Global Perspective on Structural Labour Market Reforms in Europe: Online Appendix

Povilas Lastauskas
University of Cambridge

Julius Stakenas
Bank of Lithuania
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4.2 Increase of Unemployment Benefits

4.2.1 Shock in Austria

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4.2.7 Shock in France

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4.2.9 Shock in Ireland

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4.3 Increase of Tax Wedge

4.3.1 Shock in Austria

4.3.2 Shock in Belgium

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Description

This document accompanies the paper “Global Perspective on Structural Labour Market Reforms in Europe” by Lastauskas and Stakenas. The report documents further labour market policies which, due to data limitations, have not been incorporated into the empirical analysis. Moreover, this document describes econometric framework, derives equilibrium wage equation, and provides details about the way impulse responses have been computed. Its major focus is on the graphs of employment variable (ln(1-u)) response in 15 countries, in case of an exogenous shock to one of the labour market policy variables (tax wedge, expenditure on active labour market policies, unemployment benefits) implemented in one of the 15 countries or in all countries at once (a regional shock). The results are based on the Model I and Model II (specified in the paper).

All shocks were implemented as a 1% permanent increase in one of the exogenous labour market variables. The graphs depict median response of employment variable (ln(1-u)) together with its 90% confidence interval based on 10000 bootstrap replications.

We also report results from an exercise that tracks a distribution of sign responses to all labour market reforms in the covered economies. Lastly, we conduct a counterfactual with and without United Kingdom in the fiscal union, and briefly compare the findings.
1 Further Notes on the Labour Market

1.1 Minimum Wage

In addition to the covered labour market institutions, European countries also varied with respect to minimum wage policies following the 2008-2009 crisis. In Estonia, the decision was taken not to increase the minimum wage. After freezing the minimum wage in 2009, Ireland introduced a €1 cut in the hourly minimum wage to €7.65 in December 2010, before going back to the previous rate in July 2011. Two countries, Hungary and Spain, increased the minimum wage, but at a rate lower than the CPI. A larger number of countries, including France, the Netherlands, Romania, Turkey, and the United Kingdom, increased the minimum wage over the period 2009-2010 more or less in line with consumer prices increases. One of the countries which went through a severe recession nonetheless increased the real minimum wage in the crisis period. The GDP growth was –18 percent in Latvia in 2009, yet, Latvia increased the minimum wage by 12.5 percent in January 2009, and 11.1 percent in January 2011. Latvian wages had increased up to April 2008 (20–30 percent in the pre-crisis period), leading the government to propose a minimum wage increase for 2009 in the autumn of 2008. However, wages in Latvia decreased in 2009 on average by 6 percent (3 percent in the private sector, and 10–20 percent for public wages). Table 1 summarises information on the changes in minimum wages across European economies.

Table 1: Alterations in Minimum Wages

<table>
<thead>
<tr>
<th>Countries</th>
<th>Nominal terms</th>
<th>Real terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>Estonia, Ireland (2009)</td>
<td>France, Netherlands, Romania, United Kingdom</td>
</tr>
<tr>
<td>Increase</td>
<td>Ireland (2011), Hungary, Spain</td>
<td>Latvia</td>
</tr>
</tbody>
</table>

1.2 Robustness Check: Panel regression of unemployment and policy variables

The following table reproduces panel regression used in the main text. We have used alternative definitions of two variables: replacement rate, instead of being drawn from the OECD, is now based on the database collected by van Vliet and Caminada (2012), and the tax wedge has been computed for a single person without children (as opposed to the benchmark definition of one earner in a married couple with two children). Results are broadly comparable with the ones reported in the paper – the only noticeable difference is the foreign output gap which is now statistically significant at 10% level.
Multiplying by $\kappa$

Rearrange the value for employed into we obtain (valid for all economies)

Start with assuming that wages are determined following Stole and Zwiebel (1996a,b) (we ignore 1.3 Derivation of Wage Equation

Adapt with the firm’s value (1) to obtain

In a steady state, the value functions are time-independent, therefore,

### Table 2: Panel regression of unemployment and alternative policy variables

<table>
<thead>
<tr>
<th>Dependent variable: $\ln u_{it}$</th>
<th>Aspatial Panel</th>
<th>Spatial Panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output gap $-0.0545^{***}$</td>
<td>$-0.0463^{***}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0103)</td>
<td>(0.0084)</td>
</tr>
<tr>
<td>Foreign output gap $-0.1140^*$</td>
<td>(0.0638)</td>
<td></td>
</tr>
<tr>
<td>Foreign $\ln u_{it}$ $0.8818^{**}$</td>
<td></td>
<td>(0.3456)</td>
</tr>
<tr>
<td>$\ln TaxWedge_{it}$ $1.5050^{***}$</td>
<td>$1.2938^{***}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.2384)</td>
<td>(0.2468)</td>
</tr>
<tr>
<td>$\ln ALMP_{it}$ $-0.3829^{***}$</td>
<td>$-0.4230^{***}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0729)</td>
<td>(0.0725)</td>
</tr>
<tr>
<td>$\ln ReplacementRate_{it}$ $0.0743$</td>
<td>$0.0949$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0909)</td>
<td>(0.0813)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.65</td>
<td>0.68</td>
</tr>
</tbody>
</table>

Note: 375 observations for 15 countries. Results with country fixed effects and time fixed effects, ranging from 1985 to 2009. The definitions of some labour market policy variables are different from the ones used in the main text: tax wedge was calculated for a single person without children and unemployment benefit replacement rate was taken from van Vliet and Caminada (2012). Constant included in both cases as is the dummy for Germany’s unification. Robust standard errors in parentheses and p-values in brackets. *, **, *** denote significance at 10%, 5% and 1% respectively.

