Unemployment at risk: the policy determinants of labour market exposure to economic shocks

Alain de Serres, Fabrice Murtin

Unemployment at risk

SUMMARY

This paper examines the vulnerability of labour markets to adverse economic shocks. We define labour market exposure as the cumulated amount of excess unemployment generated by a shock before unemployment returns to steady-state. We use a panel of 19 countries covering the period 1985–2010 to assess the influence of labour market policies on labour market exposure, which is also calcu-lated country by country. We find that less generous unemployment insurance, more active labour market policies or a lower minimum wage imply a trade-off between average unemployment and labour market exposure, as they help low-skilled workers to get out of unemployment at the cost of increased vulnerability to adverse shocks. On the other hand, reducing the tax wedge is conducive to both lower steady-state unemployment and labour market exposure.

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1. INTRODUCTION

Five years after the trough from the Great Recession, the absence of a vigorous and sustained recovery in many OECD countries has left a sizeable share of workers to the margin of the labour market. For many of them – in particular youth and low-skilled workers – the risk of developing weak attachment to the labour market is real, with potentially adverse consequences on their career prospects. In this context, it is legitimate to ask whether some labour market policies and institutions that may be more conducive to low unemployment during 'normal times' may leave labour markets less well-equipped to cope with severe economic recessions, and therefore more prone to entail large swings in employment along the business cycle. Put differently, is there some evidence that policy settings that contribute to lower steady-state

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unemployment could lead to more persistent deviations from steady-state following shocks?

Insofar as the short- and medium-term vulnerability of labour markets cannot be neglected from a political point of view, this is a major source of concern for policymakers. In particular, they may be more reluctant to undertake pro-employment labour market reforms if these come at the price of higher unemployment volatility. Where trade-offs are identified, the ancillary question is the extent to which these trade-offs could be eased through temporary changes in features or parameters of specific policies that would strengthen their stabilizing properties (or weaken the destabilizing ones), while still minimizing the potential adverse effects on steady-state unemployment. Even though this would in principle lead to more optimal outcomes, such structural policy fine-tuning may in practice be difficult to implement effectively.

In order to address these questions, it is first necessary to identify which type of labour market policy settings appear more likely to favour lower trend unemployment but at the cost of larger volatility (a policy trade-off), and which ones seem to improve outcomes on both counts (a policy win-win). To that aim, we assess the relationship between labour market policies and unemployment inflow and outflow rates (i.e. the turnover rates). As there is a strong empirical link between the observed unemployment rate and the (steady-state) unemployment rate predicted by turnover rates, the empirical relationships between policies and turnover rates depict fairly well unemployment dynamics. Decomposing the unemployment rate into its turnover components allows us to unveil the flow channels through which labour market policies can affect short-term and long-term unemployment dynamics. Moreover, we also examine how policies affect turnover dynamics, as we allow for an effect of policies not only on the average level of turnover rates, but also on their degree of time persistence and on their sensitivity to economic shocks.

In a second step, we define and calculate labour market exposure as the average percentage deviation of unemployment from the long-term level following an adverse shock. Interestingly, labour market exposure is found to differ quite substantially across various labour market policy settings. Indeed, we find that less generous unemployment insurance, more active labour market policies and a lower minimum wage imply larger labour market exposure. In all three cases, this can be explained by an increase in the proportion of low-skilled workers in employment whose lower productivity makes them more vulnerable to economic downturns. No such trade-off is uncovered with other policies. We find that a higher tax wedge increases both the steady-state level and volatility of unemployment and, therefore labour market exposure. Reducing the tax wedge constitutes in this regard a 'win-win' strategy. The other policies examined in the paper have no substantial effects on the level and/or the volatility of unemployment.

The analysis in the paper is grounded in the Mortensen–Pissarides (1994) model and its particular version presented in Jung and Kuhn (2013), as well as in the Murtin and Robin (2013) extension of Robin (2011). However, the paper also relates to past studies focusing on unemployment dynamics (see Blanchard, 2006, for a comprehensive survey). Starting from the classical wage and price-setting model that highlights real and nominal wage rigidities (Layard *et al.*, 1991; Bruno and Sachs, 1985), a large empirical literature has assessed the unemployment effects of unemployment insurance and employment protection systems (Nickell, 1990, 1998; Machin and Manning, 1999; Boeri and Garibaldi, 2007; Bentolila *et al.*, 2010), wage bargaining institutions (Calmfors and Driffill, 1988), product market regulation (Blanchard and Giavazzi, 2003; Nicoletti and Scarpetta, 2005; Fiori *et al.*, 2007; Griffith *et al.*, 2007), as well as the interaction between these institutional variables or with economic shocks (Blanchard and Wolfers, 2000; Bassanini and Duval, 2009; Abbritti and Weber, 2010). We believe that this paper is the first one to examine empirically the relationships between labour market institutions and unemployment *turnover* dynamics.

The paper is structured as follows. In Section 2, we present the basic relationship between unemployment stock and turnover, and describe the data as well as stylized facts. Section 3 first examines the theoretical and empirical relationships between labour market policies and unemployment turnover. It then defines and computes labour market exposure to adverse shocks under different policy settings. Section 4 provides estimates of the variation in steady-state unemployment after policy reforms and examines the potential existence of trade-offs between the level and volatility of unemployment. The last section concludes.

2. DATA AND STYLIZED FACTS

This section sheds light on the relationships between unemployment turnover and the rate of unemployment, and describes the data and stylized facts. In this study, the sample is composed of annual data covering 19 OECD countries[1] over the period 1985 to 2010.

2.1. The relationship between unemployment and unemployment turnover

The evolution of unemployment over time is conveniently described by a two-state model (employment-unemployment) that ignores inactivity and considers a fixed labour force.[2] Between two periods, the change in unemployment is simply equal to the number of workers being laid off and falling into unemployment minus the number of unemployed workers finding a job. Formally, one has:

[1] Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, New-Zealand, Portugal, Spain, Sweden, United Kingdom, United States.

[2] Taking into account inactivity would result in a three-states model (employment-unemployment-inactivity) as developed for instance by Blanchard and Diamond (1989), Burda and Wyplosz (1994) or Ponomareva and Sheen (2009). In this case, six series of transition rates would be involved instead of two, and these series are not available for a panel of OECD countries.

$$u_{t+1} - u_t = s_t e_t - f_t u_t = s_t(1 - u_t) - f_t u_t \quad (1)$$

where u_t denotes the rate of unemployment, e_t the employment rate as a share of the labour force, s_t the unemployment inflow rate and f_t the unemployment outflow rate. The two latter variables are labelled as 'unemployment turnover rates'.

Let us now define steady-state unemployment. Unemployment is constant at steady-state, implying that there is an equal number of people entering or exiting unemployment. Using the above expression, steady-state unemployment can be expressed as:

$$u_t^* = \frac{s_t}{s_t + f_t} \quad (2)$$

Notice that steady-state unemployment changes over time, as unemployment inflow and outflow rates are not constant in general. Steady-state unemployment is therefore more precisely defined as the equilibrium value that unemployment would permanently reach, were inflow and outflow rates to remain constant.

Then, the observed unemployment rate can be related to unemployment turnover rates in a simple way: One simply assumes that steady-state unemployment can be used as a proxy for the observed unemployment rate as they are empirically not very different, so that:

$$u_t \approx u_t^* \quad (3)$$

This approximation appears to be valid for all countries at all times, with the exception of Spain and Ireland during periods of very high unemployment (from the mid-1980s until the mid-1990s). The two variables are plotted against each other on Figure 1. There is a 0.972 cross-country and cross-time correlation between observed and steady-state unemployment.

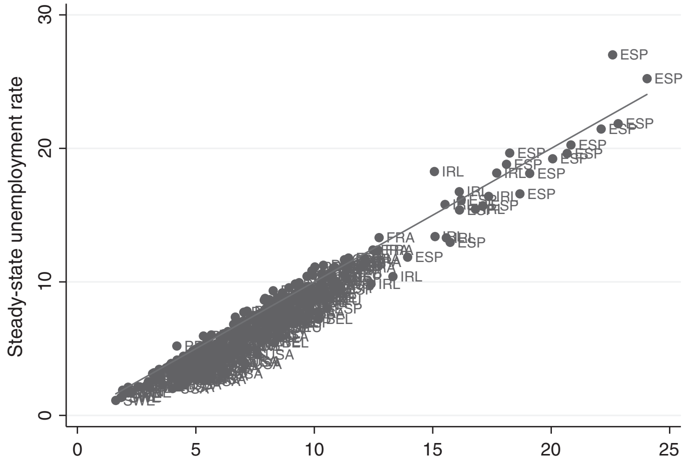

Figure 1. An approximation of the observed unemployment rate

Econometric analysis further reveals that steady-state unemployment is a linear transformation of actual unemployment with slope coefficient 1.03 and intercept −0.96. Hence, cross-country differences in actual unemployment are almost perfectly reflected by cross-country differences in steady-state unemployment, but one has to bear in mind that steady-state unemployment is on average about one percentage point lower than its observed counterpart. For instance, average steady-state unemployment is calculated at 9.8% in France between 1985 and 2010, while average unemployment equals 10.2%. The difference between steady-state and actual unemployment rates could be further explained by the way unemployment turnover rates are calculated (see below).

