnitude does not markedly change the results.

The impact of the economic downturn varies depending on institutional settings (Table 4). Institutions are found to affect both the direct impact of the downturn and the structural unemployment's persistence in the aftermath of the shock. In particular, economic downturns appear to increase structural unemployment significantly in countries and in periods with rigid (above the OECD average) institutions. By contrast, no significant effect of economic downturns on structural unemployment is found in flexible economies for crisis of medium severity. Significance increases with the severity of the crisis. As such, these results are not inconsistent with the estimated rise in the US structural unemployment in the aftermath of the 2008 financial crisis, given the severity of the latter crisis. This is consistent with other analysis on the resilience of economies after an exogenous shock (Duval, Elmeskov, and Vogel 2007).

Although all the institutions tested in the analysis appear to affect the impact of the downturn on structural unemployment, some differences between institutions are visible (Figure 7). While the shape of the response to economic downturn is simi-

lar in all the three cases, the magnitude differs, with a high (above the average) level of average replacement ratio generating the higher increase in structural unemployment. By contrast, the rise in structural unemployment in high-EPL countries, in particular high-EPL for permanent contracts, would be less pronounced (Table 5). Indeed, when EPL for regular contracts is substituted to aggregate EPL in equation 2, an economic downturn is found to have a positive and marked effect on structural unemployment only when EPL is above the country average (Table 5, column 1), and the extent of the crisis impact is found of the same order. Opposite effects are surprisingly found when EPL for temporary contracts is substituted in the equation. This could reflect labour market features in OECD countries. Economies which display low EPL for temporary contracts are usually also characterised by stronger protection for regular than for temporary contracts (Figure 8). When a crisis hits the economy, workers on a permanent contract who lose their job will either stay unemployed for a while or be offered temporary contracts which are associated with lower firing costs. This is likely to increase structural unemployment.

The influence of market institutions is particularly important in situations of extreme severe downturns (Figure 9 and Table A2). While the rise in structural unemployment after a deep recession (corresponding to output losses of at least 20%) is on average at around 1.5 percentage points at the peak, such a rise could amount to double this value in countries displaying high EPL.

6. Conclusions and Policy Implications

The empirical investigations undertaken in this paper suggest that economic downturns usually materialise into a marked rise in the level of structural unemployment and this effect is likely to be magnified by stringent institutional settings. The approach adopted in the paper relies on micro-economics foundations and applies them to macroeconomics settings. As such, it implicitly makes an assumption on the way microeconomic behaviours are aggregated. Other aggregation assumptions could lead to different results. In particular given the heterogeneity of individual behaviours leading to winner and looser from reforms it is expected that the implied estimated macro effect of institutions on the effect of crisis on the structural unemployment may be lower than what could be seen at a micro level.

The findings of the paper have direct policy implications in the current economic environment. The 2008 crisis has severely hit OECD economies, with a dramatic deterioration in labour market performance. In this context, governments should adopt measures that aim to limit long-lasting effects. This could be done through appropriate employment and social policies that support long-term unemployed and vulnerable workers to avoid a rise in the structural unemployment. Moreover, reforms in product and labour markets could also prepare the economy to cope with future crises. This would include revisiting employment protection rules by softening too stringent laws, especially for permanent contracts, lowering the average replacement ratio and injecting more flexibility in product markets.