### 1.3 Derivation of Wage Equation

Start with assuming that wages are determined following Stole and Zwiebel (1996a,b) (we ignore any country labelling),

$$
\kappa \frac{\partial J^F(h; v)}{\partial h_t} = (1 - \kappa) \left( J^E(h; v) - J_t^U \right)
$$

for all economies. Using value function for a $\varphi$–firm with $h_{it}$ workers

$$
\pi(h_{it}; v) = \max_{v_{it} \geq 0} \left\{ -\sigma(v_{it}) + x_{it} (\theta_{it}) v_{it} \frac{\partial J^E(h_{it}; \varphi)}{\partial h_{it}} \right\},
$$

we obtain (valid for all economies)

$$
\kappa \frac{\partial J^F(h_{it}; \varphi)}{\partial h_{it}} = (1 - \kappa) \left( J^E_t(h; \varphi) - J_t^U \right),
$$

$$
\kappa \frac{\partial J^F(h_{it}; \varphi)}{\partial h_t} = (1 - \kappa) \frac{\partial J^E_t(h_{it}; \varphi)}{\partial h_t},
$$

$$
\kappa \frac{\partial J^F(h_{it}; \varphi)}{\partial \varphi_t} = (1 - \kappa) \left( \frac{\partial J^E_t(h_{it}; \varphi)}{\partial \varphi_t} - \frac{\partial J_t^U}{\partial \varphi_t} \right).
$$

Rearrange the value for employed into

$$
(r + \delta) \left( \kappa \frac{\partial J^F(h_{it}; \varphi)}{\partial h_{it}} \right) = \frac{\partial J^E_t(h; \varphi)}{\partial t} + w_t(h; \varphi) + e_t(h_t) - r J_t^U + (x(\theta_t) v_t - s h_t) \kappa \frac{\partial J^F(h_{it}; \varphi)}{\partial h_{it}}.
$$

Adapt with the firm’s value (1) to obtain

$$
\left( r + \delta + s \right) \left( \kappa \frac{\partial J^F(h_{it}; \varphi)}{\partial h_{it}} \right) = \frac{\partial J^E_t(h; \varphi)}{\partial t} + w_t(h; \varphi) + e_t(h_t) - r J_t^U.
$$

Multiplying by $\kappa$ and comparing with the value function for the employed yields

$$
\kappa \left[ \frac{\partial J^E_t(h_{it}; \varphi)}{\partial \varphi_t} + \frac{\partial \pi_t(h_{it}; \varphi)}{\partial h_{it}} - \frac{\partial \sigma(v_{it})}{\partial h_{it}} \right] = (1 - \kappa) \frac{\partial J^E_t(h; \varphi)}{\partial t} + (1 - \kappa) \left[ w_t(h; \varphi) + e_t(h_t) - r J_t^U \right] .
$$

In a steady state, the value functions are time-independent, therefore,

$$
\kappa \left[ \beta \gamma \left[ 1 + I_\varphi(\varphi) \right] \left[ \frac{\partial \pi}{\partial h_{it}} \right] \right]^{1 - \beta} A \varphi^\beta h^{\gamma - 1} = \left( 1 - \kappa \right) \left[ w(h; \varphi) + e(h) - r J^U \right] ,
$$

$$
\kappa \left[ \beta \gamma \left[ 1 + I_\varphi(\varphi) \right] \left[ \frac{\partial \pi}{\partial h_{it}} \right] \right]^{1 - \beta} A \varphi^\beta h^{\gamma - 1} = \left( 1 - \kappa \right) \left[ w(h; \varphi) + e(h) - r J^U \right] ,
$$
where \( \frac{\partial \sigma(h_t; \varphi)}{\partial h_t} = \beta \gamma \left[ 1 + I_x(\varphi) \sigma^\varphi \left( \frac{\kappa}{1 - \kappa} \right)^{1 - \beta} + \frac{\partial \sigma(h_t; \varphi)}{\partial h_t} \right] \), leading to

\[
\frac{\partial w_t(h_t; \varphi)}{\partial h_t} + \frac{1}{\kappa} \frac{\partial w_t(h_t; \varphi)}{\partial \theta_t} = \left( \frac{1 - \kappa}{\kappa} \right) \left( r_{J_t} \right) - \frac{\partial \sigma(v_t)}{\partial \varphi} \right) + \Gamma_t \varphi \beta h_t \gamma^{\varphi - 2} - \frac{\partial \sigma(v_t)}{\partial \varphi} \frac{1}{\kappa},
\]

where

\[
\Gamma_t \equiv \beta \gamma \left[ 1 + I_x(\varphi) \sigma^\varphi \left( \frac{\kappa}{1 - \kappa} \right)^{1 - \beta} + \frac{\partial \sigma(h_t; \varphi)}{\partial h_t} \right] A_t A_t^\lambda \beta = \beta \gamma \Gamma(\varphi) \gamma^\beta A_t A_t^\lambda \beta.
\]

To solve the above, notice that it is written as a differential equation of the following structure

\[
w_t(h_t; \varphi) + \kappa h_t w_t'(h_t; \varphi) = \kappa p_t'(h_t; \varphi),
\]

where \( p_t'(h_t; \varphi) \equiv \left( \frac{1 - \kappa}{\kappa} \right) (r_{J_t} - e) + \Gamma_t \varphi \beta h_t \gamma^{\varphi - 1} - \frac{\partial \sigma(v_t)}{\partial \varphi} \). Let’s rearrange into

\[
w_t'(h_t; \varphi) + \frac{w_t(h_t; \varphi)}{\kappa h_t} = \frac{p_t'(h_t; \varphi)}{\kappa h_t},
\]

which is a first-order (separable) differential equation whose general solution is

\[
w_t(h_t; \varphi) = \int_0^h \exp \left( \int_0^t (\kappa h_t)^{-1} dh \right) \left( \left( \frac{1 - \kappa}{\kappa} \right) \left( r_{J_t} \right) - \frac{\partial \sigma(v_t)}{\partial \varphi} \frac{1}{\kappa} \right) dh + C.
\]

The denominator is an integrating factor, equal to

\[
\exp \left( \int_0^h (\kappa h_t)^{-1} dh \right) = \exp \left( \frac{1}{\kappa} \int_0^h dh \right) = \exp \left( \ln h_t \right) = h_t^{1/\kappa}.
\]

Plugging the relevant expressions in our case, we obtain

\[
\int_0^h \exp \left( \int_0^t (\kappa h_t)^{-1} dh \right) \left( \left( \frac{1 - \kappa}{\kappa} \right) \left( r_{J_t} \right) \right) \frac{\partial \sigma(v_t)}{\partial \varphi} \frac{1}{\kappa} \right) dh
\]

\[
= \int_0^h \frac{h_t^{1/\kappa}}{\left( \frac{1 - \kappa}{\kappa} \right) \left( r_{J_t} \right) \frac{\partial \sigma(v_t)}{\partial \varphi} \frac{1}{\kappa}} + \Gamma_t \varphi \beta h_t \gamma^{\varphi - 2} - \frac{\partial \sigma(v_t)}{\partial \varphi} \frac{1}{\kappa} \right) dh
\]

\[
= - \left( \frac{1 - \kappa}{\kappa} \right) e_t \kappa h_t^{1/\kappa} + \left( \frac{1 - \kappa}{\kappa} \right) r_{J_t} \kappa h_t^{1/\kappa} + \Gamma_t \varphi \beta h_t \gamma^{\varphi - 2} - \frac{\partial \sigma(v_t)}{\partial \varphi} \frac{1}{\kappa} \right) dh
\]