It follows that the relationship between the actual rate of unemployment and turnover rates can be approximated in the following way:[3]

$$u_t \approx \frac{s_t}{s_t + f_t} \tag{4}$$

2.2. How does the unemployment turnover look like across OECD countries?

Our measures of unemployment inflows and outflows are derived mainly from the OECD's Unemployment Distribution Database. This dataset provides information on the incidence of unemployment by duration: less than one month, 1 to 3 months, 3 to 6 months, 6 to 12 and over 12 months. The fraction of the labour force unemployed for less than m months is denoted by $u^{<m}$. The monthly inflow and outflow rates are calculated as proposed by Shimer (2012). In a first step, one computes the monthly probability of exiting unemployment, simply as equal to the stock of unemployed people observed during the following month, minus the number of people who have entered unemployment during the month, divided by the stock of unemployed people at the beginning of the month. In a second-step, one calculates the continuous-time equivalent outflow rate f^1 based on duration statistics, which is simply measured as:

$$f^1 = -\log\left(\frac{u_{t+1} - u_{t+1}^{<1}}{u_t}\right) \tag{5}$$

Similar continuous-time series can be obtained on the basis of unemployment duration statistics using a quarterly time span.[4] Following Shimer (2012) and Elsby *et al.* (2013a), the monthly inflow rate s^1 is then calculated from Equation (1) solved forward

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[3] Elsby *et al.* (2013) add a second-order term to this decomposition, which is neglected here. From an empirical perspective, Shimer (2012) shows that 'the job finding probability has accounted for three-quarters of the fluctuations in the unemployment rate in the United States and the employment exit probability for one-quarter'.

[4] In this case $f^3 = -\frac{1}{3}\log\left(\frac{u_{t+3} - u_{t+3}^{<3}}{u_t}\right)$.

by 12 months under the assumption that the monthly employment-exit and job-finding rates are constant within years. To lower the time aggregation bias (Elsby *et al.*, 2013a), we select monthly-based series for countries in which the outflow rate is found to decrease over time, and quarterly-based series for other countries. The existence of negative duration dependence, namely the decline in the outflow rate along the unemployment spell, may potentially yield an overestimation of the outflow rate, and the underestimation of the steady-state unemployment rate by one percentage point, as noted above. The resulting dataset is complemented by other sources, including Murtin *et al.* (2014), Murtin and Robin (2013), and is composed of 19 OECD countries for the period 1985–2010. In many ways, it is consistent with the data used in Elsby *et al.* (2013a), but covers more countries.

Table 1 reports the average unemployment and turnover for all countries over the period, while Figure 2 provides a scatter diagram of the average unemployment inflow and outflow rates by country. It can be seen: (1) that the average flow variables are strongly and positively correlated; and (2) that average worker flows are much larger in most English-speaking and Nordic countries than in other countries.[5,6]

Moreover we reported on this graph the iso-curves of steady-state unemployment, namely the values of inflow and outflow rates for which a similar steady-state unemployment rate is obtained. These lines reveal an interesting feature: labour markets characterized by similar rates of unemployment can hide very different underlying turnover dynamics. For instance, the Netherlands, Austria and Japan display more or less the same rate of (steady-state) unemployment as Norway or the United States, but the labour markets of the latter two countries witness far more turnover.

2.3. Labour market institutions

The database on unemployment turnover is complemented by a set of labour market policy and institutional variables. These series include: the initial (first-year) replacement rate of unemployment benefits; the average duration of unemployment benefits proxied by the ratio of the average (over five years) to initial replacement rates; the OECD index of employment protection for regular contracts;[7] the volume of active

[5] Moreover, there is generally a positive association between the coefficients of variation of the inflow and outflow rates. Among high-turnover countries, Nordic countries display much more volatility in unemployment turnover than English-speaking countries such as Australia, Canada, New Zealand and the United States.

[6] A closer look at the variation in inflow and outflow over time reveals diverging trends. In some countries such as Canada, Denmark, Ireland, Italy, the United Kingdom and Spain, there has been a clear upward trend in outflow rates. Conversely, there seems to have been a downward trend in outflow rates in Belgium, Japan and Portugal since the early 1990s. In the US we retained the variable from Robin (2011), who does not apply any correction to the raw series to account for a break in the CPS around 1993 as Shimer (2012) and Elsby *et al.* (2013). As a result, one still observes a downward trend after 1993.

[7] The analysis of dual labour market and the effect of employment protection for temporary contracts on unemployment goes beyond the scope of this paper.

Table 1. Descriptive statistics

	Unemployment	Inflow	Outflow	Net replacement rate	Benefits duration	EP regular contacts	ALMPs	Tax wedge	Minimum wage	Union density	Product market regulation
AUS	7.3	1.3	22.8	58.6	1.00	1.3	0.05	28.5	60.0	29.7	2.6
AUT	4.7	0.6	14.8	66.1	0.98	2.4	0.15	45.1	na	30.6	1.8
BEL	8.4	0.6	7.1	66.3	0.97	1.7	0.13	41.3	54.0	52.9	3.6
CAN	8.4	2.4	28.2	72.7	0.83	1.3	0.05	32.1	40.3	32.9	2.5
DEU	8.7	0.6	6.6	68.6	0.96	2.8	0.12	34.4	*na*	24.6	2.3
DNK	6.2	0.9	15.2	85.6	0.98	1.6	0.26	43.6	*na*	74.0	3.0
ESP	16.2	1.4	9.4	74.8	0.72	3.0	0.04	32.4	44.7	14.9	3.4
FIN	8.5	1.3	17.1	76.7	0.96	2.2	0.10	44.5	*na*	72.2	2.4
FRA	10.2	0.9	8.7	72.0	0.84	2.4	0.09	42.0	55.1	9.0	4.2
GBR	7.2	0.9	14.8	62.1	0.98	1.0	0.05	29.3	43.7	33.3	1.9
IRL	10.4	0.5	6.7	68.8	0.96	1.6	0.10	27.8	54.3	42.2	4.2
ITA	7.4	0.6	7.7	67.5	0.50	1.8	0.06	41.2	*na*	33.9	2.0
JPN	4.0	0.6	16.8	71.7	0.99	1.9	0.07	21.8	31.6	21.8	3.0
NLD	4.2	0.4	10.5	77.5	0.95	3.0	0.32	33.1	47.8	19.7	1.8
NOR	4.2	1.4	38.6	77.0	0.93	2.3	0.18	52.0	*na*	56.1	3.4
NZL	6.5	1.7	29.3	65.3	1.00	1.5	0.08	23.6	52.5	25.0	2.3
PRT	6.7	0.5	7.8	76.8	0.76	4.3	0.09	24.3	51.3	22.9	3.6
SWE	6.3	1.1	23.1	82.6	0.94	2.9	0.36	52.4	*na*	78.3	2.9
USA	5.9	1.5	44.6	56.9	0.72	0.2	0.03	23.5	35.5	13.7	2.1

Note: unemployment, unemployment turnover rates, the net replacement rate of unemployment benefits, the tax wedge and union density are expressed in per cents; benefits duration is calculated as the average replacement rate over a period of 5 years divided by the initial replacement rate; the OECD employment protection (EP) index measures the strictness of employment protection of regular contracts and it is comprised between 0 (very loose legislation) and 6 (very tight legislation); the ALMPs indicator is the volume of public spending in active labour mark et policies divided by the number of unemployed work er, divided by GDP per work er and smoothed with a Hoddrick–Prescott filter; the minimum wage is expressed as a percentage of the median wage; the OECD index of product mark et regulation is comprised between 0 (very loose regulation) and 6 (very tight regulation).

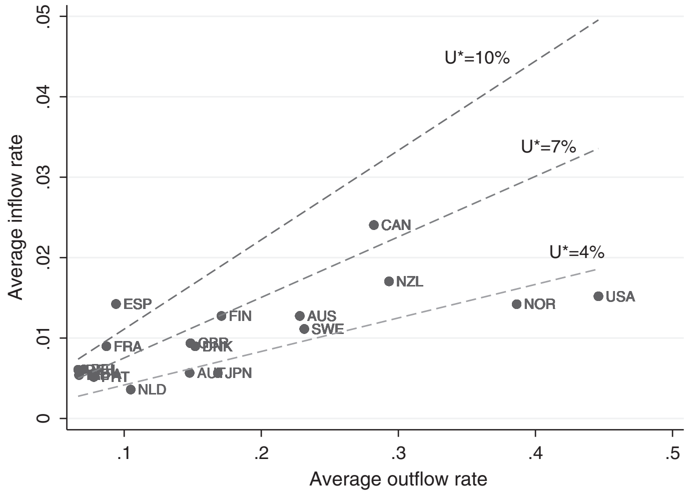

Figure 2. Average inflow and outflow rates

labour market policies per unemployed worker normalized by GDP per worker,[8] and its three main sub-components (public employment services denoted as PES, employment incentives and training); the tax wedge;[9] the OECD index of product market regulation; the share of workers that are members of a union (union density); the minimum wage as a share of the median wage.[10]

Table 1 summarizes the country averages of each institution over the period. To some extent, countries can be broadly classified according to the emphasis put on protecting employment or on providing support to the unemployed through active and passive labour market policies.

- Nordic countries combine generous unemployment benefits with strong activation measures (supported by intensive job-search assistance and training possibilities).