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Appendix

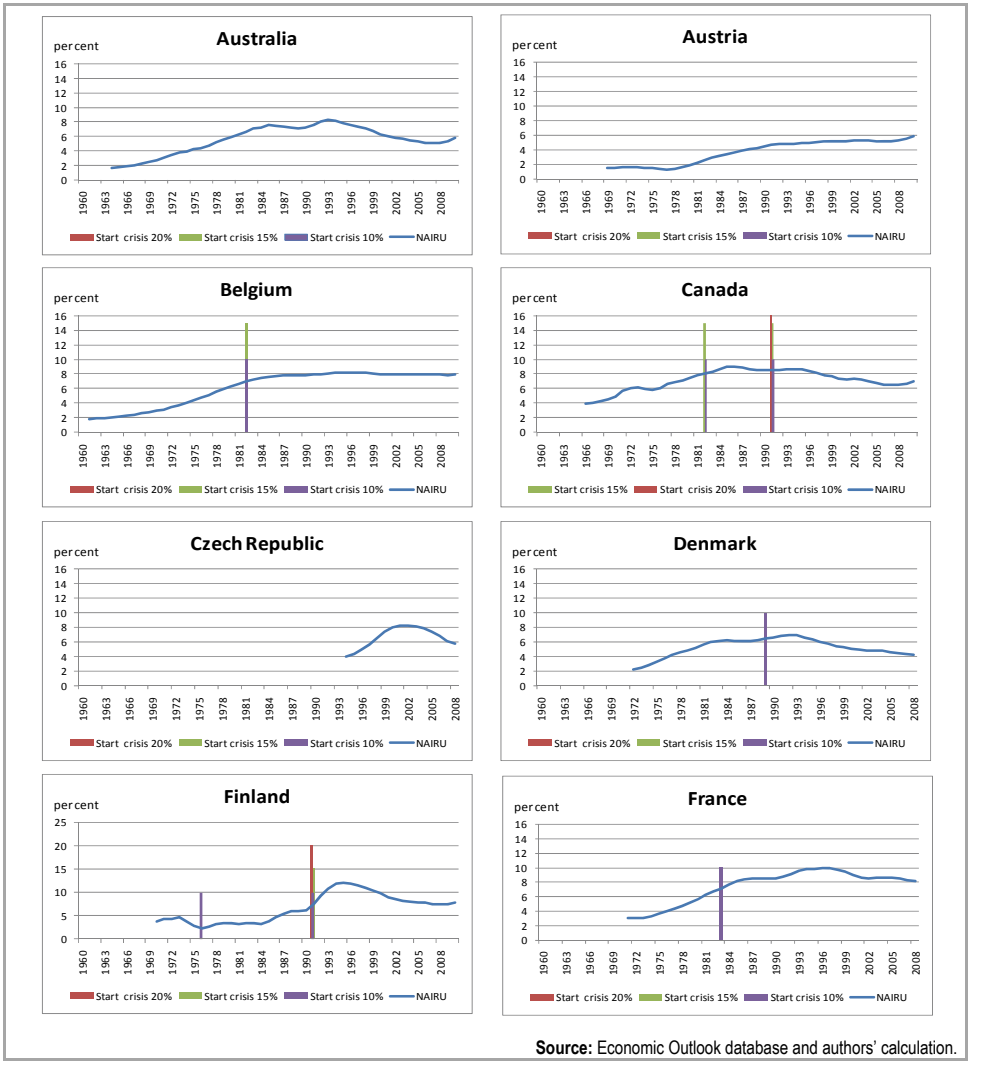
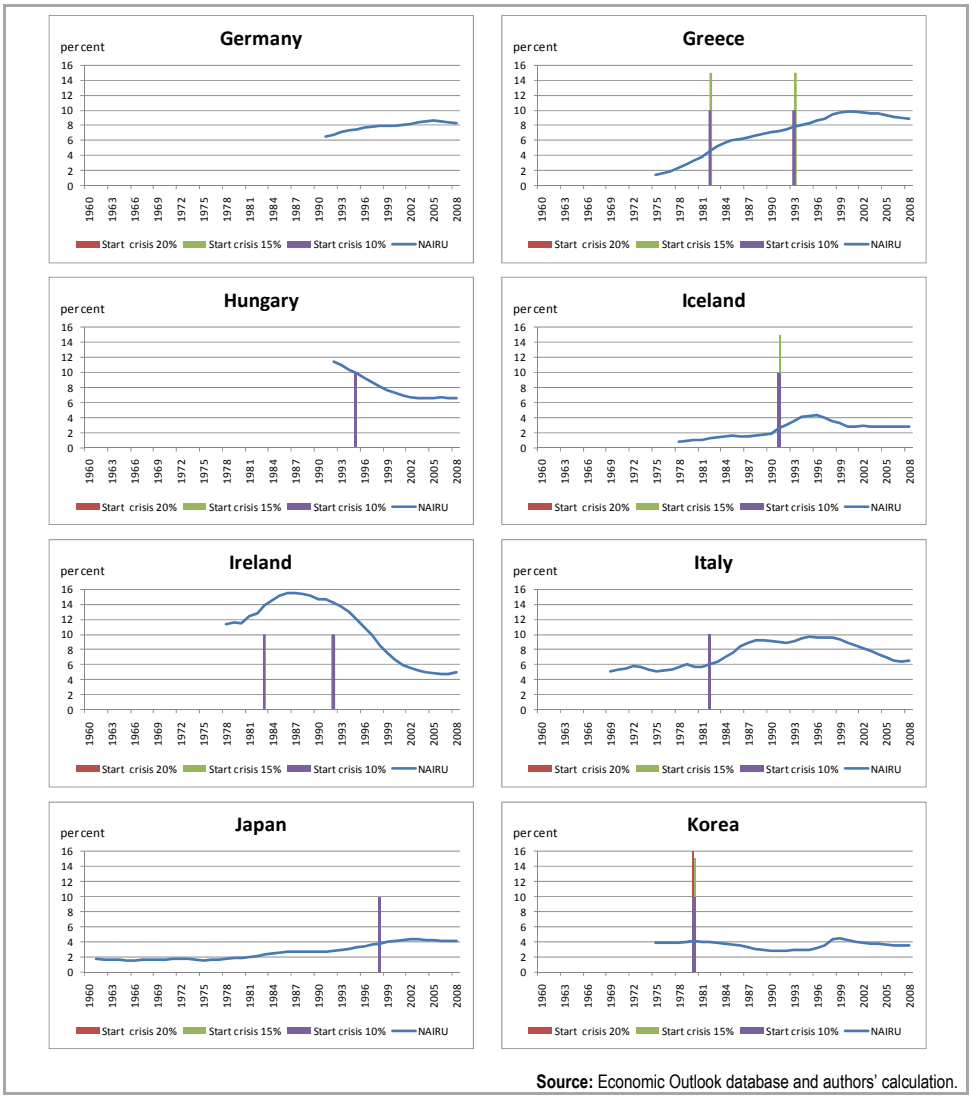
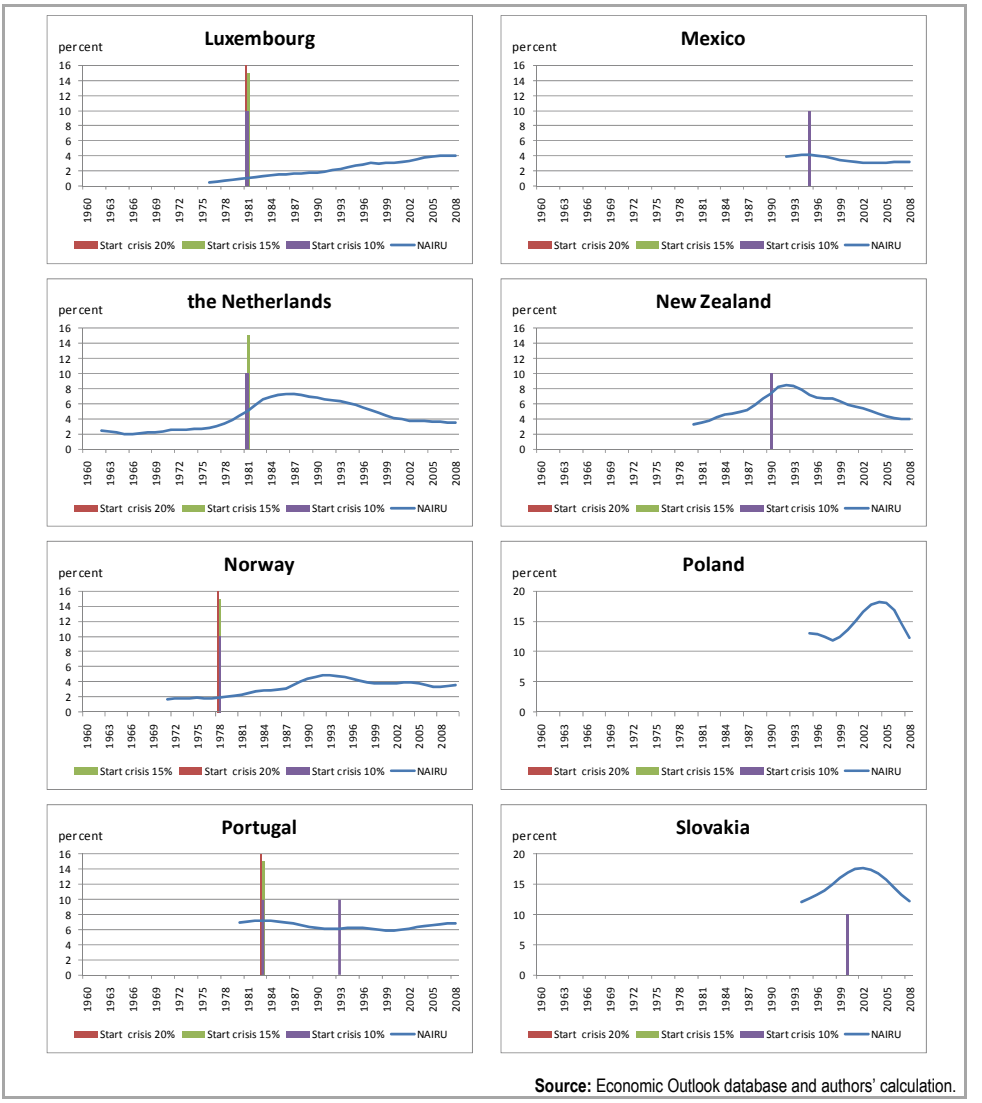


Figure 1 Structural Unemployment and Past Economic Downturns



Source: Economic Outlook database and authors' calculation.

