sciendo
Review of Economic Perspectives – Národohospodářský obzor
Vol. 23, Issue 1, 2023, pp. 47–70, DOI: 10.2478/revecp-2023-0001

Spillover effects of economic policy uncertainty on adult and youth unemployment

Silvo Dajčman[1], Alenka Kavkler[2], Natalia Levenko[3], Dejan Romih[4]

Abstract: The paper studies the effects of foreign (the US, the UK and the Chinese) and domestic economic policy uncertainty (EPU) shocks on unemployment in Germany, France, Italy and Spain. The analysis is run separately for the rates of adult and youth unemployment. Impulse responses derived from vector autoregressive models show that the magnitudes of the responses of the adult and youth segments of the labour market are quite different. Following an uncertainty shock, the youth unemployment rate increases significantly more than the adult unemployment rate. This is the case for France, Italy and Spain. The German labour market seems to be resistant to foreign (except Chinese) and domestic EPU shocks, while the remaining labour markets, foremost the Spanish and Italian ones, are susceptible to uncertainty shocks, especially to the US EPU shocks.

Keywords: Economic policy uncertainty, youth unemployment, adult unemployment, spillover effects, impulse responses

JEL Classification: E24, F62

Received: 27 September 2022 / Accepted: 3 February 2023 / Sent for Publication: 3 March 2023

1. Introduction

The outbreak of the Covid-19 pandemic was accompanied by a massive uncertainty shock to the global economy, including the countries of the euro area. One of the many negative consequences of the pandemic was that labour markets were hit hard, and one of the main culprits for this was presumably the soaring economic uncertainty. Eurostat (2021c) finds that the seasonally adjusted unemployment rate in the euro area increased from 7.4 per cent at the beginning of 2020 to 8.7 per cent in August 2020, rising by roughly one-fifth. It is notable that unemployment in the youth segment of the labour market increased by 3.3 percentage points at this time while adult unemployment increased by 1.1 percentage points.

[1] University of Maribor, Slovenia. Email: silvo.dajcman@um.si, corresponding author.
[2] University of Maribor, Slovenia. Email: alenka.kavkler@um.si.
[3] Tallinn University of Technology, Estonia, Bank of Estonia, Estonia. Email: natalia.levenko@taltech.ee.
[4] University of Maribor, Slovenia. Email: dejan.romih@um.si.

© 2023 by the authors; licensee Review of Economic Perspectives / Národohospodářský obzor, Masaryk University, Faculty of Economics and Administration, Brno, Czech Republic. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution 3.0 license, Attribution – Non Commercial – No Derivatives.

Theoretical literature in the field predicts that economic uncertainty affects labour markets negatively.[5] Substantial empirical literature corroborates the theoretical findings on the detrimental effect that uncertainty shocks have on unemployment.[6] However, neither theoretical nor empirical studies on uncertainty and unemployment distinguish between different segments of the labour market. Treating youth and adult unemployment separately is standard practice in another strand of literature, which investigates how fluctuations in the business cycle impact labour markets.[7] When analysing the dynamics of unemployment, it could also be instructive to distinguish between domestic uncertainty shocks and foreign uncertainty shocks, as foreign shocks could hurt domestic labour markets through spillover effects (Fontaine et al. 2018; Caggiano et al. 2020).[8]

This paper explores how uncertainty affects unemployment in four large euro area economies. Instead of using an aggregate indicator for unemployment, it distinguishes between the youth and adult segments of the labour market and studies them separately. Specifically, it estimates a series of country vector autoregressive models (VAR) and compares how domestic economic policy uncertainty (EPU) shocks and EPU shocks originating in the US, the UK and China, major trading partners of the EU countries, affect the youth and adult unemployment rates in Germany, France, Italy and Spain, focusing particularly on how international spillovers of uncertainty affect labour markets.

The choice of the research objects is broadly speaking size-based and Europe-focused. The four countries of interest are leading European economies with their aggregate output being around two-thirds of the EU total. USA and China, on the other hand, are the two largest world economies strongly affecting economic developments in the rest of the world. The choice of the UK is not very straightforward in this respect, but it is also a relatively large economy, a close neighbour of Germany, France, Italy and Spain, and a major trade partner for the EU, thus arguably being of importance for the dynamics of labour markets in the core European countries.

This paper makes two contributions to the literature. The first is that it takes a step forward from the previous literature on uncertainty spillovers by analysing the dynamics of unemployment in different segments of the labour market.[9] It shows that the youth segment is more vulnerable to uncertainty shocks than the adult segment. The second contribution is that it studies spillovers of uncertainty shocks into labour markets, distinguishing between foreign and domestic uncertainty. Such distinction is quite uncommon in the literature in the field. The paper shows that uncertainty shocks in the US have pronounced negative effects on the labour markets in France, Italy and Spain, while shocks in the UK

[5] For the theoretical literature, see Leduc and Liu (2016), Schaal (2017), Cacciatore and Ravenna (2021), Kandoussi and Langot (2022), Freund and Rendahl (2020).
[6] See Arpaia and Turrini (2013), Denis and Kannan (2013), Caggiano et al. (2014), Choi and Loungani (2015), Leduc and Liu (2016), Caggiano et al. (2017), Jo and Lee (2019), Oh and Picco (2020), Prüser and Schlösser (2020), Cacciatore and Ravenna (2021), Ahmed et al. (2022).
[7] See Gomez-Salvador and Leiner-Killinger (2008), Bell and Blanchflower (2011), Dietrich (2013), Dunsch (2016), Butkus and Seputiene (2019).
[8] To the best of our knowledge, studies on uncertainty spillovers affecting labour markets are limited to the papers referred to above, namely Caggiano et al. (2020) and Fontaine et al. (2018).
[9] Labour market is sometimes disaggregated into different segments in the literature on business cycles.

do not negatively affect, that is do not increase, unemployment in the observed euro area countries. The responses to domestic uncertainty shocks in these countries vary to different degrees. Germany is found to be unaffected by either domestic uncertainty shocks or foreign uncertainty shocks in the US and UK.

The rest of the paper is organised as follows. Section 2 provides a brief review of the literature on the relationship between uncertainty and unemployment, the cross-border effects of spillovers of uncertainty shocks, and different responses of youth and adult unemployment to business cycle fluctuations. Section 3 presents country VAR models and discusses the data used, Section 4 reports the results of the baseline models, Section 5 presents robustness analysis, and finally, Section 6 summarises the results and provides some policy implications of the findings.

2. Related literature

The adverse effects of uncertainty shocks on the aggregate unemployment rate can be explained by several theoretical models. If labour markets are imperfect, there should be search frictions and nominal rigidities that raise the unemployment rate in response to uncertainty shocks through two interacting mechanisms (Leduc and Liu 2016). The first mechanism is the reduction in aggregate demand that leads the business prospects of firms to deteriorate, causing them to create fewer new jobs.[10] The second one is the option-value or wait-and-see channel, the origins of which can be traced back to Bernanke (1983). Leduc and Liu (2016) note that in a labour market with search frictions, hiring decisions of firms are irreversible, particularly when coupled with nominal rigidities, leading firms to postpone new hiring.[11]

Schaal (2017) finds that the response of the unemployment rate to an uncertainty shock can be explained by the larger dispersion of productivity among firms when there is an uncertainty shock. He argues that although some firms increase hiring, total unemployment rises since the inflow to the pool of the unemployed is larger than the outflow from it. Cacciatore and Ravenna (2021) contend that an increase in the unemployment rate after an uncertainty shock can also result from the downward wage rigidity and the matching frictions in the labour market. They note that the downward wage rigidity is likely to become more binding in economic downturns than in upturns, leading to a surge in

[10] As noted in Ravn and Sterk (2017), not only higher unemployment but also greater job uncertainty induces consumers to increase precautionary saving, and this is detrimental to aggregate demand; see also Levenko (2020) for the factors behind precautionary saving and consumer behaviour. Freund and Rendahl (2020) note that this negative demand effect is coupled with a negative supply effect, which arises because households demand a higher risk premium on assets, which negatively affects their valuation, and consequently their supply.