[8] In order to remove cyclical variations in ALMPs that result from cyclical unemployment variations, we apply a HP filter to the constructed series and use only the trend series in subsequent regressions. This procedure corrects for the endogeneity that arises from the fact that ALMP spending has traditionally been relatively insensitive to *cyclical* changes in the unemployment rate (OECD, 2009). It does not address the endogeneity problem that may arise when the variation in ALMP spending falls short of the variation in the *structural* rate of unemployment. This may be less of a problem since ALMP spending has traditionally been more responsive to changes in the structural unemployment rate. If ALMP spending nevertheless falls short of the variation in structural unemployment, this will bias the estimated impact of ALMP spending on unemployment downward.

[9] The OECD tax wedge is a summary index of labour and personal income taxes. It was preferred to a simple labour tax index as the latter series is affected by a break in the late 1990s. However, our main results are largely unaffected if we replace the tax wedge by labour taxes.

[10] We impute an average minimum wage for countries that do not display any official minimum wage and systematically introduce a dummy taking value 1 for the latter set of countries in the econometric analysis. Hence the coefficient on the minimum wage pertains to the set of countries displaying a minimum wage.

Among these countries, Sweden also provides relatively strong job protection for employees on regular contract.
- A majority of Continental European countries combine strict employment protection with fairly generous support to the unemployed, mainly in the form of passive measures such as high unemployment income replacement rates. Many of them have strengthened active labour market policies during the 2000s.
- English-speaking countries generally combine weak employment protection with low to moderate income support for the unemployed. These countries typically put very little emphasis on active labour market policies.

3. THE RELATIONSHIP BETWEEN LABOUR MARKET POLICIES AND UNEMPLOYMENT TURNOVER

In this section, we explore the theoretical and empirical relationships between labour market policies and unemployment turnover series. We first compare the predictions of two different theoretical set-ups regarding the effect of labour market reforms on unemployment level and volatility, and then we lay out the econometric framework.

3.1. Theoretical Underpinnings

Labour economists have used the job search model developed by Mortensen and Pissarides (1994, henceforth MP) as a workhorse to understand unemployment dynamics. While Shimer (2005) has shown that the initial MP model was unable to account for unemployment volatility given the small magnitude of productivity shocks, several extensions of the MP model have been proposed to solve the 'unemployment volatility puzzle'. For instance, Hall (2005) relied on wage rigidities, Hagedorn and Manovskii (2008) calibrated a very high value of non-market time while Pissarides (2009) introduced fixed matching costs. Moreover, other job search models using different wage formation set-ups, such as the one proposed by Robin (2011), have successfully captured unemployment dynamics.

Cross-country differences in labour market policies and institutions have logically been viewed as prime candidates to explain the cross-country variations in unemployment and unemployment turnover dynamics. Using the modified MP framework developed by den Haan *et al.* (2000), Jung and Kuhn (2013, henceforth JK) explain the differences in the average and the volatility of worker flows between Germany and the United States mainly from differences in matching efficiency. As another example, Murtin and Robin (2013, henceforth MR) fit the dynamics of unemployment, unemployment inflow and outflows as well as labour market tightness in nine OECD countries, and find that labour market reforms are as important as business cycle shocks to explain the dynamics of the latter variables (see Box 1).

Box 1. Labour market policies in job search theory

Following Mortensen and Pissarides' (1994) seminal contribution, a number of papers have sought to integrate labour market policies into a job search model. Ljungqvist and Sargent (2008) highlight the interaction between unemployment insurance and more frequent reallocation shocks, while Prescott (2004) and Rogerson (2007) emphasize the role of labour taxes. Cahuc and Postel-Vinay (2002) study the effects of employment protection on unemployment and its turnover, while Felbermayr and Pratt (2011) analyse the effects of product market regulation.

A stylized Mortensen-Pissarides model is helpful to identify the key parameters through which labour market policies may affect unemployment. Assume that firms pay employed workers a wage w and receive y, where y is the productivity of the match. Firms post vacancies v at a cost c until *ex ante* profits from filling a job are exhausted. Unemployed workers receive a flow payment z and search for a job. The meeting rate between job seekers and firms posting vacancies follows a Cobb–Douglas technology, so that the probability for the unemployed to find a job and exit unemployment is simply $f = \phi(v/u)^{\eta}$ and the probability for an employer to fill a vacancy is $q = f.u/v$. The number of posted vacancies is determined by the 'free-entry condition' stating that firms' *ex ante* profits are null or $-c + q.V = 0$ where V is firms' surplus in case a vacancy is filled. Total surplus is the sum of the match' surplus, namely $y - w$, and employment' surplus, namely $w - z$, and is therefore equal to $y - z$. Assuming repeated Nash bargaining over total surplus between firms and employers, firms' surplus is simply $V = \beta(y - z)$ where β stands for their bargaining power. A few algebraic manipulations yield the following expression for the outflow rate $f = \phi(\phi\beta(y - z)/c)^{\eta}$. Recalling than unemployment is given by $u = s/(s + f)$, there appear to be several channels through which labour market policies may affect unemployment: matching efficiency ϕ, the value of non-market time z, the cost of posting vacancies c, workers bargaining power β. In addition, some models (e.g. Den Haan *et al.*, 2000; Cahuc and Postel-Vinay, 2002) introduce a firing tax τ.

Murtin and Robin (2013) is to the best of our knowledge the first study looking at the effects of a large number of labour market policies on both the level and the cyclical dynamics of unemployment. They use Robin's (2011) seminal model based on endogenous job destruction. Workers differ according to their ability and yield different profits to firms when employed. In a downturn, the surplus generated by low-skill workers eventually becomes negative and they are automatically laid off. If the distribution of ability displays some thickness at its left tail, a small productivity shock is able to generate a lot of job destruction. This simple amplification mechanism provides an explanation to the 'unemployment volatility puzzle' (Shimer, 2005; Pissarides, 2009).

Their framework is complemented by the introduction of policy reforms that change the structure of the labour market. In practice, key parameters governing the dynamics of unemployment and turnover depend on a set of labour market policies. These structural parameters are the rate of exogenous job destruction (s), matching efficiency (ϕ) and the cost of posting vacancies *c*. In practice, they allow the replacement rate and ALMPs to determine job destruction and matching efficiency, with the view that these institutions determine the degree of job search intensity and eventually the quality of the matching between employers and employees. Then, they allow the tax wedge and product market regulation to determine job creation through the cost of posting vacancies, as well as the exogenous job destruction rate. The model is estimated for nine OECD countries between 1985 and 2007.

Overall, their structural model explains about two-thirds of the variance of unemployment, unemployment inflows and outflows and labour market tightness, with labour market reforms accounting for one-third and business cycle shocks for another third. The most effective labour market policy reforms, in terms of reducing steady-state unemployment, are found to be active labour market policies and product market regulation. These results are in line with those described in this study.

Table 2 reviews how labour market institutions may affect unemployment turnover dynamics according to job search theory. We consider five different channels: matching efficiency, the value of non-market time, the cost of posting a vacancy, the size of the firing tax and worker's bargaining power. The first three channels are common parameters to JK and MR frameworks. Table 2 reports the changes in the average and the volatility of the inflow and outflow rates following an increase in each of the latter structural parameters.

In each case, we compare JK's theoretical results with simulation outcomes drawn from the MR model,[11] thus considering two distinct job search apparatus. Strikingly, JK theoretical results and MR simulations are fully consistent with each other regarding average flows, but have different implications about flows volatility. Indeed, the two frameworks predict an opposite change in inflow volatility when matching efficiency or the cost of posting a vacancy are increased. Under the same circumstances, JK's simple framework does not imply any change in the

[11] We use Tables 3 and 4 in JK. The JK measure of turnover rate's volatility is the percentage deviation from steady-state caused by a productivity shock. Using a first-order approximation, the latter measure coincides in absolute value with the coefficient of variation of the turnover rate (assuming without loss of generality a standard deviation of the productivity shock equal to one). In MR simulations, the volatility measure is similarly the coefficient of variation of the turnover rate.

Table 2. Turnover dynamics in job search theory

	Inflow rate		Outflow rate	
	Mean	CV	Mean	CV
Φ matching efficiency				
JK theory	+	−	+	0
MR simulations	+	+	++	+
z value of non-market time				
JK theory	+	+	−	+
MR simulations	+	+	−−	++
c cost of posting a vacancy				
JK theory	−	+	−	0
MR simulations	−	−	−−	−−
τ firing tax				
JK theory	−	+	−	+
μ worker bargaining power				
JK theory	+ (US) − (EU)	− (US) + (EU)	−	0

Note: This Table reports the sign of the change in the average and in the coefficient of variation of unemployment flows following an increase in the various structural parameters of the models. '+/−' denote respectively an increase/decrease in turnover's mean or volatility. JK uses the Mortensen–Pissarides framework augmented for labour market institutions as described by den Haan–Ramey–Watson (2000). MR consists of a slight extension of Robin (2011). In MR simulations, the changes in structural parameters are calibrated to yield a similar absolute variation in steady-state unemployment. The largest effects observed on turnover's mean and coefficient of variation are denoted as '++' and '−−'.