Hence,

\[
w_t(h_t; \varphi) = - \left( \frac{1 - \kappa}{\kappa} \right) e_t \kappa h_t^{1/\kappa} + \left( \frac{1 - \kappa}{\kappa} \right) r_{J_t} \kappa h_t^{1/\kappa} + \Gamma_t \varphi \beta h_t \gamma^{\varphi - 2} - \frac{\partial \sigma(v_t)}{\partial \varphi} \frac{1}{\kappa} \right) + C,
\]

where, following Hawkins and Acemoglu (2014), \( C = 0 \), and using the marginal bargaining due to Stole and Zwiebel (1996a,b) and the optimal vacancy posting yield:

\[
r_{J_t} = b_t + \theta_t x(\theta_t) \frac{\kappa}{1 - \kappa} \frac{\partial J^F(h_t; \varphi)}{\partial \theta_t} = b_t + \frac{\kappa}{1 - \kappa} \theta_t v_t^{\gamma - 1},
\]

giving

\[
w_t(h_t; \varphi) = \frac{\Gamma_t \varphi \beta h_t \gamma^{\varphi - 1} + (1 - \kappa) \left( \kappa e_t + \kappa \frac{1 - \kappa}{\kappa} \right) v_t^{\gamma - 1}}{1 - \kappa}.
\]

To finalise, one should use the optimal level of employment, and end up with a wage which is independent of the productivity shock. Namely,

\[
w_t(h_t; \varphi) = \left( b_t - e_t + \frac{\kappa}{1 - \kappa} \theta_t \right) + \kappa \left( \frac{r_{J_t} + \kappa}{1 - \kappa} \right) x_t^{\gamma - 1}
\]

\[
= \left( b_t - \theta_t + \frac{\kappa}{1 - \kappa} \theta_t \right) + \kappa \left( \frac{r_{J_t} + \kappa}{1 - \kappa} \right) \theta_t^{\gamma - 1}.
\]

The log linearised version is given by

\[
\ln w^* + \frac{1}{\kappa} \ln (w_t - w^*) = \ln \left( \left( b^* - e^* + \frac{\kappa}{1 - \kappa} \theta^* \right) + \kappa \left( \frac{r_{J_t} + \kappa}{1 - \kappa} \right) \theta_t^{\gamma - 1} \right) - \ln \left( \left( b^* - e^* + \frac{\kappa}{1 - \kappa} \theta^* \right) + \kappa \left( \frac{r_{J_t} + \kappa}{1 - \kappa} \right) \theta_t^{\gamma - 1} \right).
\]

\[\text{The first order condition of the optimal vacancy posting under linearity reads as } \frac{\partial \sigma(v_t)}{\partial \theta_t} = 1 = x(\theta_t) \frac{\partial J^F(h_t; \varphi)}{\partial h_t}.
\]

Thus, \( \nu_t = x(\theta_t) \frac{\partial J^F(h_t; \varphi)}{\partial h_t} = \sigma(v_t) \).
In the steady state, policy intervention is assumed to be absent, hence, $b^* - e^* = 0$, this gives

$$\ln w^* + \frac{1}{w^*} (w_t - w^*) = \ln \left( \frac{\kappa}{1 - \kappa} \theta^* + \kappa \left( \frac{r + \delta + s}{1 - \kappa} \right) (\theta^*)^{1-\eta} \right)$$

$$+ \frac{1}{w^*} \theta^* \kappa \left( \frac{r + \delta + s}{1 - \kappa} \right) (\theta^*)^{1-\eta} \left( b_t - e_t + \frac{\kappa}{1 - \kappa} \theta_t + \kappa \left( \frac{r + \delta + s}{1 - \kappa} \right) \theta_t^{1-\eta} = \left( \frac{\kappa}{1 - \kappa} \theta^* + \kappa \left( \frac{r + \delta + s}{1 - \kappa} \right) (\theta^*)^{1-\eta} \right) \right).$$

Since $\ln w^* = \ln \left( \frac{\kappa}{1 - \kappa} \theta^* + \kappa \left( \frac{r + \delta + s}{1 - \kappa} \right) (\theta^*)^{1-\eta} \right)$,

$$+ \frac{b_t}{w^*} - \frac{e_t}{w^*} + \frac{\kappa}{1 - \kappa} \theta^* \theta_t + \kappa \left( \frac{r + \delta + s}{1 - \kappa} \right) \frac{\theta_t^{1-\eta} - (\theta^*)^{1-\eta} (\theta^*)^{1-\eta}}{w^*}.$$

Using tilde notation,

$$\tilde{w}_t = \frac{b_t}{w^*} - \frac{e_t}{w^*} + \frac{\kappa}{1 - \kappa} \frac{\theta^* \theta_t}{w^*} + \kappa \left( \frac{r + \delta + s}{1 - \kappa} \right) \frac{(\theta^*)^{1-\eta} - \theta_t^{1-\eta}}{w^*}.$$
2 Few Details of the Econometric Framework

2.1 VARX Approach

Cointegration analysis provides a framework to incorporate economic theory and address the problem of spurious regressions among non-stationary time series. It also allows shedding light on important interrelationships among series, while reducing the risk of endogeneity bias. The VAR model with $I(1)$ exogenous variables with no deterministic components (such as intercept, trend and seasonals) is written as

$$\Delta z_t = -\Pi z_{t-1} + \sum_{i=1}^{n-1} \Gamma_i \Delta z_{t-i} + u_t$$

(2)

where $z_t = (y_t', x_t')'$, $y_t$ is the vector of endogenous variables, $x_t$ is the vector of weakly exogenous variables and $u_t = (u_{yt}, u_{xt})'$ is a vector of serially uncorrelated errors distributed independently of $x_t$ with zero mean and constant positive definite variance-covariance matrix $\Sigma$. As a rule, $\Pi = \alpha \beta'$ is the matrix of long-run coefficients and $\{\Gamma_i\}_{i=1}^{n-1}$ are the matrices of short-run coefficients. If deterministic variables were modelled, the restriction on the trend coefficient should be imposed to avoid a quadratic trend (see Pesaran, Shin, and Smith, 2000). Then, the model has been partitioned into:

$$\begin{pmatrix} \Delta y_t \\ \Delta x_t \end{pmatrix} = \begin{pmatrix} \Pi_y \\ \Pi_x \end{pmatrix} z_{t-1} + \begin{pmatrix} \Gamma_{y1} \\ \Gamma_{x1} \end{pmatrix} \Delta z_{t-1} + \begin{pmatrix} \Delta y_{t-1} \\ \Delta x_{t-1} \end{pmatrix} + \begin{pmatrix} u_{yt} \\ u_{xt} \end{pmatrix}$$