[11] In a closely related paper, Bloom (2009) studies the impact of uncertainty shocks on output and employment rather than unemployment. His model explains that firms only make the decision to hire or fire workers when they are certain enough about their business prospects. Bloom notes that when uncertainty shocks hit the economy, firms become more reluctant to make that business decision, and in consequence employment and economic activity fall in the short term, but in the medium term they rebound as greater volatility is observed in business conditions at the firm level (″volatility overshoot″).

unemployment when the economy is hit by a recession accompanied by an increase in uncertainty.

The positive association between uncertainty shocks and the unemployment rate through the real options channel is derived from the theoretical models in Kandoussi and Langot (2022) and Freund and Rendahl (2020). As noted by Schaal (2017), uncertainty can be associated with detrimental conditions in the financial markets that open the risk premium channel. Caldara et al. (2016) show that the negative effects on the economy in general and on the labour market in particular are exacerbated if uncertainty shocks are coupled with tight financial conditions. Oh and Picco (2020) develop a model in which uncertainty shocks induce a reduction in aggregate demand and supply. In their model, firms engage in precautionary pricing, the same way as households increase their precautionary saving, meaning that they raise their prices. This results in fewer job positions and an increased risk of unemployment.

Empirical studies in the field typically investigate the relation between the aggregate unemployment rate and various measures of uncertainty. The analysis is usually done in a vector autoregressive modelling (VAR) framework.[12] Most studies find that uncertainty increases unemployment. Arpaia and Turrini (2013) estimate a linear VAR model for the euro area, for example, and find that the unemployment rate increases after EPU shocks and does not return to its initial level for two years. Caggiano et al. (2014) estimate a smooth-transition VAR model on the US data and use the Volatility Index (VIX) as a measure of uncertainty. Focusing on periods of recessions, they find that uncertainty shocks increase the unemployment rate for several quarters after a shock.

Choi and Loungani (2015) estimate a linear VAR model for the US economy and find that in response to uncertainty shocks, which are estimated from the S&P500 stock market index, the unemployment rate increases and stays at a higher level for about a year. Baker et al. (2016) use the Economic Policy Uncertainty index as a measure of uncertainty and estimate a linear panel VAR model for 12 countries. They show that uncertainty shocks result in a higher rate of unemployment. Leduc and Liu (2016) estimate a Bayesian VAR model on the US data and use the VIX index and a consumer uncertainty indicator as two measures of uncertainty. Their results show that the unemployment rate rises significantly in response to an uncertainty shock, and it stays at a higher level for a few years.

Oh and Picco (2020) use a linear VAR model to study how macroeconomic uncertainty in the US affects different macroeconomic variables, and they also find a significant increase in the unemployment rate as a result of an uncertainty shock. Prüser and Schlösser (2020) estimate a time-varying VAR and measure the effects of shocks to EPU and macroeconomic uncertainty in the US. They find that the unemployment rate increases in response to EPU shocks but they also point out that the impact is economically small.

[12] While the focus in this paper is on the association between uncertainty and unemployment, we note that several studies focus on the association between uncertainty and employment, following the seminal paper of Bloom (2009), who found on the US data that uncertainty shocks measured as stock market volatility reduce employment. The same conclusions can be drawn from Baker at al. (2016), who use EPU as a measure of uncertainty.

Jo and Lee (2019) study the sensitivity of the US labour market to macroeconomic uncertainty shocks. They find that the unemployment rate rises in response to uncertainty shocks. They show that inflows to unemployment increase and outflows decline after an uncertainty shock, supporting the aggregate demand channel as the main channel through which uncertainty affects unemployment. Ahmed et al. (2022) also study the impact of uncertainty shocks on the inflows and outflows of unemployment. They use the Granger causality analysis and find that uncertainty increases unemployment inflows and decreases unemployment outflows. Their findings are robust to alternative uncertainty measures.

The empirical literature on how cross-border spillovers of uncertainty affect unemployment is very limited.[13] Caggiano et al. (2020) study how EPU shocks in the US affected the Canadian and UK economies during the bust and boom episodes using a smooth-transition VAR model. The variables include EPU indices, an industrial production index, the aggregate unemployment rate, the inflation rate, the policy rate, and the bilateral real exchange rates between the US and Canada, and the US and the UK. They show that positive EPU shocks in the US increase the unemployment rates in both the UK and Canada and depress economic activity in general.

The study by Fontaine et al. (2018) uses VAR and smooth-transition VAR models to analyse how EPU shocks in China affect macroeconomic variables in the US, the euro area, Japan, South Korea, Brazil and Russia. The paper shows that after a shock to EPU, the unemployment rate increases in all the countries but South Korea. They also find differences in the magnitude of the responses across the countries. The unemployment rate in the euro area is found, for instance, to be less sensitive to EPU shocks in China than the unemployment rate in the US.

Differences in the dynamics of youth and adult unemployment rates are analysed in numerous business cycle studies. These studies typically find that the rate of youth unemployment is more sensitive to changes in economic activity than the rate of adult unemployment. This is asserted for example in Gomez-Salvador and Leiner-Killinger (2008), who conduct a panel study of youth unemployment for the euro area countries; Bell and Blanchflower (2011), who investigate OECD countries; and Dietrich (2013) and Butkus

[13] The literature on the effects of international spillovers of uncertainty to other domestic macroeconomic variables is more extensive. A non-exhaustive list of papers includes Colombo (2013), who studies the effects of the US EPU shocks for the euro area economy; Stockhammar and Österholm (2017), who explore the repercussions of EPU and stock market volatility shocks for economic activity in a set of small open economies; Biljanovska et al. (2021), who inspect the macroeconomic impact of EPU shocks in the US, Europe, and China for more than 60 other economies; Lee (2018), who explores the association between the US EPU and Korean currency risk; Belke and Osowski (2019), who study the macroeconomic and financial market effects of EPU shocks in the US and the euro area for a set of OECD countries; Choi and Shim (2019), who research whether the US financial uncertainty and EPU shocks impact economic activity in six emerging economies; Bhattarai et al. (2020), who study the effects of the US uncertainty shocks measured by VIX on macroeconomic and financial variables in 15 emerging countries; Nguyen et al. (2020), who study EPU spillovers from eight EU countries to the US and the other way; Cuaresma et al. (2020), who estimate international uncertainty shocks and explore their effects on macroeconomic and financial market in the G7 countries; and Nilavongse et al. (2021), who analyse foreign and domestic uncertainty shocks in four open economies.

and Seputiene (2019), who analyse a sample of European Union countries. Dunsch (2016) investigates Poland and Germany and confirms the findings for Poland.

Literature explains these empirical findings in several ways (O'Higgins 2001; Görlich et al. 2013). First, there is a greater likelihood that younger people will voluntarily leave their job in economic downturns than that adults will. Second, firms incur lower irreversible costs if they fire young workers than older ones. Third, measures of employment protection typically favour older workers (see also Pagés and Montenegro 2007). Finally, young workers represent a relatively large share of job-seekers, and so are more vulnerable as a group to reductions in new hiring. Besides these factors, institutional, demographic and economic policy features may vary across countries, and thus result in youth unemployment responding in different ways to economic fluctuations (O'Higgins 2001, 2015; Gomez-Salvador and Leiner-Killinger 2008; Bell and Blanchflower 2011; Görlich et al. 2013).

3. Methodology and data

To address the research question, we estimate vector autoregressive models (VAR) of the following form:

$$y_t = v_k + \sum_{i=1}^{p} A_i y_{t-i} + u_t,$$

where $y_t = (epu_ab_{jt}, epu_t, ipr_t, un_{xt}, hicp_t, pr_t)$ denotes the set of endogenous variables, v_k is a constant term for $k \in \{1{:}\,6\}$, p is a number of lags found with AIC where the maximum lag allowed is 12, A_i are (6×6) coefficient matrices for $i = 1, \dots, p$, and u_t is a six-dimensional white noise process.

The endogenous variables include epu_ab_{jt} as an EPU index for a specific foreign country $j = (\text{US}, \text{UK}, \text{China})$; epu_t as a domestic EPU index; ipr_t as the logarithm of the industrial production index in the domestic country; un_{xt} as the domestic unemployment rate for a specific segment of the labour market $x = (\text{youth}, \text{adult})$; $hicp_t$ as the logarithm of the domestic consumer price index; and pr_t as the policy rate. For each euro area country in the sample, we estimate 3×2 VAR models as j can take three different values and x can take two values.