Table 3. Labour market institutions and turnover dynamics 1985–2010

	Inflow rate		Outflow rate	
	Mean	CV	Mean	CV
Initial net replacement rate			−	−
Average benefits duration		−		
Active ALMP			+	+
Tax wedge	+	+		+
Existence of minimum wage		−		+
Generosity of minimum wage	+	−		
Employment protection (regular contracts)		+		
Product market regulation			−	+
Union density		−		

volatility of the outflow rate, while MR simulations imply small but non-zero changes.

The fact that the two models behave differently regarding inflow volatility is explained by the existence of workers' heterogeneity in the MR framework. In the latter model, higher matching efficiency translates into a higher share of employed

Table 4. Labour market exposure versus steady-state unemployment

	Labour Market Exposure		Steady-state Unemployment	
	All coefficients	Only significant coefficients	All coefficients	Only significant coefficients
Benchmark	5.6	5.6	7.7	7.7
In variation relative to benchmark value				
Initial replacement rate	−1.54	−1.44	1.58	1.35
Average benefits duration	0.62	−0.25	0.48	0.00
ALMPs	2.34	2.14	−1.14	−1.12
Tax wedge	4.65	5.13	0.07	1.75
Existence of minimum wage	−3.02	−3.02	0.09	0.00
Generosity of minimum wage	−1.13	−1.45	1.97	2.26
PMR	0.24	0.21	0.71	1.17
EPL regular	0.25	0.31	0.42	0.00
Union density	−0.44	−0.31	4.55	0.00

low-skill workers who generate low profits and are therefore under the threat of being laid off if economic conditions deteriorate. In other words, higher matching efficiency yields a higher inflow volatility due to a *composition effect* among employed workers. In the MP model, workers are identical and inflow volatility is inversely proportional to the outflow rate, which increases with matching efficiency (see JK, Table 3).

The mechanisms for which MP and MR provide consistent results can be briefly discussed. A higher matching efficiency yields a higher outflow rate, but from the 'free-entry condition' describing the labour market equilibrium, it also implies a lower firm's surplus, and hence a higher inflow rate. Besides, a higher value of non-market time has a large negative impact on total surplus and firm's surplus in particular, driving the outflow rate down and the inflow rate up and making them more sensitive to economic fluctuations. A higher cost of posting vacancies depresses job creation and the outflow rate but it also raises the surplus of a filled vacancy and hence reduces the inflow rate. A higher firing tax primarily lowers the inflow rate but also expected firm's surplus in equilibrium, lowering thereby the number of posted vacancies and the outflow rate, and making job positions more sensitive to fluctuations in economic conditions. Finally, a stronger worker's bargaining power reduces firm's surplus and job creation, and it has ambiguous effects on the inflow rate (see discussion in JK).

3.2. Econometric framework

The latter results derived from two distinct job search theories are helpful to examine the estimates drawn from reduced-form regressions applied to panel data. More precisely, we model the dynamics of the turnover rate x (be it the inflow or the outflow rate) as follows:

$$\begin{cases} \log x_{i,t} = \underbrace{\rho^x_{i,t}}_{persistence} \log x_{i,t-1} + \left(1 - \rho^x_{i,t}\right) . \underbrace{x^*_{i,t}}_{level} + \underbrace{\sigma_{i,t}}_{sensitivity} . Z_{i,t} + \varepsilon^x_{i,t} \\ \rho^x_{i,t} = \rho^x_0 + \sum_k \rho^x_k (X^k_{i,t}) \\ x^*_{i,t} = \alpha^x_i + \lambda^x_t + \sum_j \beta^x_j X^j_{i,t} \\ \sigma_{i,t} = \phi^x_0 + \sum_k \phi^x_k X^k_{i,t} \\ Z_{i,t} = \rho^Z_0 Z_{i,t-1} + \varepsilon^Z_{i,t} \end{cases} \tag{7}$$

where X stands for labour market policy and institutional variables and Z for a measure of business cycle conditions. In the above framework, labour market policies affect the long-term level x^* of turnover rates through parameters β, the persistence of turnover through parameters ρ and their sensitivity to business cycle shocks through parameters ϕ. As regards unemployment, the steady-state unemployment rate is determined by the (difference between) labour market coefficients (β^s, β^f), and similarly for unemployment sensitivity parameters ϕ. Regarding persistence parameters, any policy increasing either inflow or outflow persistence coefficients (ρ^s, ρ^f) is deemed to increase unemployment persistence.[12]

Our measure of business cycle shocks Z is the output gap constructed by the OECD. While it could be argued that the output gap contains some endogenous components resulting from a lower degree of labour utilization, we did not find lagged unemployment to be a negative and significant determinant of the output gap once its lagged level is controlled for. Moreover, many economic studies use a (Hodrick–Prescott filtered) output gap as an input to unemployment dynamics (e.g. Bassanini and Duval, 2009). Therefore, while we account for the fact that the output gap Z is correlated across time, we assume that its degree of persistence is independent from policy variables.[13]

Finally, policy variables are assumed to be strictly exogenous. The relaxation of the latter assumption and the instrumentation of current policies by their lagged levels in a GMM-type framework (assuming weak exogeneity) destroys the significance of all coefficients from the gap channel possibly due to weak instrumentation (i.e. coefficients ϕ), while leaving the others mostly unchanged.

The estimates are described in the Appendix, while Table 3 reports the results in a qualitative way to ease the comparison with Table 2. In practice, we raise each labour

[12] In the wake of an adverse economic shock, any policy that increases inflow or outflow persistence maintains the inflow (respectively the outflow) above (resp. below) its steady-state, hence increasing unemployment persistence as well.

[13] In practice, it is very hard to disentangle policy effects on the output gap and those influencing the transmission of the output gap to unemployment turnover rates.

market policy by one standard deviation and we calculate the resulting changes in the average turnover rates and in their coefficient of variation.[14] The sign of the change in the average and volatility is reported below.

To a large extent, the above empirical results are consistent with theoretical priors described by Table 2. First, a higher tax wedge is associated with a higher net value of non-market time, which can explain the larger inflow rate and the increased volatility of turnover rates on Table 3. Second, a higher net replacement rate and a longer duration of unemployment benefits could also be associated with a higher value of non-market time, which in principle should entail increased inflow rates and turnover volatility. However, they also lead to less intense job search by the unemployed, hence a lower degree of matching efficiency, which pulls down the outflow rate (in both MP and MR models) and turnover volatility (in MR model). While the empirical results would suggest that the latter effect dominates the non-market activity channel, the lower volatility of inflows and outflows suggested from Table 3 could also arise from demand-side factors not captured in the model, in particular the automatic stabilizing role that unemployment benefits can play.

Similarly, the existence and generosity of the minimum wage may increase the value of non-market time, as suggested by the larger average inflow rate and the higher outflow volatility. However, the lower inflow volatility depicted on Table 3 suggests that the minimum wage may also influence turnover through other channels such as (lower) matching efficiency, or demand-side effects insofar as a higher minimum wage may cushion the impact of negative productivity shocks and reduce inflow volatility.

A tighter employment protection is linked to a larger firing tax, which explains why the volatility of the inflow rate goes up on Table 3. Similarly, stringent product market regulation partly reflects the deeper involvement of the government in economic life as in France (see Table 1) and an associated larger firing cost; the latter is consistent with a lower outflow rate and a higher outflow volatility in the empirical estimates (Table 3).

Finally, a larger union density reduces inflow volatility (Table 3), which in theory is possible when workers' bargaining power is already relatively low (Table 2).

4. IS THERE A TRADE-OFF BETWEEN LABOUR MARKET EXPOSURE AND STEADY-STATE UNEMPLOYMENT?

In this section we first define and calculate the exposure of labour markets to adverse economic shocks. In a second step, we calculate the variation in steady-state unemployment after policy reforms and examine the potential existence of trade-offs between labour market exposure and steady-state unemployment among OECD

[14] Assuming log-normal distributions, the coefficient of variation of turnover rates is given by the first-order approximation $CV \approx \frac{\sigma(X)}{(1-\rho(X)^2)^{1/2}}$

countries. To that aim, we use the statistical model (7) depicted in Table 3 and the Appendix.

4.1. Assessing labour market exposure to economic shock

4.1.1. Defining labour market exposure. We define labour market exposure to adverse shocks as the average percentage deviation of (steady-state)[15] unemployment from its long-term level following an adverse shock. It is calculated as the cumulated amount of unemployment in excess of the initial unemployment level, divided by the initial unemployment rate and the duration of the transition period during which unemployment returns to equilibrium.

Our proposed definition is best illustrated on Figure 3, which depicts the evolution of (steady-state) unemployment while assuming an average value of labour market policies. At the initial period, a one standard-deviation adverse shock is hitting the labour market previously at equilibrium (i.e. zero output gap). This corresponds to a sudden trough in the output gap that gradually returns to zero. Because of labour market sluggishness, the unemployment rate does not adjust immediately to economic conditions. Actually, it takes four years to reach its maximum level (+1.3 percentage points) on the figure below, and another 6 years to close half of the way back to equilibrium, which is identical to the initial unemployment level as there is no policy change in this simulation. After 30 years, unemployment has completely returned to initial value.