(3)

Hence, we partitioned parameter matrices $\Pi = (\Pi_y, \Pi_x)'$, $\Gamma_i = (\Gamma_{yi}, \Gamma_{xi})'$ and the error term $u_t$ conformably with $z_t = (y_t', x_t')$ as $u_t = (u_{yt}, u_{xt})'$, so that $u_{it} \sim (0, \Sigma)$, where

$$\Sigma = \begin{pmatrix} \Sigma_{yy} & \Sigma_{yx} \\ \Sigma_{xy} & \Sigma_{xx} \end{pmatrix}$$

(4)

Thus, we are able to express $u_{yt}$ conditionally on $u_{xt}$ as

$$u_{yt} = \Sigma_{yx} \Sigma_{xx}^{-1} u_{xt} + v_t$$

(5)

where $u_{it} \sim (0, \Sigma_{yy} - \Sigma_{yx} \Sigma_{xx}^{-1} \Sigma_{xy})$, and $v_t$ is uncorrelated with $u_{xt}$ by construction. For small open economies, it is reasonable to assume that $x_t$ is weakly exogenous. Substituting (4) into (3) yields

$$\begin{align*}
\Delta y_t &= -\Pi_y z_{t-1} + \sum_{i=1}^{n-1} \Gamma_{yi} \Delta z_{t-i} + \Sigma_{yx} \Sigma_{xx}^{-1} \left( \Delta x_t + \Pi_x z_{t-1} - \sum_{i=1}^{n-1} \Gamma_{xi} \Delta z_{t-i} \right) + v_t \\
&= (-\Pi_y + \Sigma_{yx} \Sigma_{xx}^{-1} \Pi_x) z_{t-1} + \sum_{i=1}^{n-1} \Gamma_{yi} - \Sigma_{yx} \Sigma_{xx}^{-1} \sum_{i=1}^{n-1} \Gamma_{xi} \Delta z_{t-i} + \sum_{i=1}^{n-1} \Gamma_{yi} \Delta z_{t-i} + v_t \\
&= -\Pi_{yy,x} x_t + \sum_{i=1}^{n-1} \Psi_i \Delta z_{t-i} + \Lambda \Delta x_t + v_t
\end{align*}$$

(6)

where $\Pi_{yy,x} \equiv \Pi_y - \Sigma_{yx} \Sigma_{xx}^{-1} \Pi_x$, $\Psi_i = \Gamma_{yi} - \Sigma_{yx} \Sigma_{xx}^{-1} \Gamma_{xi}$, $i = 1, 2, \ldots, n-1$ and $\Lambda = \Sigma_{yx} \Sigma_{xx}^{-1}$.

Assuming that the process $\{x_t\}_{t=1}^\infty$ is weakly exogenous with respect to the matrix of long-run multiplier parameters $\Pi$, i.e.,

$$\Pi_x = 0$$

(7)

so that, $\Pi_{yy,x} = \Pi_y$, the system of equations follows:

$$\begin{align*}
\Delta y_t &= -\Pi_y z_{t-1} + \sum_{i=1}^{n-1} \Psi_i \Delta z_{t-i} + \Lambda \Delta x_t + v_t \\
\Delta x_t &= \sum_{i=1}^{n-1} \Gamma_{xi} \Delta z_{t-i} + u_{xt}
\end{align*}$$

(8)

The equation for $\Delta x_t$ describes the dynamics of the weakly exogenous variables, and is referred to as marginal model. Even though the marginal model is not needed for the inference and estimation, it has to be specified for forecasting and impulse response analysis.

The cointegration rank hypothesis for the model in (8) can be stated as

$$H_r : \text{Rank} [\Pi_y] = r, \ r = 1, \ldots, m_y$$

(9)
An impulse response function measures the time profile of the effect of shocks at a given point in time. The efficient estimation of the cointegrating matrix $\beta$ is through maximum likelihood. Let $m = m_y + m_x$. If $T$ observations are available, stacking the VECM in (8) results in

$$\Delta Y = \Psi \Delta Z_{-1} - \Pi_y Z_{-1} + V$$  \hspace{1cm} (11)$$

where $\Delta Y \equiv (\Delta y_1, \ldots, \Delta y_r)$, $\Delta X \equiv (\Delta x_1, \ldots, \Delta x_T)$, $\Delta Z_{-1} \equiv (\Delta z_{1-1}, \ldots, \Delta z_{T-1})$, $i = 1, 2, \ldots, p-1$, $\Delta \Psi \equiv (\Lambda, \Psi_1, \ldots, \Psi_{p-1})$, $\Delta Z_{-1} \equiv (\Delta X', \Delta Z_{1-p}', Z_{-1} \equiv (z_0, \ldots, z_{T-1})$ and $V \equiv (v_1, \ldots, v_T)$. The log-likelihood function of the structural VECM model (11) is given by

$$l_T(\psi; r) = -\frac{m_y T}{2} \ln 2\pi - \frac{T}{2} \ln \left| \Sigma_{uv}^{-1} \right| - \frac{1}{2} \text{Trace} \left( \Sigma_{uv}^{-1} V V' \right)$$  \hspace{1cm} (12)$$

where the parameter vector $\psi$ collects together the unknown parameters in $\Sigma_{uv}$, $\Psi$ and $\Pi_y$. Concentrating out $\Sigma_{uv}$, $\Psi$ and $\Pi_y$ results in the concentrated log-likelihood function

$$l_T^c(\beta; r) = -\frac{m_y T}{2} (1 + \ln 2\pi) - \frac{T}{2} \ln \left| \hat{Y} \right| - \frac{1}{2} \text{Trace} \left( \hat{Y}^{-1} V V' \right)$$  \hspace{1cm} (13)$$