The variable selection largely follows Caggiano et al. (2020) and Fontaine et al. (2018), while the use of linear VAR is in line with a large share of the empirical studies on the effects of uncertainty on unemployment (see the discussion in Section 2). All the variables are specified in levels, following Bloom (2009), Colombo (2013), Leduc and Liu (2016), and Choi and Shim (2019)[14].

In line with the vast majority of the studies in the field, the effects of foreign EPU shocks on unemployment rates in the selected euro area countries[15] are analysed using impulse response functions. Structural shocks are identified by the Cholesky decomposition. The order of variables follows Caggiano et al. (2020) and Fontaine et al. (2018). EPU of the foreign country is ordered first under the assumption that foreign EPU shocks affect

[14] See Choi and Shim (2019) for a discussion on the merits of specifying the variables in levels.
[15] The major euro area countries are investigated.

domestic EPU and other domestic variables contemporaneously. The second variable is domestic EPU, followed by the industrial production index, the unemployment rate, the price index and the policy rate.

The intuition behind the order of the variables used in this analysis is the following. Developments in the economy affect the labour market, for example, a growing economy creates new jobs and increases employment. Employees in the tight labour market have more bargaining power, thus wages increase, feeding into price increase. A policy rate comes into play when inflation becomes too high to mitigate the consequences of the overheating economy.

Because of the availability of data, the sample periods are different for the different countries in the sample. The sample period for Germany and France is 1999M1–2021M1 in all the models, for Italy it is 1999M1–2020M9 in the models for adult unemployment and 1999M1–2020M12 in the models for youth unemployment, and for Spain the sample period covers 2001M1–2021M1 in all the models.

All the EPU indices are taken from Baker et al. (2013, 2016).[16] The data for the industrial production index, the harmonised index of consumer prices (HICP) and unemployment rates are taken from Eurostat (2021a, 2021b, 2021c). Eurostat defines youth unemployment as unemployment in the population aged 15–24 years, while the unemployment statistics for the population aged 25–74 represents adult unemployment (Eurostat 2014, 2021c). The policy rate is the average monthly EONIA rate obtained from the ECB (2021)[17]. It is the same for all the countries in the sample. The industrial production index excludes construction and is calendar and seasonally adjusted. Unemployment rates are seasonally adjusted.

4. The results of the baseline model

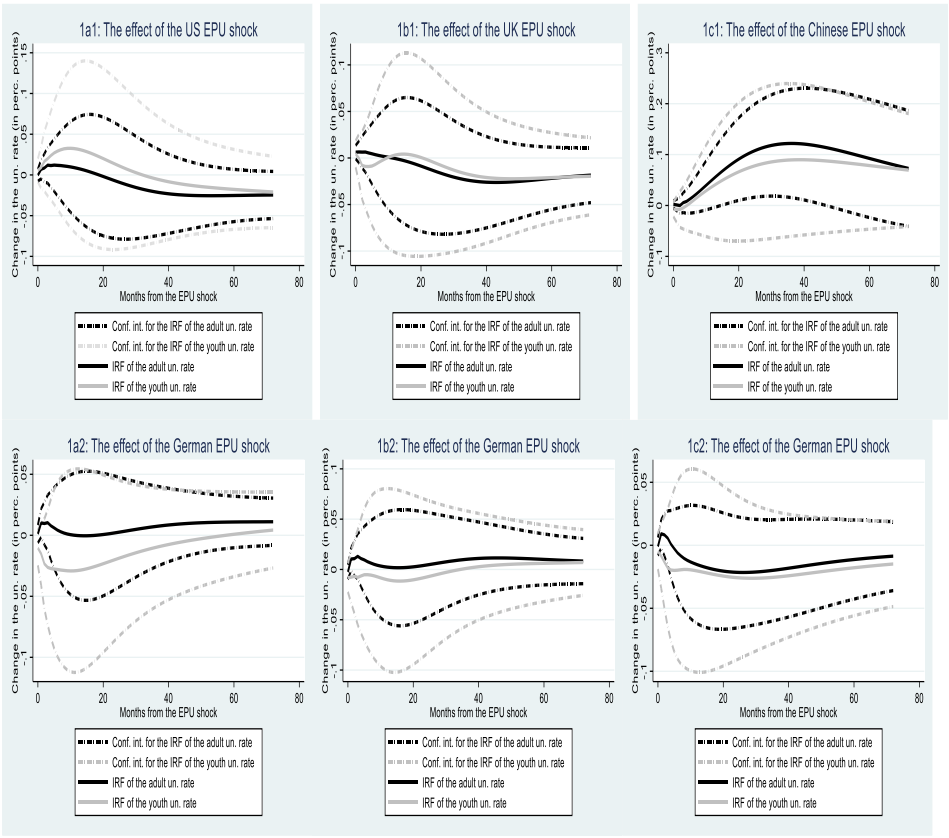
This section presents the impulse response functions (IRFs) of the adult and youth unemployment rates in Germany, France, Italy and Spain to domestic EPU shocks and EPU shocks in the US, the UK and China. Figure 1 presents the responses of the unemployment rate in two segments of the labour market in Germany to foreign EPU shocks (Figures 1a1, 1b1, 1c1) and a domestic EPU shock (Figures 1a2, 1b2, 1c2). The EPU shocks in the US and China result in a short-term rise in unemployment rates in Germany, but the responses of the unemployment rates to foreign EPU shocks, except for the adult unemployment rate response to Chinese EPU shock, are not statistically significant. Similarly,

[16] All the EPU indices are taken from the website https://www.policyuncertainty.com. The EPU index for the US is the overall policy-related economic uncertainty index denoted as ″Three Component Index″; the EPU index for the UK is the ″Monthly UK EPU index″; the EPU index for China is the ″EPU Index Based on the South China Morning Post″; and the EPU indices for Germany, France, Italy and Spain are denoted as ″News Index″. See Baker et al. (2013, 2016) and the website https://www.policyuncertainty.com on how the indices are computed based on the frequency of economic policy uncertainty occurrence hits in the newspapers.

[17] EONIA is suggested by Giannone et al. (2019) as a proxy for the European Central Bank monetary policy rate.

the shocks to domestic EPU do not significantly affect either adult or youth unemployment rates in Germany.

Figure 1: Response of the unemployment rates in Germany to foreign and domestic EPU shocks