More specifically, labour market exposure is defined as the average relative increase in unemployment over the reference 30-year time span. In practice, it is calculated as the cumulated amount of cyclical unemployment (i.e. the area under the curve) divided by the initial (or final) level of (steady-state) unemployment and divided by 30. In Figure 3, initial unemployment is at 7.7% and labour market exposure is equal to 5.6%, meaning that the adverse shock has increased unemployment by an average $5.6 \times 7.7 / 100 = 0.4$ percentage points over the 30-year time span.

Defined as such, labour market exposure appears to be a relative rather than absolute concept of 'unemployment at risk', in the sense that it captures the relative rather than absolute deviation in unemployment over time. This is justified by the log-linear relationship between unemployment and labour market policies, which trigger a multiplicative rather than additive effect upon unemployment. Moreover, looking at relative deviation as a volatility concept is the usual standpoint in the literature (see above). However, the final section will illustrate how our findings are modified when using an absolute concept of labour market exposure.

4.1.2. The impact of labour market policies on labour market exposure. In a second step, we redo the former simulation under different labour market policy

[15] 'Steady-state unemployment' is used here in the sense of 'flow-consistent unemployment rate' rather than 'long-term equilibrium unemployment rate'.

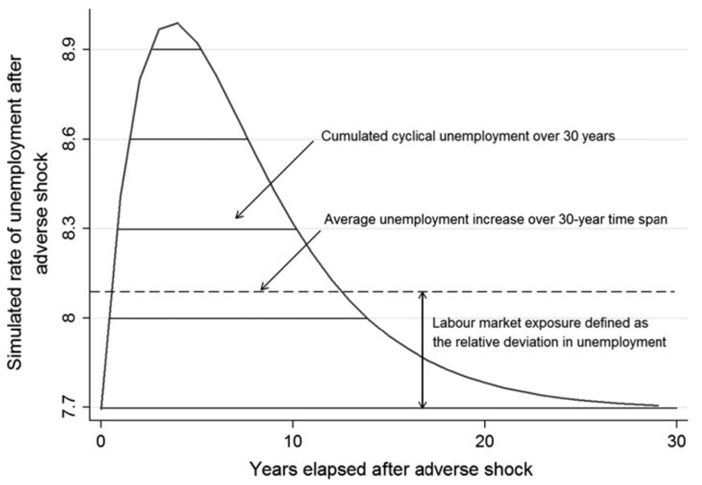

Figure 3. Unemployment dynamics in an average OECD country 1985–2010

settings. We consider an identical adverse shock across simulations, add one standard deviation to each policy separately and compare the resulting measures of labour market exposure. As policies differ across simulations, initial and final steady-state unemployment would normally differ across simulations everything else equal. To obtain the same starting values of inflows, outflows and unemployment, we do not change the value of policies in the level component, and simply allow persistence and sensitivity effects to be at play. The level effect will be examined subsequently.

To simulate the evolution of inflows, outflows and steady-state unemployment following a shock, one needs to choose a predictor, namely a statistical model. We examine two predictors. In a conservative approach, we restrict to zero the non-significant (at a 10% confidence level) coefficients of policies depicted in Table A1.[16] Alternatively, we let the data speak and keep all significant and non-significant coefficients described in Table A1, using thereby a fully unconstrained model. The latter model has pros and cons. It makes use of all available information and accounts for coefficients that were almost significant at a 10% confidence level; on the other hand, some calculated effects may rely on non-significant underlying coefficients, which may cast doubts on the calculated labour market exposure. Figure 4 describes the results obtained from the simulation with unconstrained coefficients. We also plot the benchmark with no policy change. First, four policies or institutions, namely union density, the duration of unemployment benefits, employment protection and product market regulation generate little change vis-à-vis the benchmark. These policies are therefore almost neutral in terms of labour market exposure.

Second, labour market exposure to the adverse shock largely differs across policy settings. A larger tax wedge or volume of ALMPs are associated with a larger

[16] In this case, the constants are adjusted so as to start from the same values of inflows and outflows.

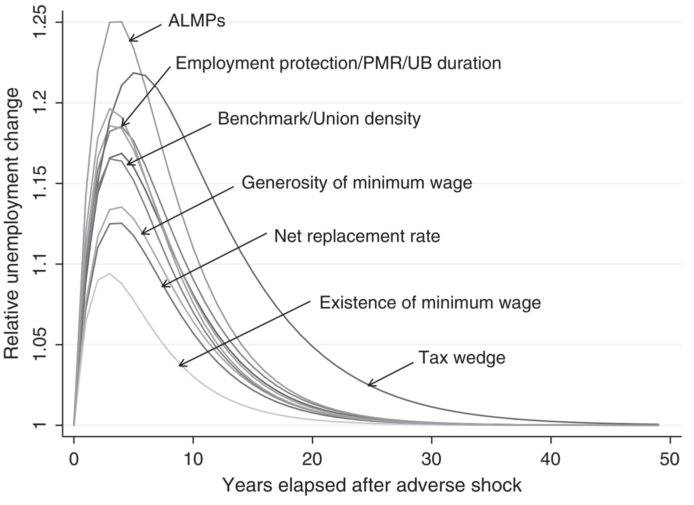

Figure 4. Labour market exposure under various institutional settings

exposure to adverse shocks. Conversely, a more generous minimum wage or replacement rate, and the existence of a minimum wage *per se* are conducive to smaller exposures. The effect of the minimum wage is explained by the lower volatility of the inflow rate, while the replacement rate affects the volatility of the outflow rate as shown on Table 2.

Notice that policies associated with a larger short-term exposure, as measured by the peak of unemployment observed within the first five years after the shock, also increase long-term exposure as defined by steady-state unemployment levels after, say, fifteen years. In other words, there does not appear to be diverging results across shorter or longer time horizons.

The first part of Table 4 summarizes the above findings on labour market exposure and examines whether they are robust to the choice of a more conservative model where only significant coefficients would be taken into consideration. Apart from the effect of unemployment benefits duration that does not display a consistent sign across the two specifications, all results are only marginally modified and can therefore be viewed as highly robust.

4.2. The impact of labour market policies on steady-state unemployment

As before, we consider a country endowed with average labour market policy settings initially at steady-state. Then, we increase each labour market policy separately by one standard deviation and calculate the new steady-state unemployment after a large number of periods have elapsed. As in the former section, we test two predictors, one with unconstrained coefficients and another with non-significant coefficients set to 0.

The second part of Table 4 reports the resulting variation in steady-state unemployment corresponding to each policy reform. As expected, increases in the replacement rate, the generosity of the minimum wage and the strictness of product market regulation are conducive to higher unemployment, while higher spending on ALMPs drives unemployment down. The effects of benefits duration, employment protection and union density are not robust to the choice of a more conservative predicting model (column 4) in contrast to the tax wedge, which recovers a positive and large effect. The introduction *per se* of a minimum wage is found to have no effect.

For each policy reform, Figure 5 displays the associated variation in labour market exposure relative to the benchmark as calculated in the previous section, with respect to the variation in steady-state unemployment described above. For this figure, the most conservative predicting model was selected (Table 4, columns 2 and 4). This graph illustrates in a simple and intuitive way whether some labour market reforms are associated with lower unemployment at the expense of higher vulnerability to economic shocks, our key economic policy issue.

Of the policy variables included in the analysis, three point to a potential trade-off between reducing the volatility of unemployment following an adverse shock and achieving low steady-state unemployment: unemployment benefits, the minimum wage and active labour market policies. The first two are found to lower unemployment persistence but at the expense of a higher long-term level. Active labour market policies have the opposite effect, that is, to lower steady-state unemployment, via a permanently increased outflow rate, but at the cost of raising persistence. Only one policy variable, the tax wedge, leads to a clear complementarity between the steady-state level and volatility of unemployment.

The generosity of unemployment benefits exerts an influence on steady-state unemployment by raising reservation wages, hence increasing the value of non-market activities. It also reduces job-search intensity and the efficiency of matching. The results reported above (Table 3 and Table A1) corroborate earlier evidence that more generous unemployment benefits raise unemployment by lowering the outflow rate.[17] Insofar as a higher net replacement rate increases the value of non-market activity, it should also raise volatility according to model predictions discussed in Section 3. We mainly attributed the negative effect of more generous benefits on unemployment persistence to the domination of another offsetting channel, namely the reduction in matching efficiency induced by weakened job search incentives. However, other factors not directly captured by the model could explain the reduced volatility. For instance, income support could play the role of automatic stabilizer, as higher replacement rates help to mitigate the propagation of adverse shocks by limiting their impact on aggregate demand.

[17] The results from Table 3 show that only the net replacement rate effect could be found as significant. Earlier evidence has shown that benefit duration has a stronger impact on the length of unemployment spells than the reduction in replacement rates (Lalive *et al.*, 2005)

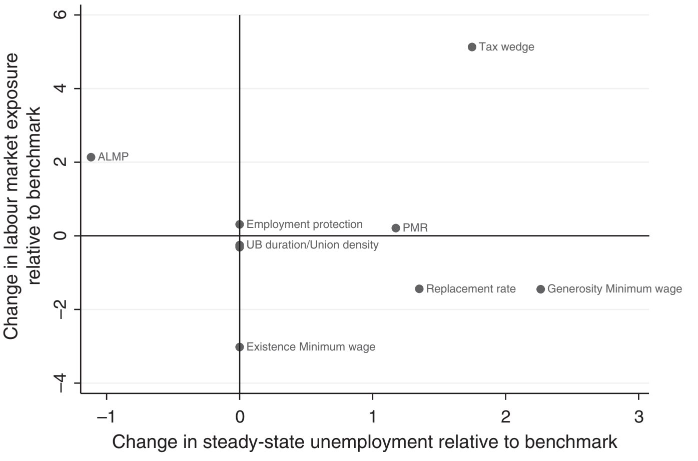

Figure 5. Labour market exposure versus steady-state unemployment

Note: Calculations are based on the statistical model with only significant coefficients as given by Table A1.