Figure 1 Structural Unemployment and Past Economic Downturns (*contd)*



Source: Economic Outlook database and authors' calculation.

Figure 1 Structural Unemployment and Past Economic Downturns *(contd)*

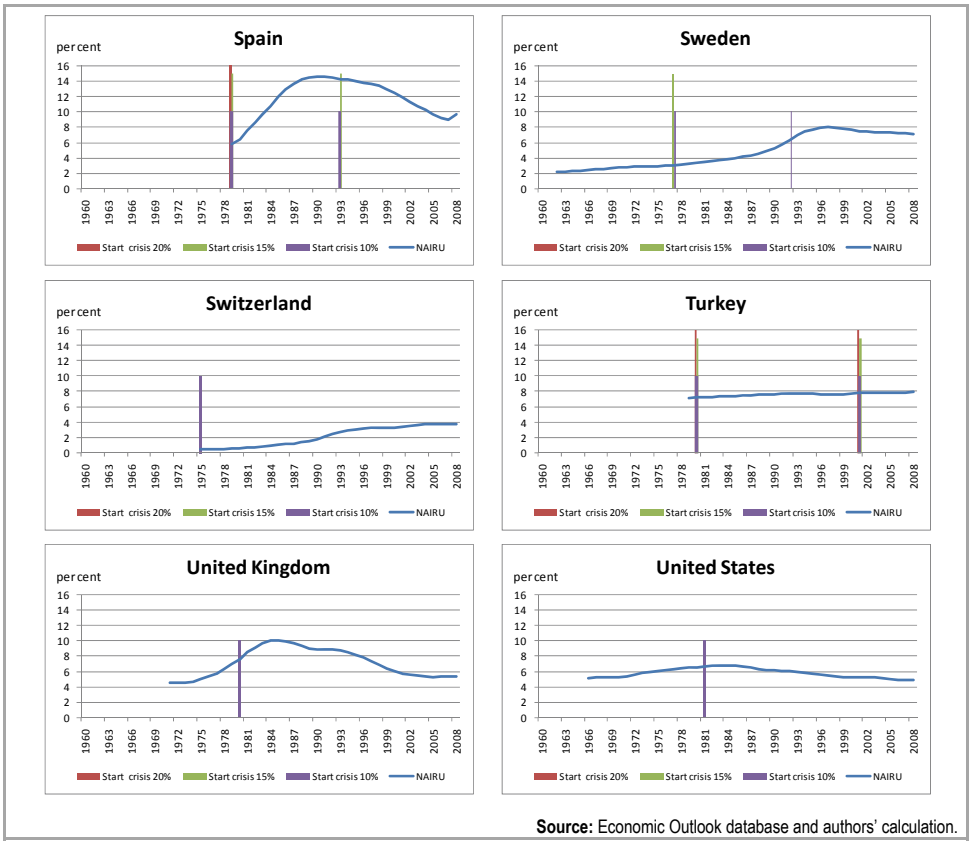


Figure 1 Structural Unemployment and Past Economic Downturns *(contd)*

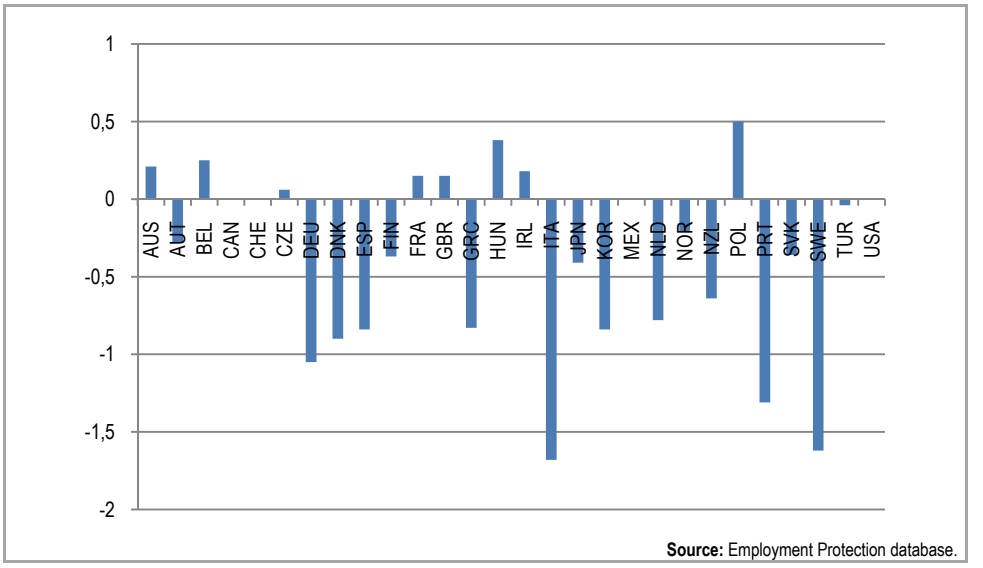


Figure 2 Changes in EPL (1985-2006), Percentage Points

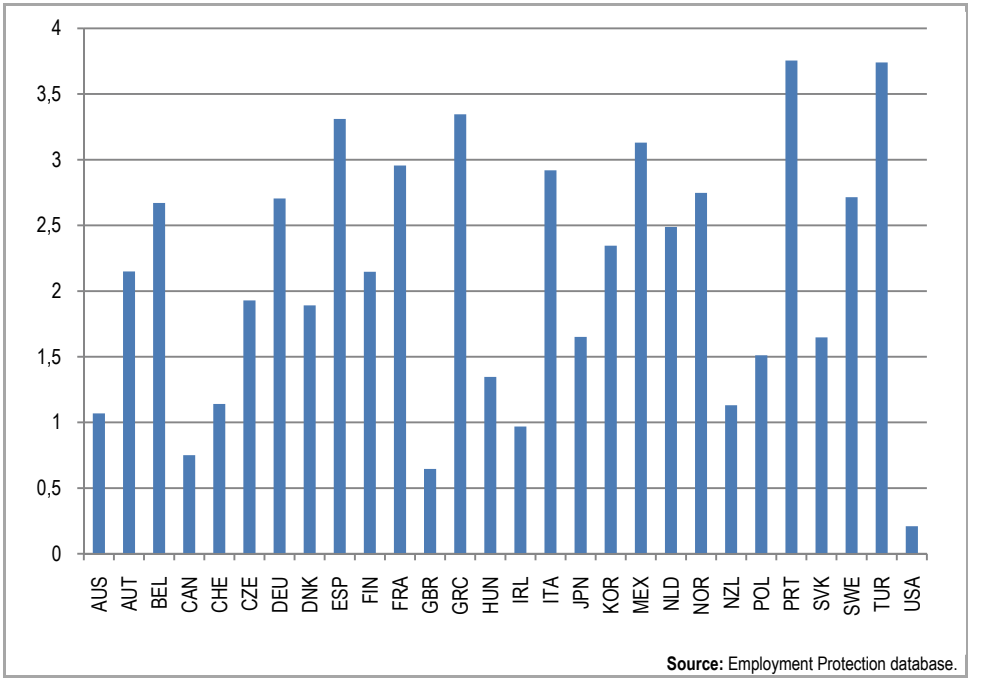


Figure 3 Average EPL (1985-2006)