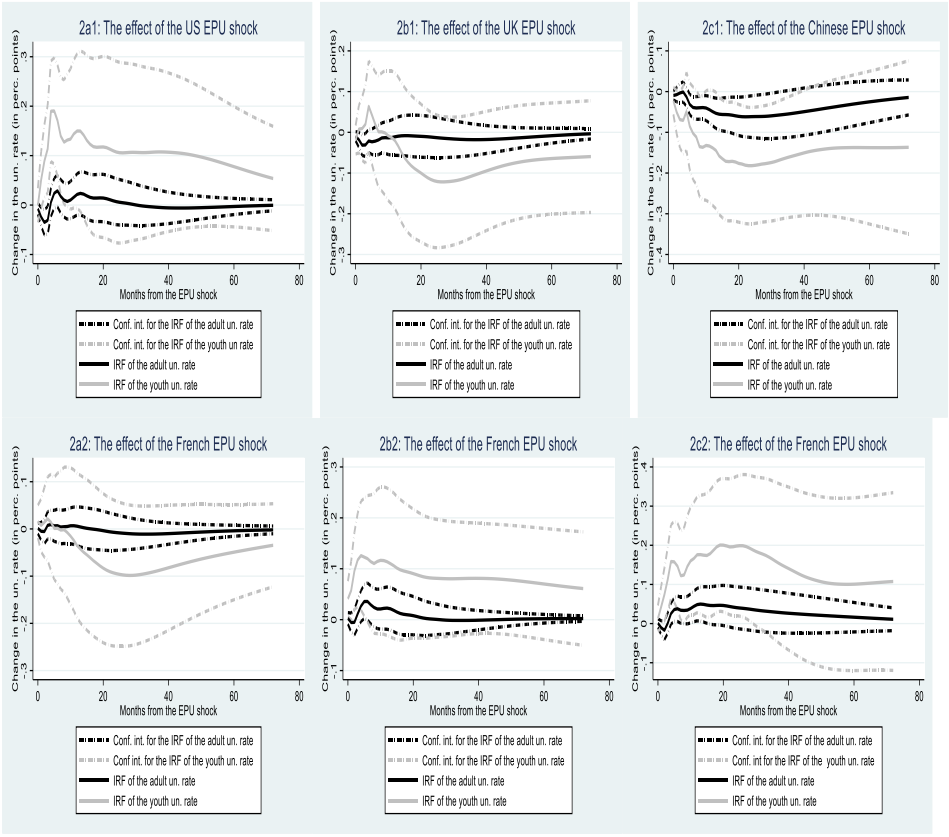


Notes: The figure presents the orthogonal impulse responses and the 95 per cent confidence intervals. Figures 1a1, 1b1 and 1c1 draw the responses of the adult and youth unemployment rates in Germany to EPU shocks in the US, the UK, and China respectively over a period of 72 months after a shock. The impulse responses are estimated from the VAR model specified on p. 6. Figures1a2, 1b2 and 1c2 show the responses of the unemployment rates in Germany to domestic EPU shocks. Note that the responses presented in figure 1a2 are based on the estimates of the same VAR model as the responses presented in figure 1a1, the responses in 1b2 are based on the estimates of the same VAR model as the responses presented in figure 1b1, and the responses in 1c2 come from the same model as the responses in figure 1c1.

The responses of the unemployment rates in France to foreign and domestic EPU shocks are presented in Figure 2. In contrast to those in Germany, more responses are statistically significant. Foreign EPU shocks, particularly the US and Chinese ones, are important for the dynamics of the unemployment rate in France. The EPU shock in the US (figure 2a1) is detrimental to the youth segment of the labour market in France. More precisely, the youth unemployment rate increases by around 0.2 percentage points a few months after

the shock and then declines gradually. Interestingly, the EPU shock in the US does not have a negative impact on (i.e. does not result in the increase of) the adult unemployment rate in France, which even falls slightly by around 0.03 percentage points in the three months after the shock. The same applies to the response of the adult unemployment rate in France to the EPU shock in the UK. The EPU shock in China is not bad news for the labour market in France, as the uncertainty shock is followed by a reduction in both unemployment rates. The response of the youth unemployment rate is much larger than that of the adult unemployment rate, indicating that the youth segment of the labour market is more sensitive than the adult segment to increased EPU in China.

Figure 2: Response of the unemployment rates in France to foreign and domestic EPU shocks



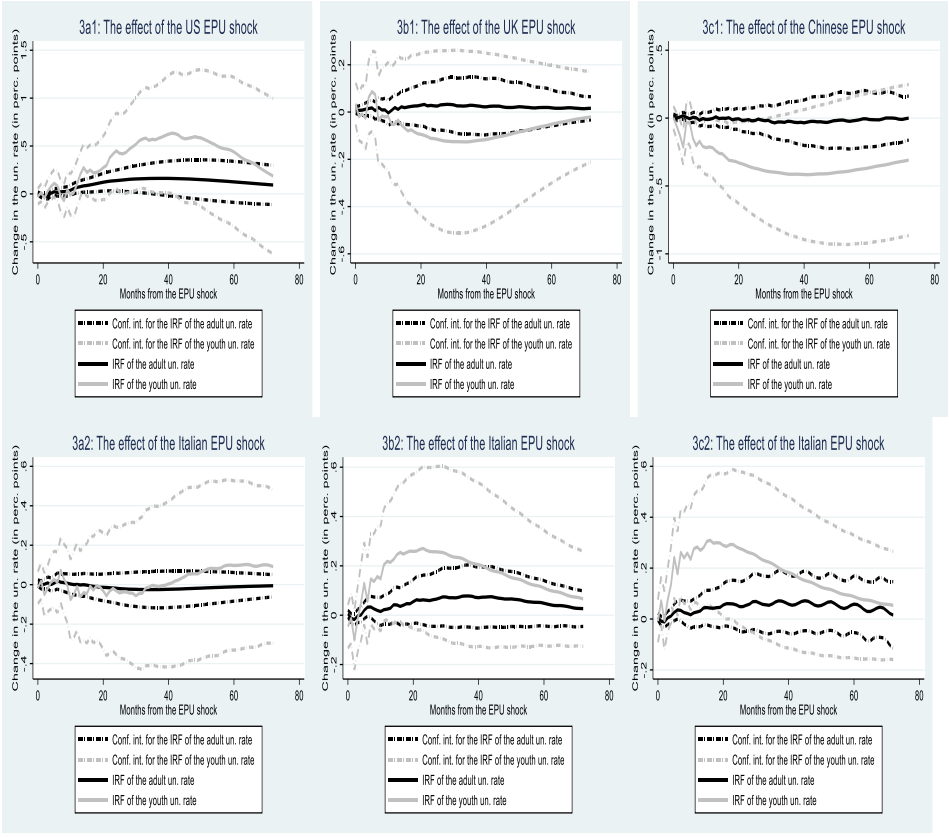
Notes: See notes to Figure 1.

Figures 2a2, 2b2 and 2c2 show the responses of the unemployment rates in France to domestic EPU shocks. The impulse responses in figure 2a2 show that in the model with the US EPU, the shock to EPU in France has no (statistically significant) detrimental effect on either the adult or the youth unemployment rate. This is not the case in the models with the UK and Chinese EPU. Figure 2b2 shows that in the model with the UK EPU, the shock to domestic EPU leads to a temporary jump in the rate of youth unemployment, which increases by some 0.1 percentage points in the four months after the

shock. This is similar to the response of the youth unemployment rate to the domestic EPU shock in the model with the Chinese EPU (figure 2c2).

The responses of the unemployment rates in Italy to the EPU shocks are shown in Figure 3. The EPU shock in the US apparently provokes significant spikes in the adult and youth unemployment rates in Italy, which increase by about 0.2 percentage points and about 0.6 percentage points respectively in around three years following the shock. While the EPU shock in the UK does not seem to produce any significant impact on the unemployment rates in Italy, the EPU shock in China reduces the youth unemployment rate by approximately 0.4 percentage points in the 29 months after a shock. The response of the unemployment rates in Italy to the domestic EPU shock is that the youth unemployment rate rises, but only in the model with the Chinese EPU (figure 3c2).

Figure 3: Response of the unemployment rates in Italy to foreign and domestic EPU shocks

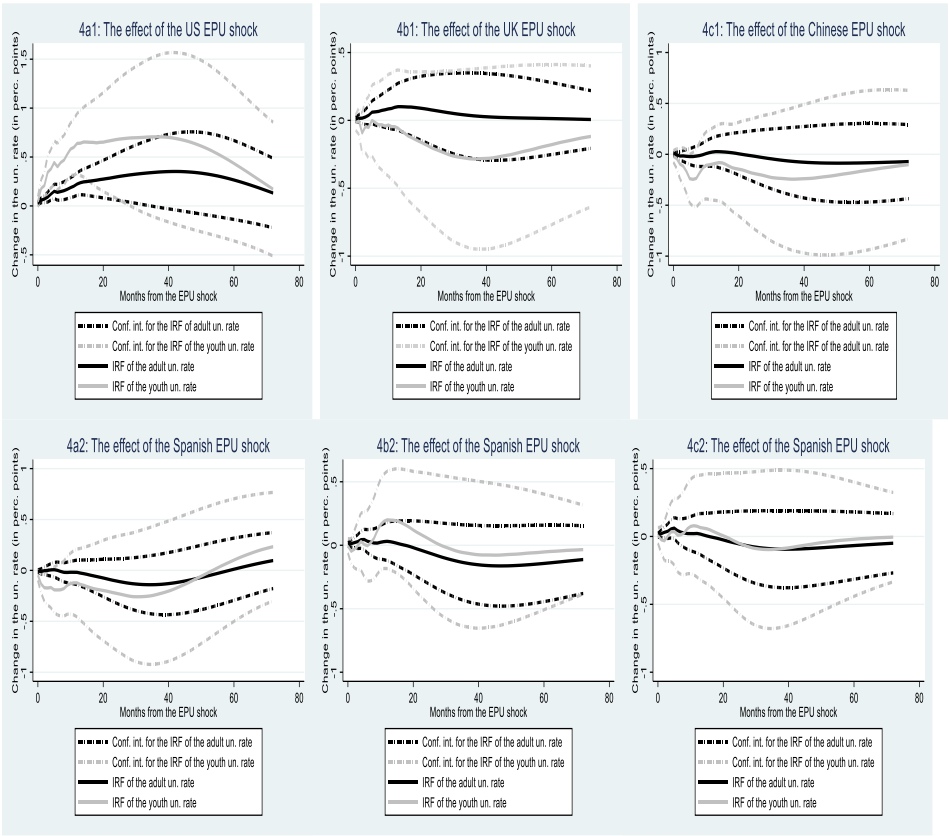


Notes: See notes to Figure 1.