Active labour market policies are found to reduce steady-state unemployment but at a relatively high cost. For instance, taking the above results at face value, an increase in spending of around 0.4 percentage points of GDP would be required to reduce steady-state unemployment by one percentage point (Table 4, column 4). Moreover, active labour market policies may foster unemployment volatility by bringing low-skill unemployed workers back into employment, but in precarious job positions.

The third policy trade-off concerns the generosity of the minimum wage, which may result in permanently higher steady-state unemployment but lower volatility due to stabilizing demand effects during an economic downturn. Note also that the effect of the minimum wage on unemployment dynamics is presumably conditional on the magnitude of other institutional variables such as the amount of payroll taxes. For the sake of simplicity, interactions between policies have been ignored in this framework.

Finally, the results reported above illustrate the potential for reduction in the tax wedge to lower both the long-term level and volatility of unemployment in response to shocks. For instance, a reduction of around 6 percentage points in the labour tax wedge could on average induce a decline of one percentage point in unemployment (Table 4, column 4).

4.3. Labour market exposure and steady-state unemployment among OECD countries

Let us now examine how OECD countries fare both in terms of labour market exposure and steady-state unemployment. To that end, we replicate the two latter simulations at the country level. First, we calculate steady-state unemployment for each country by setting the output gap to zero and by setting each policy and institution at its country-specific average over the period. Figure 6 compares the predicted steady-state unemployment to the average observed one. The correlation is very high so that our constructed steady-states appear to be credible.

Second, we impose on each country a common adverse shock that gradually returns to zero and calculate the implied labour market exposure. As above, each policy is set at its country-specific average. Notice that each country displays its specific steady-state unemployment level, which does not mechanically inflate or reduce our measure of labour market exposure, as the latter is a relative measure normalized by the steady-state unemployment level.

Figure 7 situates OECD countries in the dual space of labour market exposure and steady-state unemployment. Strikingly, there does not appear to be any cross-country correlation between labour market exposure and steady-state unemployment.

Countries with high labour market exposure and high steady-state unemployment are Spain, France and Belgium. Conversely, countries with relatively lower steady-state unemployment level and volatility include some English-speaking countries such as Australia, the United States, the United Kingdom and New Zealand, but also Denmark, typically associated with a 'flexicurity' model of labour market. The lowest labour market exposure is observed in Finland, whose steady-state unemployment is just equal to the average of the sample.

The conclusions are barely modified when one looks at an absolute measure of labour market exposure, defined as the absolute deviation from steady-state unemployment over a 30-year time span (Figure 8). As unemployment reacts in a multiplicative way to changes in labour market policies, one observes now a positive correlation of 0.61 between steady-state unemployment and absolute labour market

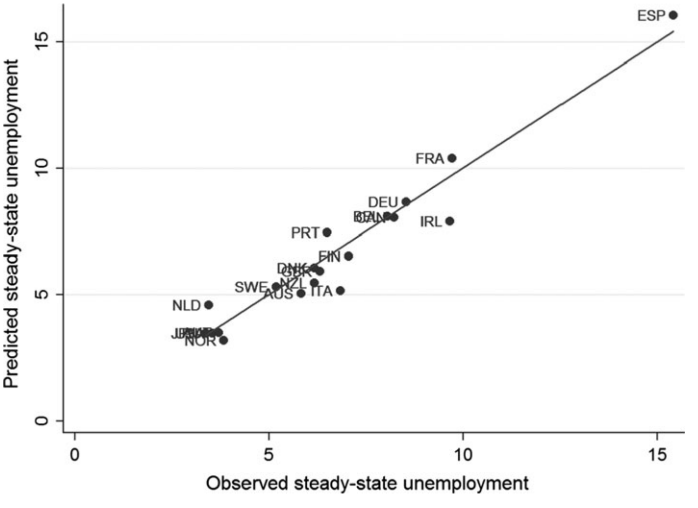

Figure 6. Predicted versus observed average steady-state unemployment

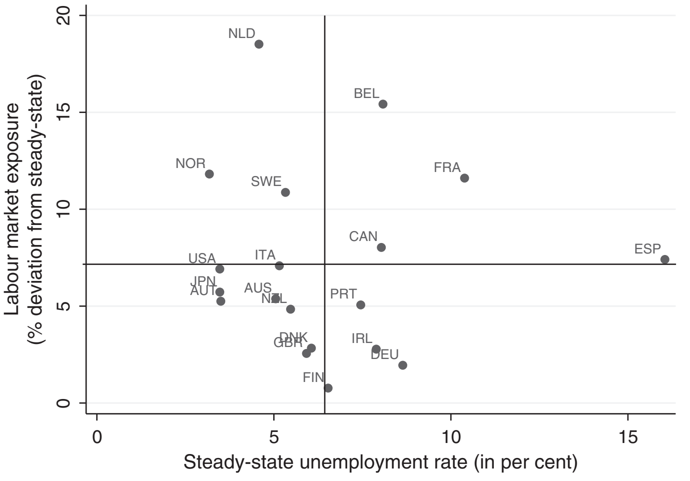

Figure 7. Labour market exposure and steady-state unemployment among OECD countries, 1985–2010

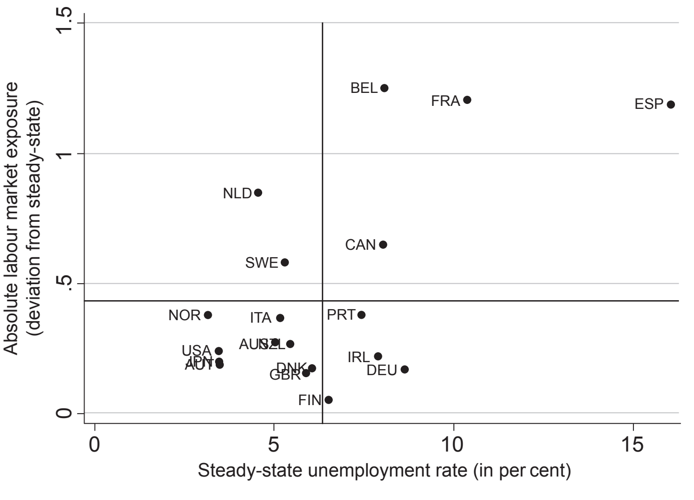

Figure 8. Absolute labour market exposure and steady-state unemployment among OECD countries

exposure. The ranking of countries is marginally modified, as Norway joins the group of countries with low unemployment level and exposure to shocks.

6. CONCLUSION

The contrasting labour market performance across countries during the Great Recession and subsequent recovery has raised the question of whether some policies that may be detrimental to employment or productivity in the long run, may nevertheless be desirable in the short run to cushion the effects of a recession. Conversely, there is a possibility that policies which are desirable in the long run might be counter-productive at a time of severe downturns, for instance by contributing to the volatility of unemployment inflow and outflow rates.

This paper has examined the vulnerability of labour markets to adverse economic shocks. Labour market exposure is defined as the average percentage deviation of (steady-state) unemployment from its long-term level following an adverse shock. The influence of labour market policies on steady-state unemployment as well as on labour market exposure is assessed through the joint estimation of inflow and outflow rates relationships for a panel of 19 countries covering annual data over the period 1985–2010 to detect possible trade-offs between labour market exposure and steady-state unemployment. The estimated effects of individual policy variables on the level and volatility of inflow and outflow rates are, by and large, found to be consistent with job search models such as Mortensen and Pissarides (1994) or Robin (2011).

We find that reducing the average net replacement rate of unemployment insurance benefits, raising spending on active labour market policies, as well as lowering minimum wages all lead to lower steady-state unemployment but a higher labour market exposure. In each case, a higher proportion of low-skilled workers are employed, but their lower productivity makes them more vulnerable to economic downturns. Conversely, reducing the tax wedge is conducive to both lower steady-state unemployment and lower labour market exposure. Other institutions such as labour and product market regulations and union density have been found to have no substantial effect on either the level or the volatility of unemployment and hence the labour market exposure.

For some policies, the evidence provides an argument for adjusting settings according to the state of the economy so as to reinforce the stabilizing (or offset the destabilizing) properties and to reduce the volatility of unemployment. In the case of the unemployment income insurance, this could mean, for instance, temporarily raising the replacement rate and extending the duration of benefits, as has been done in response to the crisis in a number of countries (e.g. Canada and the United States). This adjustment should be temporary only, as many studies have found the average length of unemployment spells to be significantly influenced by the duration of unemployment benefits through duration dependence effects, that is, where the probability of moving from unemployment to employment diminishes with the length of the jobless spell.[18]

As regards ALMPs, governments should seek to ensure that budget increases are commensurate to the increases in caseloads during a downturn so as to avoid a

[18] See Krueger and Mueller (2010) for a survey of the evidence. For example, estimates have suggested that the combined federal-state extension of benefit in the United States from an average of 26 weeks to 99 weeks (or 90 weeks on a national average) in response to the crisis could, if maintained, raise the average length of the unemployment spell by between 0.5 to 1.2 weeks (Aaronson *et al.*, 2010).

reduction in effective support when it is most needed. However, active labour market programmes involve significant budgetary costs, clearly a constraint for many countries, not least those confronted with high risk of unemployment persistence. This raises the question of the extent to which resources should be concentrated on cases that stand better chances to find a match, which in principle would argue for focusing on those with relatively short unemployment spells duration, despite the risk of deadweight loss.