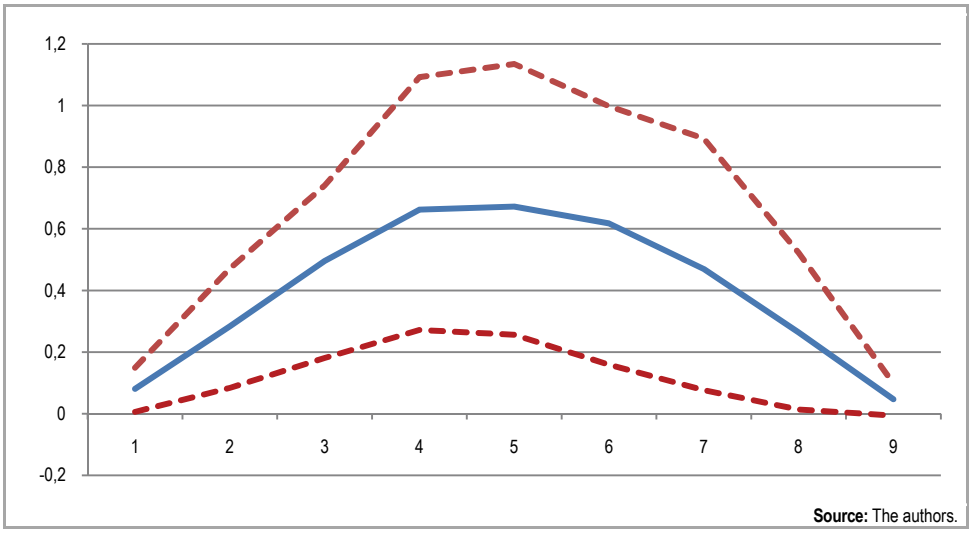


Figure 4 The Effects of Economic Downturns on Structural Unemployment, Percentage Points (s=15)

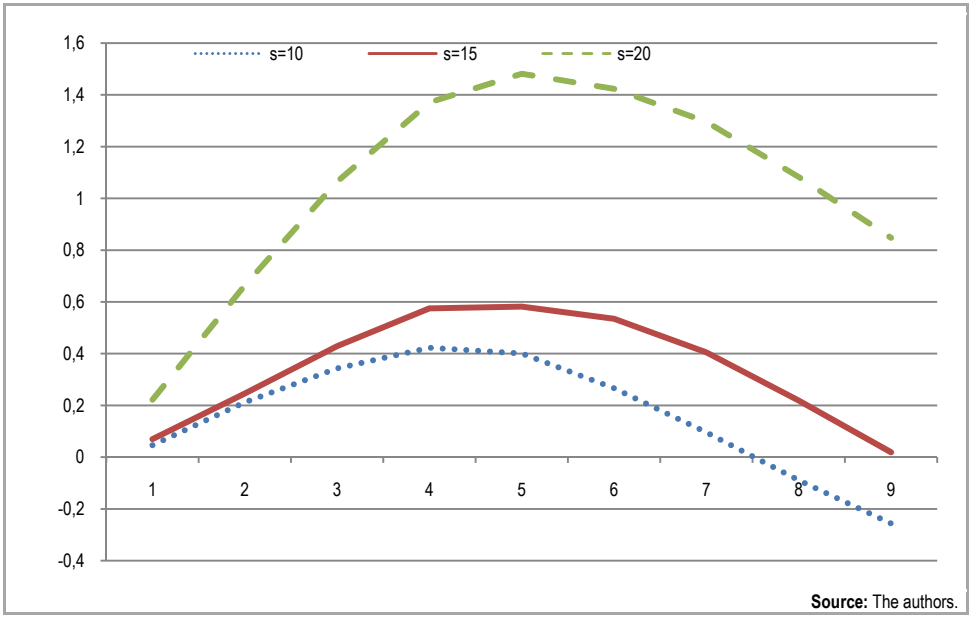
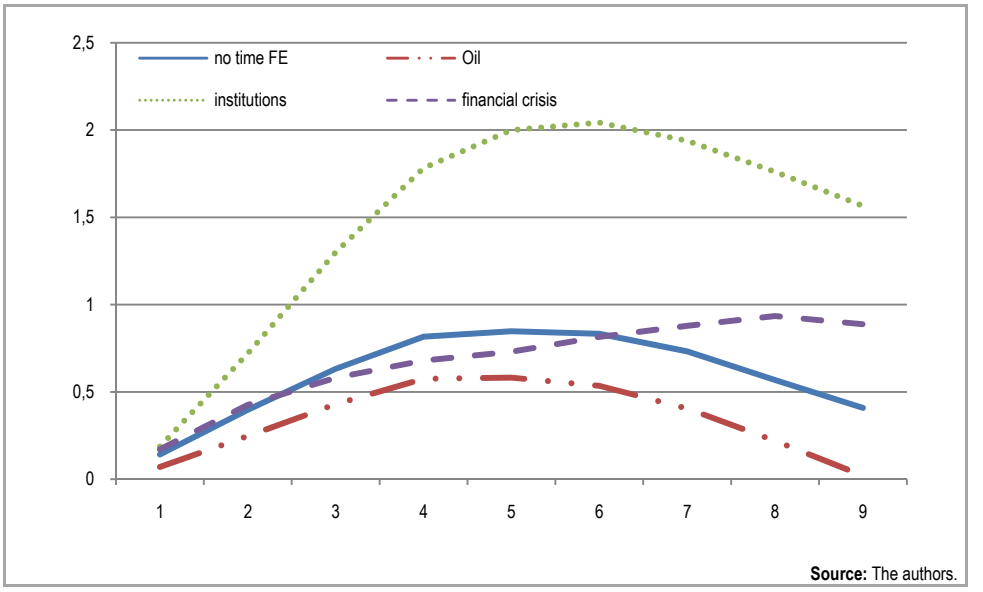
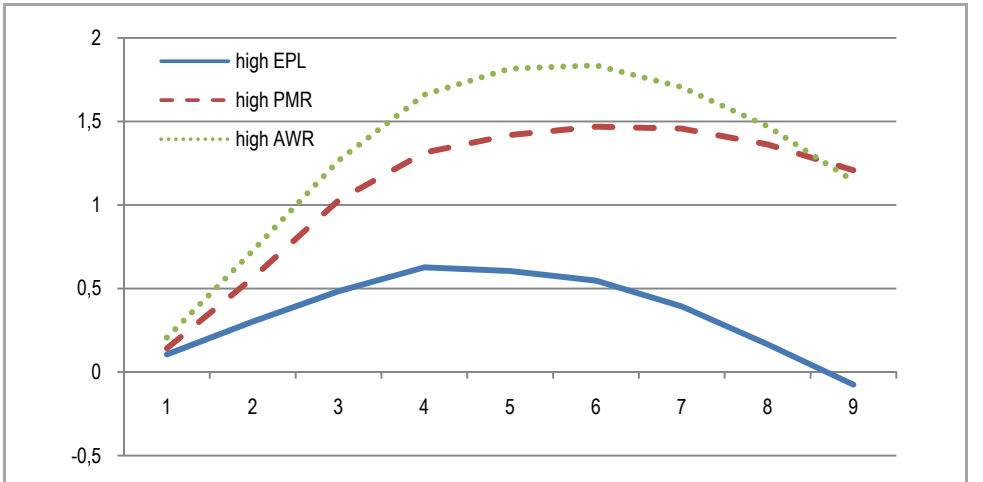