Figure 4 presents the responses of the Spanish labour market to foreign EPU shocks. The EPU shock in the US affects both the adult and youth unemployment rates in Spain. The adult rate rises by about 0.3 percentage points in the 34 months after the shock, while the youth rate rises by about 0.7 percentage points in 28 months. The EPU shocks in the UK and China have no negative effect on the unemployment rates in Spain. Figures 4a2, 4b2

and 4c2 show the responses of the unemployment rates to domestic EPU shocks. A statistically significant response from the youth unemployment rate is captured only by the model with the US EPU. The youth unemployment rate falls by about 0.2 percentage points in three months after a domestic EPU shock.

Figure 4: Response of the unemployment rates in Spain to foreign and domestic EPU shocks



Notes: See notes to Figure 1.

5. Robustness analysis

We perform two robustness tests. In the first, we follow the practice of e.g. Dennis and Kannan (2013), Caggiano et al. (2014), Choi and Loungani (2015), Fontaine et al. (2018), and Caggiano et al. (2020), and put the foreign and domestic uncertainty in the penultimate and last places after all other domestic variables, implying that EPU index can respond to the developments in the economy. In this way, we get more conservative estimates of the effects of foreign EPU shocks on the unemployment rate (Choi and Loungani,

2015). The order of the remaining variables is kept the same as in the baseline model. The optimal lag length is chosen using the AIC criteria.[18]

The results of the first robustness analysis are presented in figures A1–A4 in Appendix A. We find that the baseline specification is largely robust to the alternative ordering of the variables. More precisely, we observe that the responses of the unemployment rates in Germany to foreign EPU shocks remain as in the baseline model, but in contrast to the baseline, there is a statistically significant short-term rise in the adult unemployment rate in response to the domestic EPU shock in the models with the UK EPU (figure A1b2) and Chinese EPU (figure A1c2).

Most of the findings for France are also robust. However, we find that when we use the alternative ordering of the variables, the EPU shock in the US does not yield a significant response for the adult unemployment rate in France and the response of the youth unemployment rate becomes more moderate. Furthermore, the EPU shock in the UK does not have a significant impact on the adult unemployment rate in France, unlike in the baseline model. We should also note that the response of the youth unemployment rate to the domestic EPU shock becomes insignificant in the VAR model for France with the UK EPU.

For Italy, we find that the alternative specification reduces the effect of the EPU shock in the US on both unemployment rates in Italy, and the peak of the impulse response is reached earlier than in the baseline model. We also find that the effect of the domestic EPU shock on youth unemployment is reduced in the model with Chinese EPU. The alternative specification of the Spanish models affects only the responses of the youth unemployment rate to the domestic EPU shock in the model with the US EPU.

The second robustness test is performed by changing the lag structure of the baseline model. Following Baker et al. (2016), we set $p = 3$ for all the models. The results are presented in Figures B1–B3 in Appendix B. Note that since the AIC of the baseline VAR models for Germany yielded three lags as the optimum, the results for Germany are the same as in the baseline model, and so their presentation is not repeated. While there are some differences from the baseline model, we find that the results are fairly robust to this alternative specification.

6. Discussion and conclusions

We have used structural VAR models to study the transmission of domestic EPU shocks and EPU shocks in the US, the UK and China to the labour markets in Germany, France, Italy and Spain. Several important findings emerge when the responses of the unemployment rates in different labour market segments to the uncertainty shocks are compared. In line with Caggiano et al. (2020), we find that uncertainty shocks in the US are the most important for fluctuations in the unemployment rates in the sample countries. We find lesser sensitivity to the UK and Chinese EPU shocks.[19] We also find that for unemployment foreign EPU shocks are more relevant than domestic EPU shocks.

[18] The results for AIC criteria are available on request.

[19] This is in contradiction to the findings in Fontaine et al. (2018), who show detrimental international effects of EPU shocks in China.

We find that the responses of the unemployment rates to the EPU shocks are country-specific, which corroborates the results of Fontaine et al. (2018). The German labour market seems to be fairly immune to both foreign and domestic EPU shocks except for Chinese ones, meaning that there is no significant increase in the unemployment rates in response to shocks in EPU. This is not the case for France, Italy and Spain, as the EPU shocks in the US lead to an increase in the unemployment rates in these countries. It should be noted, however, that the unemployment rates in Spain and Italy are more responsive to foreign EPU shocks than those in France. The heterogeneity between the countries in the sample could, as noted in the literature, be explained at least to some extent by differences in their labour market institutional frameworks, demographic characteristics and economic policy features (see e.g. O'Higgins 2001, 2015; Gomez-Salvador and Leiner-Killinger 2008; Bell and Blanchflower 2011; Görlich et al. 2013).

The main contribution of the paper is that it distinguishes between adult and youth unemployment and shows that the sensitivities of these two segments of the labour market to EPU shocks are different. The paper presents evidence that the youth segment of the labour market in France, Italy and Spain is much more sensitive to foreign EPU shocks than the adult segment. The response of the youth unemployment rate is larger than that of the adult unemployment rate. Our findings supplement the existing empirical evidence in Gomez-Salvador and Leiner-Killinger (2008), Bell and Blanchflower (2011), Dietrich (2013), Dunsch (2016), and Butkus and Seputiene (2019), who find that the youth segment of the labour market is more vulnerable to negative shocks than the total unemployment.

The results of the paper have important policy implications. First, as unemployment is expected to rise if there is an EPU shock in the US, policy-makers should monitor this indicator carefully in order to take preventive measures. Second, policy measures that are intended to offset the negative effect of an uncertainty shock on labour markets should be quick and strong, as jumps in the unemployment rate fade quite quickly, but the jumps in youth unemployment are large in magnitude. Finally, since the labour market in Germany seems to be fairly well protected against EPU shocks, its institutional structure might be considered as a model for other countries.

Acknowledgements: The authors would like to thank Karsten Staehr for very useful comments.

Funding: This research has been financially supported by the Slovenia Research Agency (research core funding P5-0023 (A) and BI-EE/20-22-005).

Disclosure statement: The views expressed are those of the authors and not necessarily those of the Bank of Estonia or the Eurosystem.

References

Ahmed, A., Granberg, M., Troster, V., & Uddin, G. S. (2022). Asymmetric Dynamics Between Uncertainty and Unemployment Flows in the United States. *Studies in Nonlinear Dynamics & Econometrics*, 26(1): 155–172. https://doi.org/10.1515/snde-2019-0058

Arpaia, A., & Turrini A. (2013). Policy-related uncertainty and the euro-zone labour market. ECFIN Economic Brief, Issue 24, June 2013.

Baker S., Bloom N., Davis S. J., & Wang X. (2013). Economic Policy Uncertainty in China. Unpublished paper, University of Chicago.

Baker S. R., Bloom N., & Davis, S. J. (2016). Measuring Economic Policy Uncertainty. *The Quarterly Journal of Economics*, 131(4): 1593–1636. https://doi.org/10.1093/qje/qjw024

Bell, D. N. F., & Blanchflower, D. G. (2011). Young people and the Great Recession. *Oxford Review of Economic Policy*, 27(2): 241–267. https://doi.org/10.1093/oxrep/grr011

Belke, A., & Osowski, T. (2019). International Effects of Euro Area versus U.S. Policy Uncertainty: A FAVAR Approach. *Economic Inquiry*, 57(1): 453–481. https://doi.org/10.1111/ecin.12701

Bernanke, B. S. (1983). Irreversibility, Uncertainty, and Cyclical Investment. *The Quarterly Journal of Economics*, 98(1): 85–106. https://doi.org/10.2307/1885568

Bhattarai S., Chatterjee A., & Park, W. Y. (2020). Global Spillover Effects of US Uncertainty. *Journal of Monetary Economics*, 114: 71–89. https://doi.org/10.1016/j.jmoneco.2019.05.008

Biljanovska, N., Grigoli, F., & Hengge, M. (2021). Fear Thy Neighbor: Spillovers from Economic Policy Uncertainty. *Review of International Economics*, 29(2): 409–438. https://doi.org/10.1111/roie.12531

Bloom N. (2009). The Impact of Uncertainty Shocks. *Econometrica*, 77(3): 623–685. https://doi.org/10.3982/ECTA6248

Butkus M., & Seputiene, J. (2019). The Output Gap and Youth Unemployment: An Analysis Based on Okun's Law. E*conomies*, 2019, 7(4): 1–17.