where $\hat{Y}$ and $\hat{Z}_{-1}$ are respectively the OLS residuals from regressions of $\Delta Y$ and $Z_{-1}$ on $\Delta Z_{-1}$. Defining the sample moment matrices

$$S_{YY} \equiv T^{-1} \hat{Y} \hat{Y}' \quad S_{YZ} \equiv T^{-1} \hat{Y} \hat{Z}_{-1}' \quad S_{ZZ} \equiv T^{-1} \hat{Z}_{-1} \hat{Z}_{-1}'$$  \hspace{1cm} (14)$$

the maximization of the concentrated log-likelihood function $l_T^c(\beta; r)$ of (13) reduces to the minimization of

$$S_{YY} - S_{YZ} \beta (S_{ZZ} \beta)^{-1} S_{ZY} = 0$$

where $S_{YY} = S_{ZZ}^{-1} S_{YZ}$. The solution $\hat{\beta}$ to this minimization problem, that is, the maximum likelihood (ML) estimator for $\beta$, is given by the eigenvectors corresponding to the $r$ largest eigenvalues $\hat{\lambda}_1 > \ldots > \hat{\lambda}_r > 0$ of

$$\hat{\lambda} S_{ZZ} - S_{ZY} S_{YY}^{-1} S_{YZ}$$  \hspace{1cm} (15)$$

see Johansen (1991). The ML estimator $\hat{\beta}$ is identified up to post-multiplication by an $r \times r$ non-singular matrix; that is, $r^2$ just-identifying restrictions on $\beta$ are required for exact identification. The resultant maximised concentrated log-likelihood function $l_T^c(\beta; r)$ at $\hat{\beta}$ of (13) is

$$l_T^c(\beta; r) = -\frac{m_y T}{2} (1 + \ln 2\pi) - \frac{T}{2} \ln \left| S_{YY} \right| - \frac{T}{2} \sum_{i=1}^r \ln \left| 1 - \hat{\lambda}_i \right|$$  \hspace{1cm} (16)$$

2.3 Impulse Response Analysis

An impulse response function measures the time profile of the effect of shocks at a given point in time on the (expected) future values of the variables in a dynamical system.

The GVAR literature uses the Generalised IR function to circumvent the problem of the dependence of the orthogonalised impulse responses to the ordering of the variables in the VAR.
The concept of the Generalised Impulse Response function, advanced in Koop et al. (1996) was originally intended to deal with the problem of impulse response analysis in the case of non-linear dynamical systems, but can also be readily applied to multivariate time series models such as VAR.

In the context of the VAR model, the GIRF for a system-wide shock, $u^0_t$, is defined by

$$ GI_y(s, u^0_t, \Omega^0_{t-1}) = \mathbb{E} \left( y_{t+s} | u_t = u^0_t, \Omega^0_{t-1} \right) - \mathbb{E} \left( y_{t+s} | \Omega^0_{t-1} \right) $$

(17)

where $\mathbb{E} (\cdot | \cdot)$ is the conditional mathematical expectations taken with respect to the VAR model, and $\Omega^0_{t-1}$ is a particular historical realization of the process at time $t - 1$. In the case of the VAR model having the infinite moving-average representation, i.e., $y_t = \sum_{j=0}^{\infty} A_j u_{t-j}$ where the matrices $A_j$ are determined by the recursive relations: $A_j = \Phi_1 A_{j-1} + \Phi_2 A_{j-2} + \ldots + \Phi_p A_{j-p}$, $j = 1, 2, \ldots$ and . $A_0 = I_m$, and $A_j = 0$, for $j < 0$, we have

$$ GI_y(s, u^0_t, \Omega^0_{t-1}) = A_s u^0_t $$

(18)

which is independent of the history of the process. This history invariance property of the impulse response function (also shared by the traditional methods of impulse response analysis) is, however, specific to linear systems and does not carry over to non-linear dynamic models.

As is clear, the GIRF approach does not try to identify structural shocks in a model (which given model’s dimensionality poses many potential difficulties), but instead performs a counterfactual exercise compatible with the historical structure of correlations between the shocks. Although the GIRF method would give us a response to a likely scenario in case of a change in the policy variable, we would still be unable to disentangle whether the effect is due to the shock to policy variable or due to other correlated shocks.

In our case, we were more comfortable assuming that labour market policy variables are being governed by discretionary decisions outside of our model framework instead of allowing them to change on a quarterly basis depending on current economic conditions. This effectively leads us to a GVAR model complemented by exogenous variables. Whether or not the exogeneity assumption is plausible may be a matter of discussion, but it also conveniently allows us to obtain structural exogenous shocks for labour market policy variables.

The implementation of the shocks to exogenous variables in our model is quite standard. Without loss of generality, consider the following GVAR(1) model augmented with exogenous variables:

$$ x_t = b_0 + b_1 t + F_1 x_{t-1} + G_0 y_t + G_1 y_{t-1} + \varepsilon_t, $$

(19)

where $y_t$ is an exogenous variable vector of labour market policy variables.

We use equation (19) for recursive forecasting, starting from an arbitrary time period $T$:

$$ \hat{x}_{T+h} = \hat{b}_0 + \hat{b}_1 (T + h) + \hat{F}_1 \hat{x}_{T+h-1} + \hat{G}_0 \hat{y}_{T+h} + \hat{G}_1 \hat{y}_{T+h-1}, $$

(20)

where $\hat{y}_{T+h} = y_{T+h}$ in case of a baseline scenario, and $\hat{y}_{T+h} = y_{T+h} + a$ in case of a shock scenario, where $h = 1, 2, 3, \ldots 40$. The result of the shock is the forecast difference in the two scenarios.

The magnitude of the the shock is always set to $a = \log(1.01)$. As our labour market policy variables in the model are logarithmically transformed, this translates to increasing the non-transformed variable by 1% above the baseline level during the whole forecasting period. It should be also noted that such implementation is independent of the initial level of exogenous variable vector $x_T$.