Discussion

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The role of shocks and institutions in the rise of European unemployment is a classical topoi in macroeconomics (see Blanchard and Wolfers, 2000). Traditionally, the literature has focused on explaining differences in longer-run trends in unemployment across countries. But the recent crisis has urged the need to understand the causal effects of different institutional settings on short-run fluctuations in labour market turnover rates across countries as well.

The paper contributes to the literature by analysing how differences in institutions affect both the long- as well as the short-term vulnerability of labour markets across countries. It utilizes the cross-country variation in policy measures to jointly estimate the effects of less generous unemployment insurance, more active labour market policy, lower minimum wages and larger tax-wedges on average labour market turnover rates and on the persistence of these rates to adverse shocks.

For the first three policies the authors find a 'trade-off': these policies strengthen the long-run labour market performance but make the countries more vulnerable to adverse shocks. In contrast, an increase in the tax-wedge is found to weaken the long-run performance and to increase the vulnerability to short-run shocks, suggesting a 'win–win' situation for a policymaker.

The paper offers a fresh view on the interaction of shocks and institution from an empirical perspective. In my discussion I will briefly discuss the link to the theoretical literature in the first section, will express some concerns regarding the empirical implementation strategy in the second section and will put the findings into perspective from a normative viewpoint in the final section.

Link to theory

Some findings of the paper align well with existing theories of the labour market, others are more challenging from a theoretical perspective because they contradict some of the well-established channels of basic labour market search models. For example, the authors find that an increase in the generosity of the unemployment benefit system leads to a decline in the volatilities of the hiring rate. This result contrasts sharply with the standard mechanism highlighted in Hagedorn and Manovskii (2008) that an increase in the outside option also increases the outflow rate volatility (see the debate involved in solving the so-called Shimer puzzle). Moreover, as shown in Jung and Kuhn (2013) analytically, an increase in benefits would tend to increase the volatility in the inflows as well.

The authors offer the following economic rationale for their finding: less generous benefits increase the proportion of low-skilled workers in the employment pool, so an adverse shock will hit this group particularly strong and makes the labour market more vulnerable to shocks. I am somewhat sceptical that the proposed mechanism would actually deliver the suggested increase in volatility, at least in the basic work-horse model of the Mortensen–Pissarides type. Heterogeneity in worker types by itself is clearly not sufficient to overturn the basic mechanism (see Jung and Kuhn, 2010). But, as argued by the authors, standard search models do not, for example, include a demand channel which could alter the picture considerably.

If the findings are robust, the signs of the estimated coefficients would pose a considerable challenge to existing search models. But before improving the model the question arises how reliable the empirical estimates really are. Some potential pitfalls of the empirical estimation strategy are discussed below.

Empirical issues

The paper estimates the following stylized process for separation rates $s_{i,t}$ (and similarly for hiring rates) using non-linear ordinary least squares:

$$\log s_{i,t} = \rho_{i,t-1}(X_{i,t-1}) \log s_{i,t-1} + (1 - \rho_{i,t-1}(X_{i,t-1}))\alpha_i + \sum_k \beta_{i,k} Interaction(x_{i,t}, Z_{i,t}) + \varepsilon_{i,t} \quad (1)$$

where $X_{i,t}$ is a vector of institutions for country i in t and $Z_{i,t}$ is a measure of shocks. The authors suggest to use the persistence reflected in the autocorrelation function $\rho_{i,t-1}$ together with the interaction terms quantified by β_i as their preferred measure for the short−run volatility. They use the α_i as a measure of the long-run level effect.

Other than the usual critiques to reduced form regression estimates, the procedure offered in the paper has some particular problems of its own, which I shall briefly list:

1. The methodology relies on one particular measure, the OECD output gap, as summary of all shocks, and assumes that its autocorrelation is independent to changes in policy institutions. Given that the output gap measure relies on a particular filtering procedure (using information from leads) it might not be

orthogonal to changes in institutions, which makes identification using time-variation within a country a bit problematic.

2. While this problem might be minor, a more serious issue is the treatment of the labour market turnover data. Both the hiring as well as the separation rates display, in many countries, time trends, which are possibly unrelated to institutional changes (but, for example, might be due to ageing of the society). To study level and cyclical affects jointly, the authors could not use an HP-filter or other detrending methods to·filter the raw turnover data. The literature instead has typically studied differences in volatilities across countries in isolation, that is, has not attempted to jointly estimate level and volatility effects.[19] Scholars who studied the relative importance of the *ins* and *outs* in the volatility decomposition of unemployment rates have found that the variance decomposition is strongly affected by the filtering method, see Fujita and Ramey (2009). High frequency deviations ‘that are due to mismeasurement would, in the current context, likely be captured in the ρ_i coefficients, but could easily be attributed to changes in institutions as well. Similarly, I would suspect that some of the trends in the data might be correlated with some trends in institutional changes over time, without that a causal relation is given. Some caution might therefore be in order when interpreting the results.
3. The potential presence of mis-specification might be seen from the magnitudes of the estimated regression coefficients. While theory suggests that institutional differences would show up in the $\beta_{i,k}$ coefficients, all estimated interaction terms are insignificant. So most action for the cyclical variation is obtained from the autocorrelation estimates instead. Here theory provides no guidance (in fact almost all search models do not have lagged separations as a state variable, that is, $\rho_{i,t-1} = 0$, but would predict varying β instead). The estimator on ρ_i as a function of institutional differences might then pick up some noise in the data, or some trends, rather than a causal change in the institution.
4. The paper focuses on in- and outflows of unemployment, but ignores flows in and out of the labour force due to data limitations. As shown by Elsby *et al.* (2013b) these flows might matter for unemployment volatility. When interpreting their findings the authors though appeal to an argument that involves cross-country differences in the attachment to the labour force, rather than the search choice of the worker. Again, the signs on the volatility measures could be affected.
5. The regression suffers from missing variable bias, in particular the matching efficiency is likely to vary both across countries and over time (see Jung and Kuhn, 2013), which again likely affects the results. Similarly, misspecification

[19] Given the flexibility of the functional form it was unclear to me what the authors gained by estimating the level and volatilities jointly, rather than attacking the problem separately, given that they did not use parameter restrictions offered from search theory in the estimation.

might arise due to missing higher order control variables that lead to non-linear effects.[20]

The empirical identification of causal effects from institutional differences across country is a challenging task. Severe data limitations and measurement issues aside, the authors progress by offering an interesting empirical perspective on some of the cross-country correlations in labour market turnover. Yet, my discussion should have made clear that the findings might be somewhat sensitive to the particular method employed, so jumping to causal conclusions and policy advice might warrant further investigation.

I will now briefly turn to a discussion of the normative implications of the paper.

A normative perspective

Based on their empirical findings the authors argue that certain labour market policies like the generosity of the unemployment benefit system might entail a trade-off. On the one hand, a reduction in benefits might lead to long-run gains in terms of labour market performance measured by the unemployment rate; on the other hand, it might lead to an amplification of shocks in downturns. In their view this suggests that policies should be employed state−contingent, that is, unemployment benefits should be temporarily increased· in recessions while long-run reforms should be done in booms. Yet, jumping to policy conclusions without a structural model that analyses the trade-offs explicitly might be premature.

Taken their empirical finding for granted for the sake of the argument, two questions arise: first, under what conditions does a trade-off between long-run averages and volatility really exist? The authors essentially assume that an increase in the volatility is a bad thing. But this is not necessarily the case. In particular, an increase in the volatility of separations might imply a more efficient reallocation of labour and might be welfare enhancing, rather than welfare reducing. One channel, where an increase in volatility actually has negative effects, is explored in Jung and Kuester (2008) and Hairault *et al.* (2008). These papers show that an increase in the volatilities of the hiring rate might have negative feedback effects on the long-run average turnover rates with associated potential welfare losses. But the repercussion of an increased volatility on the long-run means highlighted in this strand of the literature does not necessarily imply a trade-off for any given policy reform, only a potential weakening of an otherwise positive effect. The conclusion that delaying a, by assumption, welfare-enhancing reform could be optimal in recessions cannot be drawn.

The second question that arises is, what should optimal state-contingent labour market policies actually look like? That is, under what conditions should we increase

[20] For example, in the Mortensen–Pissarides model, the interaction of shocks and institutions like union density (bargaining power) is parabolic around the Hosios condition.

the generosity of the unemployment benefit system in recessions? Views differ on this important question. For example, Landais *et al.* (2010) argue that unemployment benefits should be increased in recessions, others highlight that one should leave unemployment benefits roughly constant and rather focus on alternative policies like hiring subsidies and firing taxes, see Jung and Kuester (2014). Independent of the precise policy prescription these papers share a common approach that highlights various market frictions like moral hazard considerations or externalities that change over the cycle and might offer scope for policy improvements. How these frictions map into the reduced form estimates of changes in the persistence of unemployment rates remains an open issue.