Cacciatore, M., & Ravenna, F. (2021). Uncertainty, Wages and the Business Cycle. *The Economic Journal*, 131(639): 2797–2823.

Caggiano G., Castelnuovo, E., & Groshenny, N. (2014). Uncertainty shocks and unemployment dynamics in U.S. recession. *Journal of Monetary Economics*, 67: 78–92. https://doi.org/10.1016/j.jmoneco.2014.07.006

Caggiano, G., Castelnuovo, E., & Figueres, J. M. (2017). Economic policy uncertainty and unemployment in the United States: A nonlinear approach. *Economics Letters*, 151: 31–34. https://doi.org/10.1016/j.econlet.2016.12.002

Caggiano, G., Castelnuovo, E., & Figueres, J. M. (2020). Economic Policy Uncertainty Spillovers in Booms and Busts. *Oxford Bulletin of Economics and Statistics*, 82(1): 125–155. https://doi.org/10.1111/obes.12323

Caldara, D., Fuentes-Albero, C., Gilchrist, S., & Zakrajsek, E. (2016). The macroeconomic impact of financial and uncertainty shocks. *European Economic Review*, 88: 185–207. https://doi.org/10.1016/j.euroecorev.2016.02.020

Choi, S., & Loungani, P. (2015). Uncertainty and Unemployment: The Effects of Aggregate and Sectoral Channels. *Journal of Macroeconomics*, 46: 344–358. https://doi.org/10.1016/j.jmacro.2015.10.007

Choi, S., & Shim, M. (2019). Financial vs. Policy Uncertainty in Emerging Market Economies. *Open Economies Review*, 30(2): 297–318. https://doi.org/10.1007/s11079-018-9509-9

Colombo, V. 2013. Economic policy uncertainty in the US: Does it matter for the Euro area? *Economics Letters*, 121(1): 39–42. https://doi.org/10.1016/j.econlet.2013.06.024

Cuaresma, J. C., Huber, F., & Onorante, L. (2020). Fragility and the effect of international uncertainty shocks. *Journal of International Money and Finance*, 108: 1–15.

Denis, S., & Kannan, P. (2013). The Impact of Uncertainty Shocks on the UK Economy. IMF Working Paper WP/13/66, International Monetary Fund.

Dietrich, H. (2013). Youth unemployment in the period 2001–2010 and the European crisis – looking at the empirical evidence. *Transfer: European Review of Labour and Research*, 19(3): 305–324. https://doi.org/10.1177/1024258913495147

Dunsch, S. (2016). Okun' Law and Youth Unemployment in Germany and Poland. *International Journal of Management and Economics*, 49: 34–57. https://doi.org/10.1515/ijme-2016-0003

ECB. (2021). EON: EONIA: Euro Interbank Offered Rate. EON.D.EONIA_TO.RATE. Available: https://sdw.ecb.europa.eu/browse.do?node=9689692.

Eurostat. (2014). Eurostat Statistics Explained. Glossary: Youth unemployment. Available: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Youth_unemployment_rate.

Eurostat. (2021a). Production in industry - monthly data [sts_inpr_m]. Mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply. Available: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=sts_inpr_m&lang=en.

Eurostat. (2021b). HICP (2015 = 100) - monthly data (index) [prc_hicp_midx]. Available: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=prc_hicp_midx&lang=en.

Eurostat. (2021c). Unemployment by sex and age – monthly data [une_rt_m]. Available: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=une_rt_m&lang=en.

Fontaine, I., Razafindravaosolonirina, J., & Didier, L. (2018). Chinese policy uncertainty shocks and the world macroeconomy: Evidence from STVAR. *China Economic Review*, 51: 1–19. https://doi.org/10.1016/j.chieco.2018.04.008

Freund, L. B., & Rendahl, P. (2020). Unexpected Effects: Uncertainty, Unemployment, and Inflation. Cambridge Working Papers in Economics, Cambridge-INET Working Paper Series No. 2020/20, University of Cambridge, Faculty of Economics.

Giannone, D., Lenza, M., & Reichlin, L. (2019). Money, Credit, Monetary Policy, and the Business Cycle in the Euro Area: What Has Changed Since the Crisis? *International Journal of Central Banking*, 15(5): 137–174.

Gomez-Salvador, R., & Leiner-Killinger, N. (2008). An analysis of youth unemployment in the euro area. ECB Occasional Paper series No. 89, European Central Bank.

Görlich, D., Stepanok, I., & Al-Hussami F. (2013). Youth unemployment in Europe and the world: Causes, consequences and solutions. Kiel Policy Brief No. 59, Kiel Institute for the World Economy (IfW).

Jo, S., & Lee, J. J. (2019). Uncertainty and Labour Market Fluctuation. Federal Reserve Bank of Dallas Working Paper No. 1904, Federal Reserve Bank of Dallas.

Kandoussi, M., & Langot, F. (2022). Uncertainty Shocks and Unemployment Dynamics. *Economics Letters*, 219: 110760. https://doi.org/10.1016/j.econlet.2022.110760

Leduc, S., & Liu, Z. (2016). Uncertainty shocks are aggregate demand shocks. *Journal of Monetary Economics*, 82: 20–35. https://doi.org/10.1016/j.jmoneco.2016.07.002

Lee, S. (2018). Economic Policy Uncertainty in the US: Does It Matter for Korea? *East Asian Economic Review*, 22(1): 29–54.

Levenko, N. (2020). Perceived uncertainty as a key driver of household saving. *International Review of Economics & Finance*, 65, 126–145. https://doi.org/10.1016/j.iref.2019.10.005

Oh, J., & Picco, A. R. (2020). Macro Uncertainty and Unemployment Risk. Sveriges Riksbank Working Paper Series No. 395, Sveriges Riksbank.

O'Higgins, N. (2001). Youth unemployment and employment policy: A global perspective (Geneva ILO). 23698, University Library of Munich, Germany. Available at SSRN: https://ssrn.com/abstract=3019316mpra.ub.uni-muenchen.de/23698/1/youth_unemploy_end_employment_policy.pdf.

O'Higgins, N. (2015). Youth unemployment. IZA Policy Paper No. 103. Institute for the Study of Labor (IZA).

Nguyen, C. P., Su, T. D., Wongchoti, U., & Schinckus, C. (2020). The spillover effects of economic policy uncertainty on financial markets: a time-varying analysis. *Studies in Economics and Finance*, 37(3): 513–543. https://doi.org/10.1108/SEF-07-2019-0262

Nilavongse, R., Michał, R., Staehr, K., & Uddin, G. (2021). Foreign and domestic uncertainty shocks in four open economies, *Open Economies Review*, 32(5), 933–954. https://doi.org/10.1007/s11079-021-09656-0

Pagés C., & Montenegro, C. E. (2007). Job Security and the Age-Composition of Employment: Evidence from Chile. *Estudios de Economía*, 34(2): 109–139.