The final estimates of the shocks and the corresponding 90% error bands in our study are based on 10000 bootstrap replications. The bootstrapping procedure, adjusted for the inclusion of exogenous variables, was implemented as in Smith and Galesi (2014) with Ledoit and Wolf (2004) type correlation matrix shrinkage and resampling with replacement from the orthogonalised residuals.
3 Model I

3.1 Increase of Expenditure on Active Labour Market Policies

3.1.1 Shock in Austria

Figure 1: Response of employment due to an increase in expenditure on active labour market policies in Austria
3.1.2 Shock in Belgium

Figure 2: Response of employment due to an increase in expenditure on active labour market policies in Belgium
3.1.3 Shock in Germany

Figure 3: Response of employment due to an increase in expenditure on active labour market policies in Germany
3.1.4 Shock in Denmark

Figure 4: Response of employment due to an increase in expenditure on active labour market policies in Denmark
3.1.5 Shock in Spain

Figure 5: Response of employment due to an increase in expenditure on active labour market policies in Spain
3.1.6 Shock in Finland

Figure 6: Response of employment due to an increase in expenditure on active labour market policies in Finland
3.1.7 Shock in France

Figure 7: Response of employment due to an increase in expenditure on active labour market policies in France

Austria

Belgium

Germany

Denmark

Spain

Finland

France

Greece

Ireland

Italy

Luxembourg

Netherlands

Portugal

Sweden

United Kingdom
3.1.8 Shock in Greece

Figure 8: Response of employment due to an increase in expenditure on active labour market policies in Greece
3.1.9 Shock in Ireland

Figure 9: Response of employment due to an increase in expenditure on active labour market policies in Ireland
3.1.10 Shock in Italy

Figure 10: Response of employment due to an increase in expenditure on active labour market policies in Italy
3.1.11 Shock in Luxembourg

Figure 11: Response of employment due to an increase in expenditure on active labour market policies in Luxembourg
Figure 12: Response of employment due to an increase in expenditure on active labour market policies in Netherlands
Figure 13: Response of employment due to an increase in expenditure on active labour market policies in Portugal
3.1.14 Shock in Sweden

Figure 14: Response of employment due to an increase in expenditure on active labour market policies in Sweden
Figure 15: Response of employment due to an increase in expenditure on active labour market policies in United Kingdom

3.1.15 Shock in United Kingdom
Figure 16: Response of employment due to an increase in expenditure on active labour market policies in all of the analysed countries at once.
3.2 Increase of Unemployment Benefits

3.2.1 Shock in Austria

Figure 17: Response of employment due to an increase in unemployment benefits in Austria
3.2.2 Shock in Belgium

Figure 18: Response of employment due to an increase in unemployment benefits in Belgium
3.2.3 Shock in Germany

Figure 19: Response of employment due to an increase in unemployment benefits in Germany
3.2.4 Shock in Denmark

Figure 20: Response of employment due to an increase in unemployment benefits in Denmark
3.2.5 Shock in Spain

Figure 21: Response of employment due to an increase in unemployment benefits in Spain
3.2.6 Shock in Finland

Figure 22: Response of employment due to an increase in unemployment benefits in Finland
3.2.7 Shock in France

Figure 23: Response of employment due to an increase in unemployment benefits in France
3.2.8 Shock in Greece

Figure 24: Response of employment due to an increase in unemployment benefits in Greece
3.2.9 Shock in Ireland

Figure 25: Response of employment due to an increase in unemployment benefits in Ireland
3.2.10 Shock in Italy

Figure 26: Response of employment due to an increase in unemployment benefits in Italy
3.2.11 Shock in Luxembourg

Unemployment benefit replacement rate data in Luxembourg was not available for the whole time period, therefore, the variable was omitted from the country VAR model and the shock was not implemented.
3.2.12 Shock in Netherlands

Figure 27: Response of employment due to an increase in unemployment benefits in Netherlands
3.2.13 Shock in Portugal

Figure 28: Response of employment due to an increase in unemployment benefits in Portugal
3.2.14 Shock in Sweden

Figure 29: Response of employment due to an increase in unemployment benefits in Sweden
3.2.15 Shock in United Kingdom

Figure 30: Response of employment due to an increase in unemployment benefits in United Kingdom
3.2.16 Regional Shock

Figure 31: Response of employment due to an increase in unemployment benefits in all of the analysed countries at once
3.3 Increase of Tax Wedge

3.3.1 Shock in Austria

Figure 32: Response of employment due to an increase in tax wedge in Austria
3.3.2 Shock in Belgium

Figure 33: Response of employment due to an increase in tax wedge in Belgium
3.3.3 Shock in Germany

Figure 34: Response of employment due to an increase in tax wedge in Germany
3.3.4 Shock in Denmark

Figure 35: Response of employment due to an increase in tax wedge in Denmark
### 3.3.5 Shock in Spain

Figure 36: Response of employment due to an increase in tax wedge in Spain
3.3.6 Shock in Finland

Figure 37: Response of employment due to an increase in tax wedge in Finland
3.3.7 Shock in France

Figure 38: Response of employment due to an increase in tax wedge in France
3.3.8 Shock in Greece

Figure 39: Response of employment due to an increase in tax wedge in Greece
3.3.9 Shock in Ireland

Figure 40: Response of employment due to an increase in tax wedge in Ireland
3.3.10 Shock in Italy

Figure 41: Response of employment due to an increase in tax wedge in Italy
3.3.11 Shock in Luxembourg

Figure 42: Response of employment due to an increase in tax wedge in Luxembourg
3.3.12 Shock in Netherlands

Figure 43: Response of employment due to an increase in tax wedge in Netherlands
3.3.13 Shock in Portugal

Figure 44: Response of employment due to an increase in tax wedge in Portugal
3.3.14 Shock in Sweden

Figure 45: Response of employment due to an increase in tax wedge in Sweden
3.3.15  Shock in United Kingdom

Figure 46: Response of employment due to an increase in tax wedge in United Kingdom
3.3.16 Regional Shock

Figure 47: Response of employment due to an increase in tax wedge in all of the analysed countries at once

![Graphs showing the response of employment due to an increase in tax wedge for each country.](image-url)
4 Model II

4.1 Increase of Expenditure on Active Labour Market Policies

4.1.1 Shock in Austria

Figure 48: Response of employment due to an increase in expenditure on active labour market policies in Austria
4.1.2 Shock in Belgium

Figure 49: Response of employment due to an increase in expenditure on active labour market policies in Belgium
4.1.3 Shock in Germany

Figure 50: Response of employment due to an increase in expenditure on active labour market policies in Germany
4.1.4 Shock in Denmark

Figure 51: Response of employment due to an increase in expenditure on active labour market policies in Denmark
4.1.5 Shock in Spain

Figure 52: Response of employment due to an increase in expenditure on active labour market policies in Spain
4.1.6 Shock in Finland