Figure 5 The Effects of Economic Downturns on Structural Unemployment Depending on the Severity of the Downturn, Percentage Points



Source: The authors.

Figure 6 Robustness Tests, Percentage Points



Notes: EPL: Employment Protection Legislation; PMR: Product Market Regulation; AWR: Average Replacement ratio. The downturn dummy corresponds to s=15.

Source: The authors.

Figure 7 Effect on Structural Unemployment, Accounting for Institutions, Percentage Points

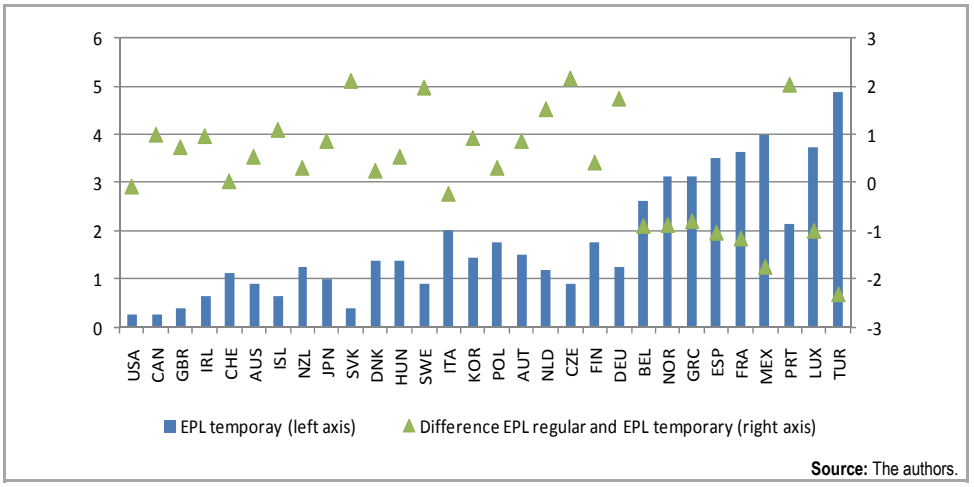


Figure 8 EPL for Temporary Contracts

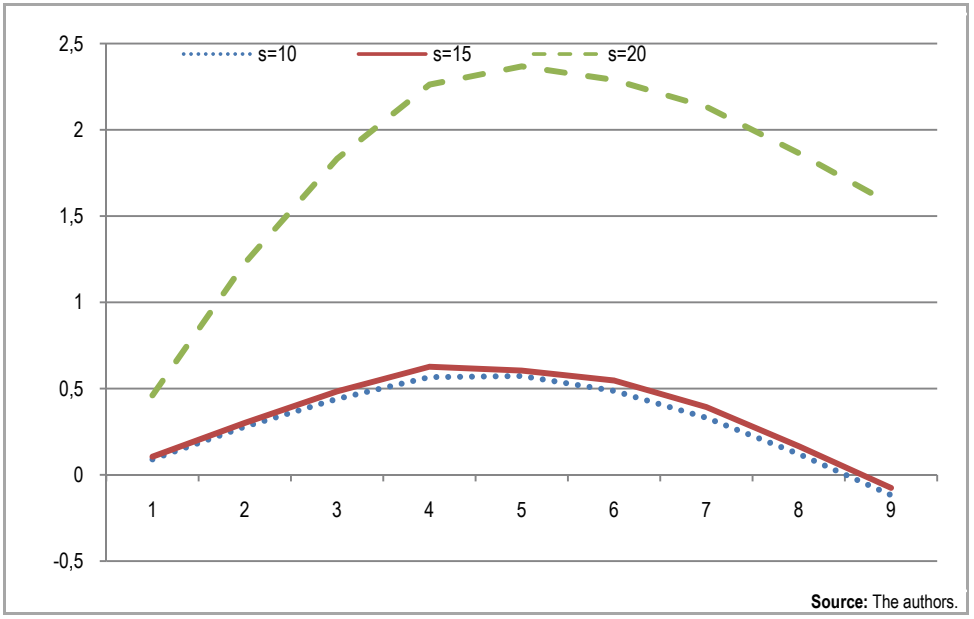


Figure 9 The Effects of Economic Downturns on Structural Unemployment, when EPL is Above Average, Percentage Points

Table 1 Rise in Structural Unemployment During Severe Downturns

		Percentage point change after		
		1 year	**4 years**	**10 years**
CAN	1991	0.0	0.1	-1.3
FIN	1991	1.8	4.7	1.5
KOR	1980	-0.1	-0.4	-1.3
LUX	1981	0.1	0.4	0.8
NOR	1978	0.1	0.6	1.6
PRT	1983	-0.1	-0.4	-1.1
ESP	1979	0.6	3.9	8.7
TUR	1980	0.0	0.1	0.4

Source: Authors' estimations.