Panel discussion

Hans-Werner Sinn asked why a policymaker should be concerned with labour market exposure in addition to the unemployment rate. Nicola Fuchs-Schündeln pointed out that the labour market exposure measure appears to be capturing the size of the initial shock and its persistence simultaneously. Would it be helpful to disentangle the two from a welfare point of view?

Fabrice Murtin clarified that from a policy perspective it is important to consider labour market exposure as it can hurt the government's budget constraint. On the joint estimation of the various equations, Murtin claimed that in contrast to the standard errors the estimates are unlikely to change. Regarding the theory, he emphasized that the core of their explanation is based on worker heterogeneity. He informed the panel that their story is verified by Robin's (2011) model. However, Murtin did accept that one could always find other theoretical models that are inconsistent with their arguments.

Although Murtin agreed with Philip Jung that lagged unemployment flows do not appear in any theory, he was keen to highlight that they are prevalent in the empirical literature. Referring to the lagged hiring/outflow rate, for instance, he said that one could think of it as a proxy for the duration of time spent in unemployment or, alternatively, as a means of gauging persistence effects. Further elaborating, Murtin posited that negative duration dependence is indicative of hysteresis effects. Moving on, Murtin thought that adopting a three-state model for verification purposes would be a good idea. Conversely, he was not convinced by Jung's flows volatility measure precisely because, as the discussant mentioned, it depends on HP filtering. Specifically, he was sceptical about what HP filtering really does – whether it eliminates structural effects or parts of the cycle which may be persistent in some countries. Lastly, with respect to welfare, Murtin stated that the persistence of unemployment (particularly long unemployment spells) is the key driver of unhappiness. He contended that this is why the flexicurity system, characterized by strong outflow rates, is particularly beneficial for welfare.

APPENDIX

ESTIMATION RESULTS

Our analysis not only examines the channels through which labour market policies and institutions have an effect (inflow versus outflow), but also reflects on the type of effects at play. We retain three types of effects: Labour market policies having an effect on the steady-state levels of inflow and outflow rates (labelled as the 'level' effect), on their degree of time persistence (the 'persistence' effect) and on the sensitivity to business cycle shocks (the 'sensitivity' effect transiting through the elasticity of the output gap). In practice, we estimate the following system where X stands for policy and institutional variables and Z for the output gap:

$$
\begin{cases}
\log s_{i,t} = \underbrace{\rho^s_{i,t}}_{persistence} \log s_{i,t-1} + \left(1-\rho^s_{i,t}\right)\left(\underbrace{\alpha^s_i + \lambda^s_t + \sum_j \beta^s_j X^j_{i,t}}_{level}\right) + \left(\underbrace{\phi^s_0 + \sum_k \phi^s_k (X^k_{i,t})}_{sensitivity}\right) Z_{i,t} + \varepsilon^s_{i,t} \\
\rho^s_{i,t} = \rho^s_0 + \sum_k \rho^s_k (X^k_{i,t}) \\
\log f_{i,t} = \rho^f_{i,t} \log f_{i,t-1} + \left(1-\rho^f_{i,t}\right) \left. \alpha^f_i + \lambda^f_t + \sum_j \beta^f_j X^j_{i,t}\right) + \left(\phi^f_0 + \sum_k \phi^f_k (X^k_{i,t})\right) Z_{i,t} + \varepsilon^f_{i,t} \\
\rho^f_{i,t} = \rho^f_0 + \sum_k \rho^f_k (X^k_{i,t}) \\
Z_{i,t} = \rho^Z_0 Z_{i,t-1} + \varepsilon^Z_{i,t}
\end{cases}
$$

The results from estimating this econometric system via non-linear ordinary least squares are reported in Table A1.

Table A1. Policy and institutional effects through various channels, 1985–2010

Dependent variable:	$\log s$			$\log f$		
Channel:	level	gap	lag	level	gap	lag
	(1)	(2)	(3)	(4)	(5)	(6)
Initial net replacement rate	0.323	−0.001	−0.019	−2.074*	−0.011*	−0.021
	(0.771)	(0.005)	(0.020)	(1.175)	(0.006)	(0.037)
Average benefits duration	−0.447	−0.002	−0.058***	−1.016	0.002	0.022
	(0.901)	(0.004)	(0.016)	(1.165)	(0.004)	(0.029)
EPL regular	−0.145	−0.008*	−0.115***	−0.205	0.000	−0.005
	(0.168)	(0.004)	(0.038)	(0.198)	(0.005)	(0.033)
Active ALMP normalised	−0.026	−0.006	−0.024	1.496**	0.016**	−0.024
	(0.634)	(0.006)	(0.041)	(0.701)	(0.007)	(0.036)
Tax wedge	0.023*	0.009	0.306***	0.024	0.007	0.157***
	(0.012)	(0.005)	(0.045)	(0.015)	(0.006)	(0.038)

Table A1. (Continued)

Dependent variable:	log *s*			log *f*		
Channel:	level	gap	lag	level	gap	lag
	(1)	(2)	(3)	(4)	(5)	(6)
Minimum wage	3.136***	0.011**	0.043	0.363	0.003	−0.007
	(1.149)	(0.005)	(0.031)	(1.651)	(0.006)	(0.034)
No minimum wage	−0.144	−0.010**	−0.145***	0.185	−0.023***	−0.121***
	(0.137)	(0.005)	(0.027)	(0.300)	(0.006)	(0.033)
Union density	0.014	0.002	−0.077*	−0.010	0.004	−0.031
	(0.011)	(0.006)	(0.042)	(0.013)	(0.007)	(0.043)
PMR	−0.048	−0.001	−0.015	−0.127*	0.011**	−0.084***
	(0.059)	(0.004)	(0.010)	(0.076)	(0.005)	(0.028)
Output gap		−0.011***			0.033***	
		(0.004)			(0.006)	
Lagged dependent variable			0.715***			0.718***
			(0.038)			(0.038)
Time effects		Yes			Yes	
Country fixed-effects		Yes			Yes	
R^2		0.96			0.97	
N		368			368	

DATA SOURCES

Unemployment, labour force, inflow and outflow rates

- **Unemployment rate:** Unemployed workers as a share of the labour force, in %. Aggregate rates refer to the 15–64 age group. *Source:* OECD Database on Labour Force Statistics; OECD, Annual Labour Force Statistics.
- **Unemployment inflow rate:** The pace at which workers become unemployed. *Source*: OECD Unemployment Distribution Database.
- **Unemployment outflow rate:** The pace at which unemployed workers leave unemployment. *Source*: OECD Unemployment Distribution Database.

Policy and institutional indicators

- **Net initial replacement rate**: average unemployment benefit replacement rate during the first year of unemployment across two income situations (100% and 67% of APW earnings) and three family situations (single, with dependent spouse, with spouse in work). *Source*: OECD, Benefits and Wages Database
- **Average replacement rate**: average unemployment benefit replacement rate across two income situations (100% and 67% of APW earnings), three family situations (single, with dependent spouse, with spouse in work) and three different unemployment durations (1st year, 2nd and 3rd years, and 4th and 5th years of unemployment). *Source*: OECD, Benefits and Wages Database.

- **Average benefits duration:** ratio of average to initial unemployment benefit replacement rate (see above). *Source*: OECD, Benefits and Wages Database.
- **Tax wedge**: Tax wedge between the labour cost to the employer and the corresponding net take-home pay of the employee.

$$\begin{aligned} \text{Tax wedge } &= 1 - (1 - TYH.R) * (1 - SSC.R) * (PGDP/PCP) \\ & 1 - (1 - TYH/(WSSS - SSC + YOTH)) \\ & * (1 - SSC/WSS) * (PGDP/PCP) \end{aligned}$$

where: *TYH*: Direct taxes on household income; *WSSS*: Compensation of employees; *SSC*: Social Security Contributions (excluding self-employed); *YOTH*: Net self-employment and property income received by households; *PGDP*: GDP price deflator; *PCP*: Private consumption price deflator. *Source*: OECD, *Economic Outlook*, No 87, May 2010 and *Revenue Statistics*, 2010.

- **PES and administration, employment incentives and training measures**: Public expenditure in labour market programmes per unemployed person divided by GDP per capita adjusted for cyclical fluctuations using a HP filter. *Source*: OECD, Employment Outlook 2010.
- **Employment protection for regular contracts**: OECD summary indicator of the stringency of employment protection legislation for regular or temporary workers. *Source*: Venn (2009).
- **Product market regulation (PMR)**: OECD summary indicator of regulatory impediments to product market competition in seven non-manufacturing industries. *Source*: Wölfl *et al.* (2009),
- **Union density**: Trade union density rate, i.e. the share of workers affiliated to a trade union, in %. *Source*: OECD, Employment Outlook 2010.
- **Minimum wage:** Ratio of minimum wage to median wage. *Source*: Employment Labour and Social Affairs Directorate Database and National sources.

Other variables

- **Output gap:** OECD measure of the gap between actual and potential output as a percentage of potential output. *Source*: OECD *Economic Outlook*, No. 87, May 2010.

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