Figure 53: Response of employment due to an increase in expenditure on active labour market policies in Finland
4.1.7 Shock in France

Figure 54: Response of employment due to an increase in expenditure on active labour market policies in France
4.1.8 Shock in Greece

Figure 55: Response of employment due to an increase in expenditure on active labour market policies in Greece
4.1.9 Shock in Ireland

Figure 56: Response of employment due to an increase in expenditure on active labour market policies in Ireland
4.1.10 Shock in Italy

Figure 57: Response of employment due to an increase in expenditure on active labour market policies in Italy
4.1.11 Shock in Luxembourg

Figure 58: Response of employment due to an increase in expenditure on active labour market policies in Luxembourg
Figure 59: Response of employment due to an increase in expenditure on active labour market policies in Netherlands
4.1.13 Shock in Portugal

Figure 60: Response of employment due to an increase in expenditure on active labour market policies in Portugal
4.1.14 Shock in Sweden

Figure 61: Response of employment due to an increase in expenditure on active labour market policies in Sweden
4.1.15 Shock in United Kingdom

Figure 62: Response of employment due to an increase in expenditure on active labour market policies in United Kingdom
4.1.16 Regional Shock

Figure 63: Response of employment due to an increase in expenditure on active labour market policies in all of the analysed countries at once
4.2 Increase of Unemployment Benefits

4.2.1 Shock in Austria

Figure 64: Response of employment due to an increase in unemployment benefits in Austria
4.2.2 Shock in Belgium

Figure 65: Response of employment due to an increase in unemployment benefits in Belgium
4.2.3 Shock in Germany

Figure 66: Response of employment due to an increase in unemployment benefits in Germany

[Graphs showing the response of employment for countries including Austria, Belgium, Germany, Denmark, Spain, Finland, France, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Sweden, and United Kingdom. Each graph represents the change in natural log of (1 - unemployment rate) over time (horizon in quarters).]
4.2.4 Shock in Denmark

Figure 67: Response of employment due to an increase in unemployment benefits in Denmark

Austria
Belgium
Germany
Denmark
Spain
Finland
France
Greece
Ireland
Italy
Luxembourg
Netherlands
Portugal
Sweden
United Kingdom
4.2.5 Shock in Spain

Figure 68: Response of employment due to an increase in unemployment benefits in Spain
4.2.6 Shock in Finland

Figure 69: Response of employment due to an increase in unemployment benefits in Finland
4.2.7 Shock in France

Figure 70: Response of employment due to an increase in unemployment benefits in France
4.2.8 Shock in Greece

Figure 71: Response of employment due to an increase in unemployment benefits in Greece
4.2.9 Shock in Ireland

Figure 72: Response of employment due to an increase in unemployment benefits in Ireland
4.2.10 Shock in Italy

Figure 73: Response of employment due to an increase in unemployment benefits in Italy
4.2.11 Shock in Luxembourg

Unemployment benefit replacement rate data in Luxembourg was not available for the whole time period, therefore, the variable was omitted from the country VAR model and the shock was not implemented.
4.2.12 Shock in Netherlands

Figure 74: Response of employment due to an increase in unemployment benefits in Netherlands

- Austria
- Belgium
- Germany
- Denmark
- Spain
- Finland
- France
- Greece
- Ireland
- Italy
- Luxembourg
- Netherlands
- Portugal
- Sweden
- United Kingdom
4.2.13 Shock in Portugal

Figure 75: Response of employment due to an increase in unemployment benefits in Portugal
Figure 76: Response of employment due to an increase in unemployment benefits in Sweden
4.2.15 Shock in United Kingdom

Figure 77: Response of employment due to an increase in unemployment benefits in United Kingdom
4.2.16 Regional Shock

Figure 78: Response of employment due to an increase in unemployment benefits in all of the analysed countries at once
4.3 Increase of Tax Wedge

4.3.1 Shock in Austria

Figure 79: Response of employment due to an increase in tax wedge in Austria
4.3.2 Shock in Belgium

Figure 80: Response of employment due to an increase in tax wedge in Belgium
4.3.3 Shock in Germany

Figure 81: Response of employment due to an increase in tax wedge in Germany
4.3.4 Shock in Denmark

Figure 82: Response of employment due to an increase in tax wedge in Denmark
4.3.5 Shock in Spain

Figure 83: Response of employment due to an increase in tax wedge in Spain
4.3.6 Shock in Finland

Figure 84: Response of employment due to an increase in tax wedge in Finland
4.3.7 Shock in France

Figure 85: Response of employment due to an increase in tax wedge in France
4.3.8 Shock in Greece

Figure 86: Response of employment due to an increase in tax wedge in Greece
4.3.9 Shock in Ireland

Figure 87: Response of employment due to an increase in tax wedge in Ireland
4.3.10  Shock in Italy

Figure 88: Response of employment due to an increase in tax wedge in Italy
4.3.11 Shock in Luxembourg

Figure 89: Response of employment due to an increase in tax wedge in Luxembourg
4.3.12 Shock in Netherlands

Figure 90: Response of employment due to an increase in tax wedge in Netherlands
4.3.13 Shock in Portugal

Figure 91: Response of employment due to an increase in tax wedge in Portugal
4.3.14 Shock in Sweden

Figure 92: Response of employment due to an increase in tax wedge in Sweden
4.3.15 Shock in United Kingdom

Figure 93: Response of employment due to an increase in tax wedge in United Kingdom
4.3.16 Regional Shock

Figure 94: Response of employment due to an increase in tax wedge in all of the analysed countries at once
Table 3: Distribution of the signs of impulse responses in case of a positive shock on expenditure for active labour market policies in one of the countries