Table 2 Average Impact of Economic Downturns on Structural Unemployment

	s = 10	**s = 15**	**s = 20**
$\Delta u^*(-1)$	1.026	1.037	1.028
	(26.69)***	(27.13)***	(26.87)***
$\Delta u^*(-2)$	-0.300	-0.299	-0.287
	(-5.47)***	(-5.45)***	(-5.25)***
$\Delta u^*(-3)$	0.125	0.106	0.105
	(2.30)**	(1.95)*	(1.94)*
$\Delta u^*(-4)$	-0.276	-0.269	-0.269
	(-5.20)***	(-5.05)***	(-5.06)***
$\Delta u^*(-5)$	0.310	0.298	0.291
	(6.06)***	(5.80)***	(5.67)***
$\Delta u^*(-6)$	-0.132	-0.129	-0.129
	(-2.80)***	(-2.74)***	(-1.61)***
$\Delta u^*(-7)$	-0.071	-0.068	-0.070
	(-1.64)*	(-1.56)	(-1.61)
$\Delta u^*(-8)$	0.031	0.030	0.038
	(1.04)	(0.95)	(1.21)
DOWNTURN	0.046	0.070	0.222
	(1.46)	(1.57)	(2.79)***
DOWNTURN(-1)	0.119	0.104	0.214
	(3.74)***	(2.33)**	(2.67)***
DOWNTURN(-2)	-0.025	0.020	0.010
	(-0.82)	(0.49)	(0.14)
DOWNTURN(-3)	-0.0105	0.002	-0.003
	(-0.35)	(0.05)	(-0.04)
DOWNTURN(-4)	-0.073	-0.090	-0.076
	(-2.55)**	(-2.38)**	(-1.36)
DOWNTURN(-5)	-0.072	-0.003	-0.072
	(-2.54)**	(-0.07)	(-1.29)
DOWNTURN(-6)	-0.060	-0.090	-0.059
	(-2.24)**	(-2.63)***	(-1.15)
DOWNTURN(-7)	-0.040	-0.053	-0.073
	(-1.52)	(-1.47)	(-1.42)
DOWNTURN(-8)	-0.016	-0.049	-0.031
	(-0.60)	(-1.36)	(-0.60)
R^2	0.87	0.87	0.87
N	731	731	731
F- test country	3.63***	3.60***	3.57***
F- test time	2.77***	2.82***	2.91***

Notes: T-statistics in parenthesis. *,**,*** denote significant at 10%, 5% and 1%, respectively.

Source: Authors' estimations.

Table 3 Structural Unemployment Effect on the Downturn Occurrence Probability

DOWNTURN-1	DOWNTURN-2	DOWNTURN-3	DOWNTURN-4	DOWNTURN-5	DOWNTURN-6	DOWNTURN-7	DOWNTURN-8	
-0.074 (-2.54)**	-0.079 (-2.41)**	-0.058 (-2.63)***	-0.054 (-2.21)**	-0.056 (-2.46)**	-0.039 (-2.31)**	-0.031 (-2.01)**	-0.050 (-2.48)**	
Δu	Δu*(-1)	Δu*(-2)	Δu*(-3)	Δu*(-4)	Δu*(-5)	Δu*(-6)	Δu*(-7)	Δu*(-8)
0.054 (0.80)	-0.012 (-0.21)	-0.035 (-0.77)	0.029 (0.73)	-0.062 (-1.25)	0.094 (1.59)	-0.015 (-0.47)	-0.031 (-0.78)	0.020 (0.71)

Notes: the downturn dummy corresponds to a degree of severity of 15%. T-statistics in parenthesis. *,**,*** denote significant at 10%, 5% and 1%, respectively.

Source: Authors' estimations.

Table 4 Influence of Institutions

	EPL	Product market regulation	Average replacement ratio
	HIGH		
Δu*(-1)	1.128 (17.38)***	1.241 (21.27)***	1.118 (22.04)***
Δu*(-2)	-0.506 (-5.19)***	-0.602 (-7.33)***	-0.371 (-5.13)***
Δu*(-3)	0.187 (1.93)*	0.278 (3.37)***	0.055 (0.79)
Δu*(-4)	-0.259 (-2.86)***	-0.308 (-3.80)***	-0.231 (-3.51)***
Δu*(-5)	0.228 (2.52)**	0.284 (3.65)***	0.341 (5.62)***
Δu*(-6)	-0.047 (-0.51)	-0.116 (-1.72)*	-0.143 (-2.54)**
Δu*(-7)	-0.047 (-0.52)	-0.048 (-0.81)	-0.072 (-1.38)
Δu*(-8)	-0.040 (-0.65)	0.025 (0.56)	0.008 (0.21)
DOWNTURN	0.295 (3.36)***	0.098 (1.41)	0.177 (2.60)***
DOWNTURN(-1)	0.262 (2.95)***	0.214 (3.08)***	0.238 (3.45)***
DOWNTURN(-2)	0.071 (0.81)	0.043 (0.61)	0.001 (0.02)
DOWNTURN(-3)	0.174 (1.99)**	-0.021 (-0.31)	-0.014 (-0.17)
DOWNTURN(-4)	-0.085 (-0.97)	-0.071 (-1.00)	-0.091 (-1.32)
DOWNTURN(-5)	0.224 (2.58)***	-0.091 (-1.28)	0.033 (0.47)
DOWNTURN(-6)	-0.148 (-1.70)*	-0.112 (-1.79)*	-0.160 (-2.34)**
DOWNTURN(-7)	-0.028 (-0.32)	-0.067 (-1.08)	-0.091 (-1.32)
DOWNTURN(-8)	-0.051 (-0.59)	-0.090 (-1.45)	-0.042 (-0.61)

Table 4 Influence of Institutions (*contd)*

	EPL	Product market regulation	Average replacement ratio
		LOW	
Δu*(-1)	0.708	0.964	0.892
	(9.26)***	(22.78)***	(16.87)***
Δu*(-2)	-0.189	-0.216	-0.173
	(-2.24)**	(-3.82)***	(-2.43)**
Δu*(-3)	0.211	0.117	0.170
	(2.66)***	(2.10)**	(2.42)**
Δu*(-4)	-0.250	-0.267	-0.273
	(-3.20)***	(-4.91)***	(-4.06)***
Δu*(-5)	0.175	0.257	0.194
	(2.30)**	(4.81)***	(2.96)***
Δu*(-6)	-0.032	-0.141	-0.101
	(-0.45)	(-2.93)***	(-1.65)
Δu*(-7)	0.059	-0.045	-0.107
	(0.90)	(-0.99)	(-1.83)*
Δu*(-8)	-0.055	0.014	0.082
	(-1.04)	(0.41)	(1.83)*
DOWNTURN	0.027	0.064	0.002
	(0.43)	(1.05)	(0.03)
DOWNTURN(-1)	-0.005	0.014	-0.001
	(-0.08)	(0.24)	(-0.02)
DOWNTURN(-2)	0.030	-0.021	0.031
	(0.59)	(-0.41)	(0.58)
DOWNTURN(-3)	-0.045	0.031	0.008
	(-0.77)	(0.60)	(0.16)
DOWNTURN(-4)	-0.158	-0.075	-0.089
	(-3.09)***	(-1.68)*	(-1.93)*
DOWNTURN(-5)	-0.056	0.008	-0.028
	(-1.09)	(0.18)	(-0.60)
DOWNTURN(-6)	-0.131	-0.077	-0.089
	(-2.74)***	(-1.68)*	(-1.93)**
DOWNTURN(-7)	-0.119	-0.053	-0.048
	(-2.54)**	(-1.18)	(-1.12)
DOWNTURN(-8)	-0.094	-0.032	-0.059
	(-2.20)**	(-0.75)	(-1.42)
R^2	0.84	0.88	0.87
N	731	731	731
F- test country	1.22	3.65***	3.35***
F- test time	1.75***	2.84***	2.75***