Prüser, J., & Schlösser, A. (2020). On the Time-Varying Effects of Economic Policy Uncertainty on the US Economy. *Oxford Bulletin of Economics and Statistics*, 82(5): 1217–1237. https://doi.org/10.1111/obes.12380

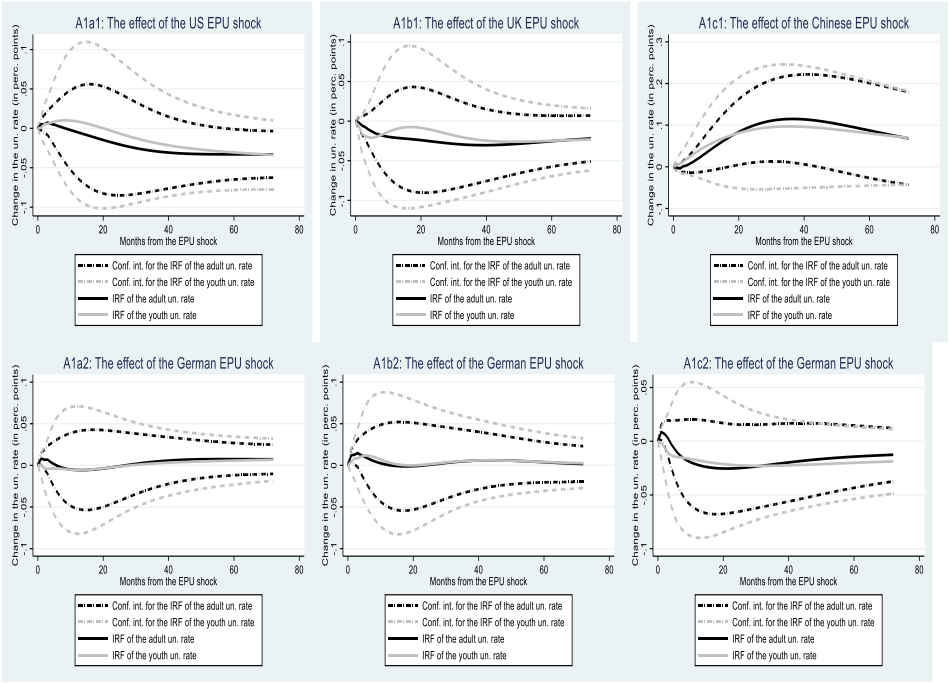
Ravn, M. O., & Sterk, V. (2017). Job uncertainty and deep recession. *Journal of Monetary Economics*, 90, 125–141. https://doi.org/10.1016/j.jmoneco.2017.07.003

Schaal, E. (2017). Uncertainty and Unemployment. *Econometrica*, 85(6): 1675–1721. https://doi.org/10.3982/ECTA10557

Stockhammar, P., & Österholm, P. (2017). The Impact of US Uncertainty Shocks on Small Open Economies. *Open Economies Review*, 28(2): 347–368. https://doi.org/10.1007/s11079-016-9424-x

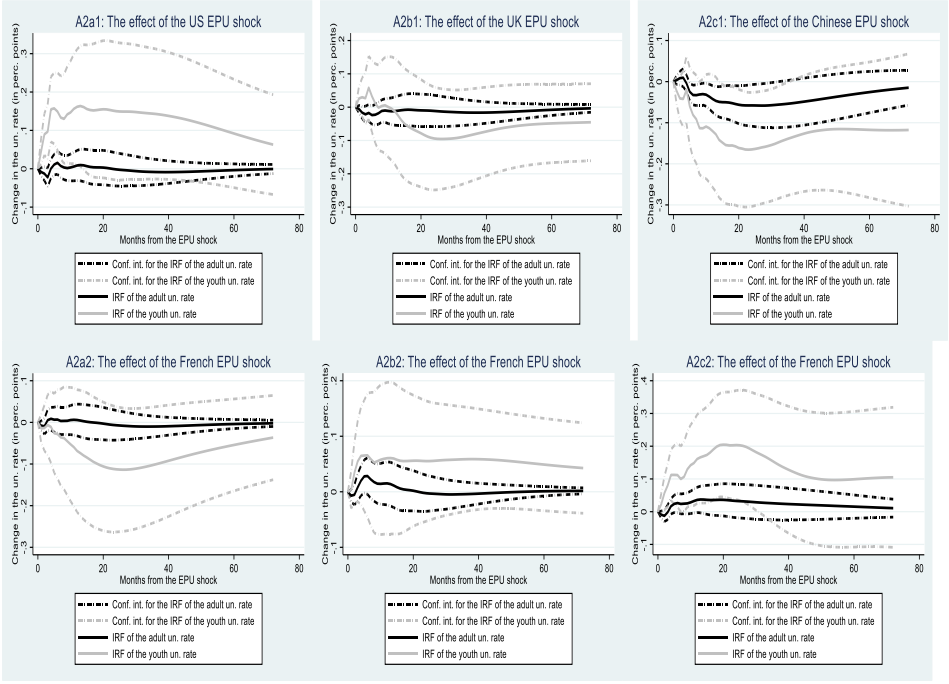
Appendix A

Figure A1. Response of the unemployment rates in Germany to foreign (A1a1, A1b1, A1c1) and domestic (A1a2, A1b2, A1c2) EPU shocks



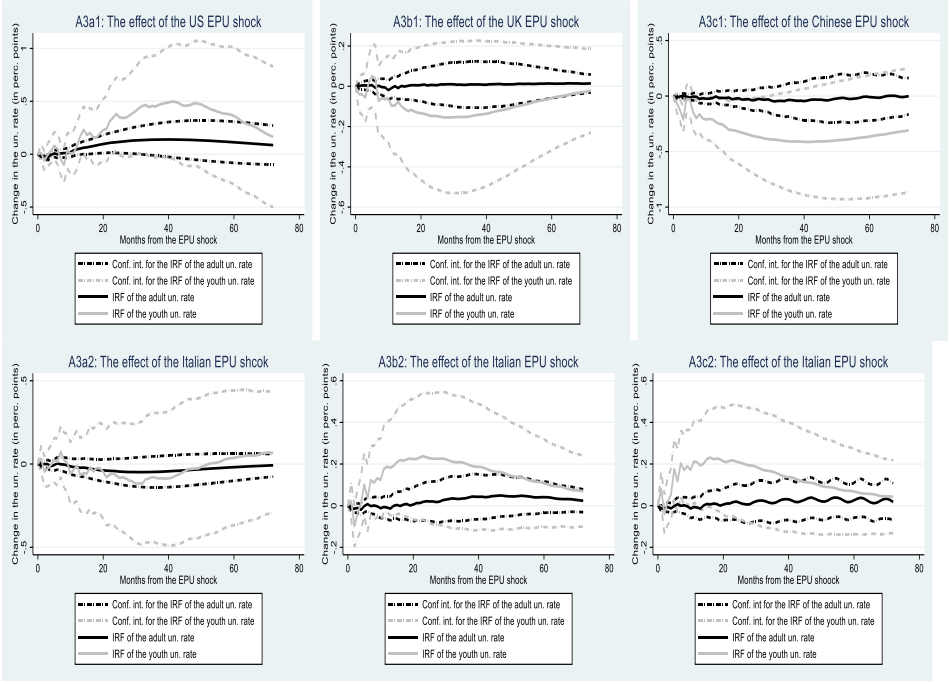
Notes: See notes for Figure 1.

Figure A2. Response of the unemployment rates in France to foreign (A2a1, A2b1, A2c1) and domestic (A2a2, A2b2, A2c2) EPU shocks



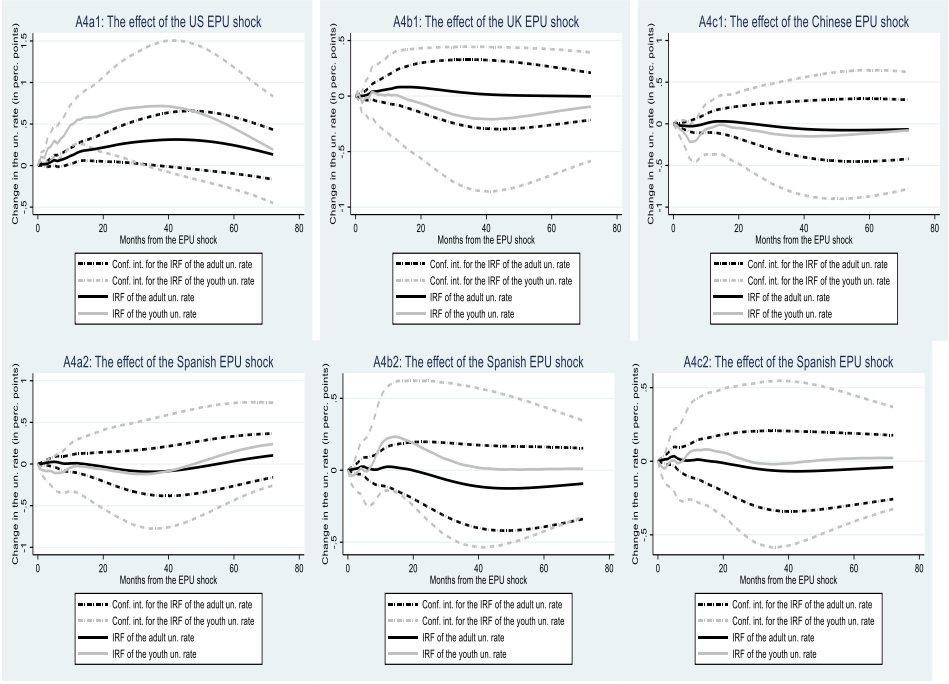
Notes: See notes for Figure 1.