<table>
<thead>
<tr>
<th>Source of a shock</th>
<th>ΔEmployment</th>
<th>ΔGDP</th>
<th>ΔOpenness</th>
<th>ΔREER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>+ 9</td>
<td>- 6</td>
<td>+ 15</td>
<td>0</td>
</tr>
<tr>
<td>Belgium</td>
<td>+ 2</td>
<td>+ 13</td>
<td>- 0</td>
<td>+ 15</td>
</tr>
<tr>
<td>Denmark</td>
<td>+ 4</td>
<td>+ 11</td>
<td>- 4</td>
<td>+ 11</td>
</tr>
<tr>
<td>Finland</td>
<td>+ 1</td>
<td>+ 14</td>
<td>0</td>
<td>+ 15</td>
</tr>
<tr>
<td>France</td>
<td>+ 1</td>
<td>+ 14</td>
<td>12</td>
<td>- 3</td>
</tr>
<tr>
<td>Germany</td>
<td>+ 11</td>
<td>- 4</td>
<td>10</td>
<td>- 5</td>
</tr>
<tr>
<td>Greece</td>
<td>+ 7</td>
<td>+ 8</td>
<td>15</td>
<td>+ 0</td>
</tr>
<tr>
<td>Ireland</td>
<td>+ 1</td>
<td>+ 14</td>
<td>0</td>
<td>+ 15</td>
</tr>
<tr>
<td>Italy</td>
<td>+ 10</td>
<td>- 5</td>
<td>15</td>
<td>+ 0</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>+ 2</td>
<td>+ 13</td>
<td>0</td>
<td>+ 15</td>
</tr>
<tr>
<td>Netherlands</td>
<td>+ 12</td>
<td>- 3</td>
<td>15</td>
<td>+ 0</td>
</tr>
<tr>
<td>Portugal</td>
<td>+ 14</td>
<td>+ 1</td>
<td>15</td>
<td>+ 0</td>
</tr>
<tr>
<td>Spain</td>
<td>+ 15</td>
<td>- 0</td>
<td>14</td>
<td>+ 1</td>
</tr>
<tr>
<td>Sweden</td>
<td>+ 0</td>
<td>+ 15</td>
<td>1</td>
<td>+ 14</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>- 10</td>
<td>5</td>
<td>4</td>
<td>+ 11</td>
</tr>
</tbody>
</table>

Note: the first column of the table indicates a country in which shock is observed. We count the cases when the shock induced positive/ negative changes in one of the variables in 15 analysed countries 10 quarters after the shock.

5 Other Extensions

5.1 Distribution of Shock Signs After 10 Periods

In this section, we perform a similar test as in the main text. However, instead of computing the distribution of signs in major macroeconomic variables, caused by changes in labour market policies, after one period has passed, we report the distribution after 10 periods. Interestingly, the fiscal union yields substantially more homogeneous responses than under a current arrangement of uncoordinated fiscal houses. All the results are reported in Tables 3-6.

5.2 Fiscal Union: With and Without the UK

In this section, we also consider a fiscal union of all European economies but the United Kingdom (UK). We compare two cases: with and without the UK undergoing labour market reforms (in both of them, all other economies are implementing the reforms). Figures report a difference in two shocks: a deviation from the benchmark with the UK and a deviation from the benchmark without the UK.

As is seen from the Figure 95, there are economies whose employment increases and decreases once the UK is included in the counterfactual of the fiscal union. For instance, the UK, the Netherlands, and Italy react more positively to changes in the active labour market policies but the story is opposite for Sweden and Spain. The difference in responses, with and without the UK, is always negative for the tax wedge and unemployment benefits, indicating that employment tends to react more negatively with the UK being a part of the regional shock. These insights are evidenced in Figure 96 and Figure 97. Notice that this exercise has been implemented using Model I.
Table 4: Distribution of the signs of impulse responses in case of a positive shock on unemployment benefits in one of the countries

<table>
<thead>
<tr>
<th>Source of a shock</th>
<th>∆Employment</th>
<th>∆GDP</th>
<th>∆Openness</th>
<th>∆REER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>3</td>
<td>12</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Belgium</td>
<td>12</td>
<td>3</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Denmark</td>
<td>14</td>
<td>1</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Finland</td>
<td>1</td>
<td>14</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>France</td>
<td>7</td>
<td>8</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Germany</td>
<td>13</td>
<td>2</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Greece</td>
<td>1</td>
<td>14</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Ireland</td>
<td>1</td>
<td>14</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>Italy</td>
<td>13</td>
<td>2</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1</td>
<td>14</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Portugal</td>
<td>14</td>
<td>1</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Spain</td>
<td>14</td>
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<td>11</td>
<td>4</td>
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<td>Sweden</td>
<td>1</td>
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<td>0</td>
<td>15</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0</td>
<td>15</td>
<td>0</td>
<td>15</td>
</tr>
</tbody>
</table>

Note: the first column of the table indicates a country in which shock is observed. We count the cases when the shock induced positive/ negative changes in one of the variables in 15 analysed countries 10 quarters after the shock.

Table 5: Distribution of the signs of impulse responses in case of a positive shock on labour tax wedge in one of the countries

<table>
<thead>
<tr>
<th>Source of a shock</th>
<th>∆Employment</th>
<th>∆GDP</th>
<th>∆Openness</th>
<th>∆REER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>12</td>
<td>3</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>Belgium</td>
<td>4</td>
<td>11</td>
<td>2</td>
<td>13</td>
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<tr>
<td>Denmark</td>
<td>14</td>
<td>1</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Finland</td>
<td>1</td>
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<td>14</td>
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<tr>
<td>France</td>
<td>14</td>
<td>1</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Germany</td>
<td>14</td>
<td>1</td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>Greece</td>
<td>2</td>
<td>13</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
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<td>15</td>
</tr>
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<td>2</td>
<td>15</td>
<td>0</td>
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<tr>
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<td>15</td>
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<td>13</td>
<td>2</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Spain</td>
<td>1</td>
<td>14</td>
<td>7</td>
<td>8</td>
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<tr>
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<td>7</td>
<td>8</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>2</td>
<td>13</td>
<td>0</td>
<td>15</td>
</tr>
</tbody>
</table>

Note: the first column of the table indicates a country in which shock is observed. We count the cases when the shock induced positive/ negative changes in one of the variables in 15 analysed countries 10 quarters after the shock.

Table 6: Distribution of the signs of a positive regional shock to one of the labour market policy variables

<table>
<thead>
<tr>
<th>Shock to</th>
<th>∆Employment</th>
<th>∆GDP</th>
<th>∆Openness</th>
<th>∆REER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenditure on ALMP</td>
<td>3</td>
<td>12</td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>Unemployment Benefits</td>
<td>2</td>
<td>13</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Labour Tax Wedge</td>
<td>12</td>
<td>3</td>
<td>14</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: we count the cases when the shock induced positive/ negative changes in one of the variables in 15 analysed countries 10 quarters after the shock.
Figure 95: Difference in Shocks to ALMP with and without the UK

Figure 96: Difference in Shocks to Unemployment Benefits with and without the UK
Figure 97: Difference in Shocks to Tax Wedge with and without the UK

References