Notes: T-statistics in parenthesis. *,**,*** denote significant at 10%, 5% and 1%, respectively. The DOWNTURN dummy corresponds to s=15. Dummy for institutions have been included in the analysis, but they are not reported since they turned out not to be significant.

Source: Authors' estimations.

Table 5 EPL for Permanent Contracts and EPL for Temporary Contracts

	EPL for permanent contracts	EPL for temporary contracts	EPL
	HIGH		
$\Delta u^*(-1)$	1.112	1.182	1.128
	(17.35)***	(14.87)***	(17.38)***
$\Delta u^*(-2)$	-0.442	-0.441	-0.506
	(-4.59)***	(-3.91)***	(-5.19)***
$\Delta u^*(-3)$	0.182	0.242	0.187
	(1.94)*	(2.31)**	(1.93)*
$\Delta u^*(-4)$	-0.297	-0.364	-0.259
	(-3.47)***	(-3.81)***	(-2.86)***
$\Delta u^*(-5)$	0.289	0.302	0.228
	(3.37)***	(3.14)***	(2.52)**
$\Delta u^*(-6)$	-0.088	-0.181	-0.047
	(-1.01)	(-1.88)*	(-0.51)
$\Delta u^*(-7)$	-0.059	0.028	-0.047
	(-0.70)	(0.30)	(-0.52)
$\Delta u^*(-8)$	-0.040	0.037	-0.040
	(-0.65)	(0.51)	(-0.65)
DOWNTURN	0.267	-0.092	0.295
	(3.13)***	(-0.87)	(3.36)***
DOWNTURN(-1)	0.324	0.158	0.262
	(3.77)***	(1.54)	(2.95)***
DOWNTURN(-2)	0.057	-0.045	0.071
	(0.66)	(-0.45)	(0.81)
DOWNTURN(-3)	0.171	0.093	0.174
	(2.03)**	(0.91)	(1.99)**
DOWNTURN(-4)	-0.121	-0.031	-0.085
	(-1.44)	(-0.31)	(-0.97)
DOWNTURN(-5)	0.185	0.161	0.224
	(2.23)**	(1.62)	(2.58)***
DOWNTURN(-6)	-0.192	-0.183	-0.148
	(-2.31)**	(-1.82)*	(-1.70)*
DOWNTURN(-7)	-0.044	-0.013	-0.028
	(-0.53)	(-0.13)	(-0.32)
DOWNTURN(-8)	-0.074	-0.129	-0.051
	(-0.89)	(-1.30)	(-0.59)

Table 5 EPL for Permanent Contracts and EPL for Temporary Contracts (*contd*)

	EPL for permanent contracts	EPL for temporary contracts	EPL
	LOW		
Δu*(-1)	0.956	1.006	0.708
	(20.31)***	(24.88)***	(9.26)***
Δu*(-2)	-0.219	-0.280	-0.189
	(-3.44)***	(-4.96)***	(-2.24)**
Δu*(-3)	0.142	0.103	0.211
	(2.32)**	(1.84)*	(2.66)***
Δu*(-4)	-0.294	-0.265	-0.250
	(-4.96)***	(-4.85)***	(-3.20)***
Δu*(-5)	0.264	0.307	0.175
	(4.65)***	(5.85)***	(2.30)**
Δu*(-6)	-0.142	-0.124	-0.032
	(-2.81)***	(-2.58)***	(-0.45)
Δu*(-7)	-0.047	-0.083	0.059
	(-1.00)	(-1.86)*	(0.90)
Δu*(-8)	-0.074	0.0258	-0.055
	(-0.89)	(0.79)	(-1.04)
DOWNTURN	-0.001	0.115	0.027
	(-0.02)	(2.15)**	(0.43)
DOWNTURN(-1)	0.009	0.113	-0.005
	(0.16)	(2.09)**	(-0.08)
DOWNTURN(-2)	0.031	0.036	0.030
	(0.62)	(0.75)	(0.59)
DOWNTURN(-3)	-0.028	-0.014	-0.045
	(-0.56)	(-0.29)	(-0.77)
DOWNTURN(-4)	-0.088	-0.123	-0.158
	(-1.98)**	(-2.86)***	(-3.09)***
DOWNTURN(-5)	-0.043	-0.035	-0.056
	(-0.53)	(-0.81)	(-1.09)
DOWNTURN(-6)	-0.078	-0.093	-0.131
	(-1.86)*	(-2.26)**	(-2.74)***
DOWNTURN(-7)	-0.054	-0.054	-0.119
	(-1.30)	(-1.32)	(-2.54)**
DOWNTURN(-8)	-0.041	-0.038	-0.094
	(-1.02)	(-0.98)	(-2.20)**
R^2	0.87	0.87	0.84
N	491	491	491
F- test country	268***	3.69***	1.22
F- test time	3.77***	2.79***	1.75***

Notes: T-statistics in parenthesis. *,**,*** denote significant at 10%, 5% and 1%, respectively. The DOWNTURN dummy corresponds to s = 15. Dummy for institutions have been included in the analysis, but they are not reported since they resulted to not be significant.

Source: Authors' estimations.