Figure A3. Response of the unemployment rates in Italy to foreign (A3a1, A3b1, A3c1) and domestic (A3a2, A3b2, A3c2) EPU shocks



Notes: See notes for Figure 1.

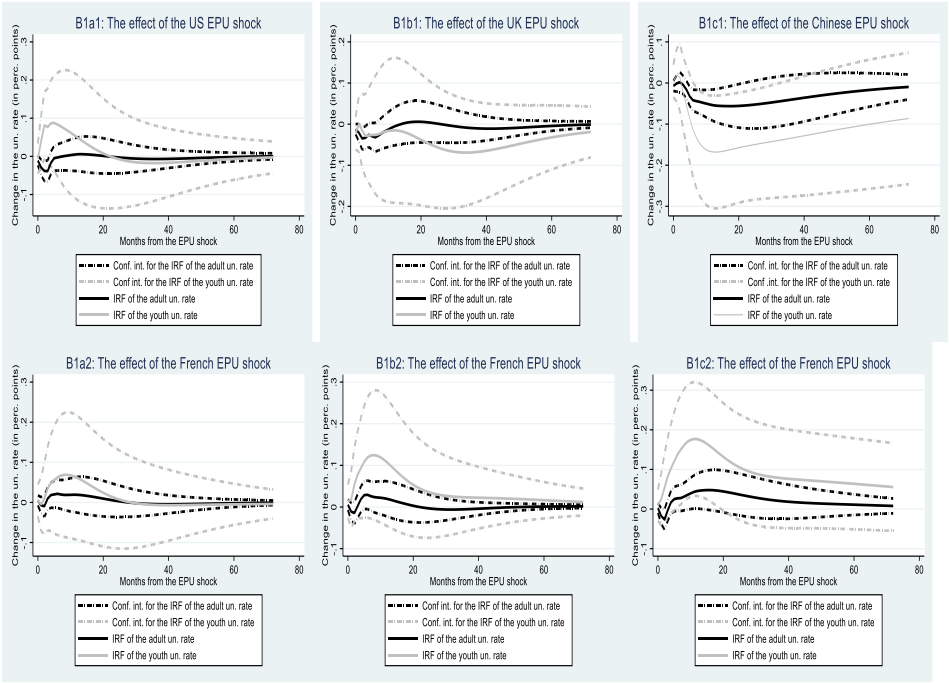
Figure A4. Response of the unemployment rates in Spain to foreign (A4a1, A4b1, A4c1) and domestic (A4a2, A4b2, A4c2) EPU shocks



Notes: See notes for Figure 1.

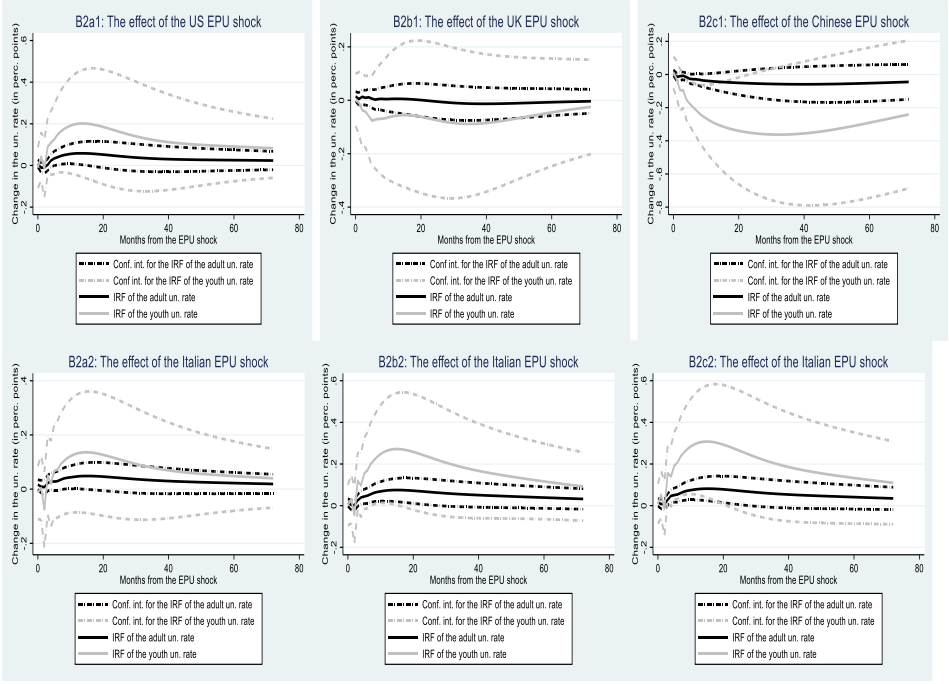
Appendix B

Figure B1. Response of the unemployment rates in France to foreign (B1a1, B1b1, B1c1) and domestic (B1a2, B1b2, B1c2) EPU shocks



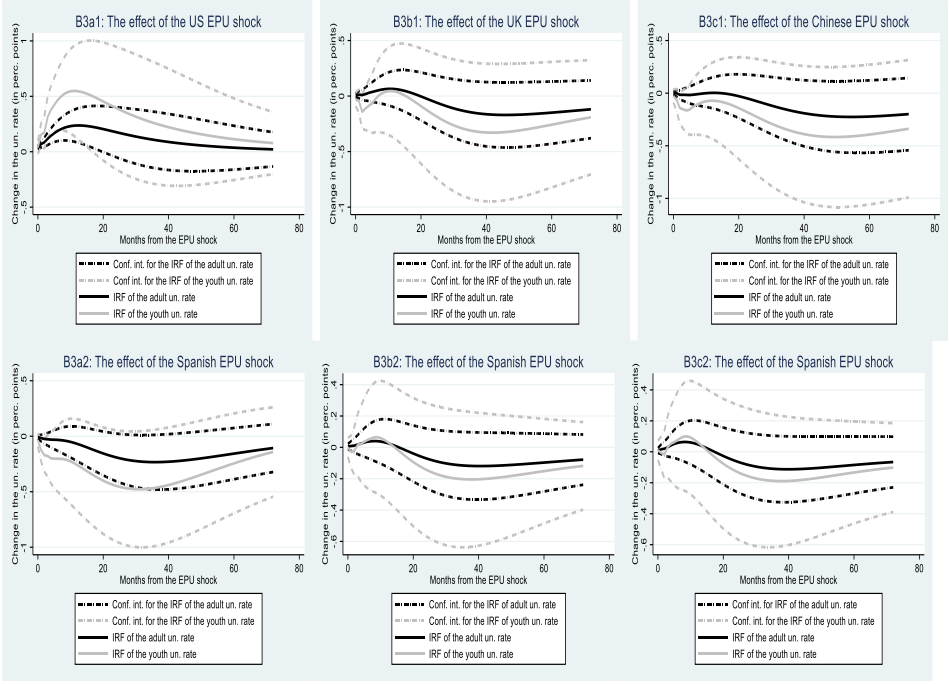
Notes: See notes for Figure 1.

Figure B2. Response of the unemployment rates in Italy to foreign (B2a1, B2b1, B2c1) and domestic (B2a2, B2b2, B2c2) EPU shocks



Notes: See notes for Figure 1.

Figure B3. Response of the unemployment rates in Spain to foreign (B3a1, B3b1, B3c1) and domestic (B3a2, B3b2, B3c2) EPU shocks



Notes: See notes for Figure 1.