Table A1 Robustness Checks

	S=15 and no time FE	S=15, time dummies, country FE +oil shocks	S=15, time & country FE introduction of institutions (∆EPL, ∆PMR, ∆AWR)	Financial DOWNTURN dummy time & country FE
$\Delta u^*(-1)$	1.079	1.037	1.071	1.042
	(28.74)***	(27.13)***	(17.19)***	(27.36)***
$\Delta u^*(-2)$	-0.308	-0.299	-0.332	-0.304
	(-5.64)***	(-5.45)***	(-3.67)***	(-5.59)***
$\Delta u^*(-3)$	0.101	0.106	-0.022	0.100
	(1.86)*	(1.95)**	(-0.23)	(1.84)*
$\Delta u^*(-4)$	-0.267	-0.269	-0.113	-0.269
	(-5.07)***	(-5.05)***	(-1.21)	(-5.11)***
$\Delta u^*(-5)$	0.333	0.298	0.223	0.289
	(6.56)***	(5.80)***	(2.62)***	(5.70)***
$\Delta u^*(-6)$	-0.146	-0.129	-0.125	-0.127
	(-3.12)***	(-2.74)***	(-1.69)***	(-2.73)***
$\Delta u^*(-7)$	-0.068	-0.068	-0.041	-0.065
	(-1.56)	(-1.56)	(-0.63)	(-1.51)
$\Delta u^*(-8)$	0.058	0.030	0.016	0.042
	(1.87)*	(0.95)	(0.34)	(1.37)
DOWNTURN	0.142	0.070	0.187	0.171
	(3.19)***	(1.57)	(2.19)**	(4.27)***
DOWNTURN(-1)	0.102	0.104	0.333	0.077
	(2.29)**	(2.33)***	(3.79)***	(1.89)*
DOWNTURN(-2)	0.003	0.020	0.069	-0.058
	(0.08)	(0.49)	(0.79)	(-1.43)
DOWNTURN(-3)	-0.005	0.002	0.044	-0.003
	(-0.12)	(0.05)	(0.51)	(-0.08)
DOWNTURN(-4)	-0.083	-0.090	-0.076	0.017
	(-2.19)**	(-2.38)***	(-1.11)	(0.40)
DOWNTURN(-5)	0.005	-0.003	0.002	0.066
	(0.14)	(-0.19)	(0.03)	(1.80)*
DOWNTURN(-6)	-0.095	-0.090	-0.099	-0.030
	(-2.60)***	(-2.47)***	(-1.73)*	(-0.94)
DOWNTURN(-7)	-0.045	-0.053	-0.047	0.036
	(-1.23)	(-1.47)	(-0.83)	(1.17)
DOWNTURN(-8)	-0.021	-0.049	-0.030	-0.080
	(-0.57)	(-1.36)	(-0.58)	(-2.54)**
R^2	0.84	0.87	0.85	0.87
N	731	731	306	731

Notes: T-statistics in parenthesis. *,**,*** denote significant at 10%, 5% and 1%, respectively.

Source: Authors' estimations.

Table A2 Effect of Economic Downturns on Structural Unemployment and Severity of Crises

	s=10	s=15	s=20
	HIGH EPL		
Δu*(-1)	1.131	1.128	1.008
	(18.02)***	(17.38)***	(14.79)***
Δu*(-2)	-0.481	-0.506	-0.345
	(-5.08)***	(-5.19)***	(-3.54)***
Δu*(-3)	0.145	0.187	0.171
	(1.53)	(1.93)*	(1.81)*
Δu*(-4)	-0.218	-0.259	-0.186
	(-2.47)**	(-2.86)***	(-2.09)**
Δu*(-5)	0.229	0.228	0.101
	(2.59)**	(2.52)**	(1.15)
Δu*(-6)	-0.041	-0.047	-0.005
	(-0.46)	(-0.51)	(-0.06)
Δu*(-7)	-0.081	-0.047	-0.088
	(-0.93)	(-0.52)	(-1.00)
Δu*(-8)	-0.003	-0.040	0.053
	(-0.04)	(-0.65)	(0.88)
DOWNTURN	0.182	0.295	0.977
	(3.01)***	(3.36)***	(6.70)***
DOWNTURN(-1)	0.161	0.262	0.642
	(2.62)***	(2.95)***	(3.99)***
DOWNTURN(-2)	0.042	0.071	0.193
	(0.68)	(0.81)	(1.20)
DOWNTURN(-3)	0.095	0.174	0.062
	(1.53)	(1.99)**	(0.40)
DOWNTURN(-4)	-0.044	-0.085	-0.494
	(-0.70)	(-0.97)	(-3.22)***
DOWNTURN(-5)	0.068	0.224	-0.097
	(1.10)	(2.58)***	(0.62)
DOWNTURN(-6)	-0.095	-0.148	-0.165
	(-1.53)	(-1.70)*	(-1.04)
DOWNTURN(-7)	0.002	-0.028	-0.073
	(0.03)	(-0.32)	(-0.46)
DOWNTURN(-8)	-0.020	-0.051	0.076
	(-0.33)	(-0.59)	(0.50)

Table A2 Effect of Economic Downturns on Structural Unemployment and Severity of Crises (*contd*)

	s=10	s=15	s=20
	LOW EPL		
$\Delta u^*(-1)$	0.659	0.708	0.744
	(8.43)***	(9.26)***	(10.27)***
$\Delta u^*(-2)$	-0.177	-0.189	-0.219
	(-2.06)**	(-2.24)**	(-2.69)***
$\Delta u^*(-3)$	0.238	0.211	0.194
	(2.99)***	(2.66)***	(2.52)**
$\Delta u^*(-4)$	-0.253	-0.250	-0.291
	(-3.25)***	(-3.20)***	(-3.89)***
$\Delta u^*(-5)$	0.172	0.175	0.175
	(2.22)	(2.30)**	(2.38)**
$\Delta u^*(-6)$	-0.032	-0.032	-0.104
	(-0.44)	(-0.45)	(-1.52)
$\Delta u^*(-7)$	0.056	0.059	0.072
	(0.82)	(0.90)	(1.12)
$\Delta u^*(-8)$	-0.070	-0.055	-0.052
	(-1.29)	(-1.04)	(-1.01)
DOWNTURN	0.029	0.027	0.166
	(0.58)	(0.43)	(1.37)
DOWNTURN(-1)	0.055	-0.005	0.041
	(1.10)	(-0.08)	(1.16)
DOWNTURN(-2)	0.006	0.030	-0.091
	(0.13)	(0.59)	(-0.68)
DOWNTURN(-3)	-0.046	-0.045	-0.120
	(-0.96)	(-0.77)	(-0.91)
DOWNTURN(-4)	-0.143	-0.158	-0.108
	(-3.15)***	(-3.09)***	(-1.36)
DOWNTURN(-5)	-0.123	-0.056	-0.123
	(-2.67)***	(-1.09)	(-1.52)
DOWNTURN(-6)	-0.095	-0.131	-0.087
	(-1.53)**	(-2.74)***	(-1.26)
DOWNTURN(-7)	-0.133	-0.119	-0.150
	(-3.14)***	(-2.54)**	(-2.19)**
DOWNTURN(-8)	-0.124	-0.094	-0.086
	(-3.03)***	(-2.20)**	(-1.34)
R^2	0.83	0.84	0.85
N	491	491	491
F- test country	1.39*	1.22	1.29
F- test time	1.92***	1.75***	2.06***

Notes: T-statistics in parenthesis. *,**,*** denote significant at 10%, 5% and 1%, respectively.

Source: Authors' estimations.