Monetary Integration and Structural Change in a Small Open Economy: Evidence from Slovakia*

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July 6, 2026

Abstract

This paper studies how Slovakia's adoption of the euro in 2009 affected the structural macroeconomic relationships governing inflation, output, and monetary policy. We estimate a two-country structural VAR for Slovakia and the rest of the euro area, where we allow Slovak structural relations to differ across regimes. We find that euro adoption was associated with a pronounced flattening of the Slovak Phillips curve and with a marked change in the role of interest rates in aggregate demand. After euro adoption, Slovak demand shocks became much less inflationary, supply shocks generated smaller output and inflation responses, and domestic impulse responses moved substantially closer to their euro-area counterparts. The convergence is strongest on the supply side and in the immediate absorption of shocks, while demand-side convergence is more selective: the inflation sensitivity of demand remains relatively stable, whereas the interest-rate semi-elasticity shifts sharply towards zero. We interpret these results as evidence that monetary integration can induce genuine structural convergence in small open economies by strengthening nominal anchoring, changing the information content of domestic interest rates, and reinforcing real economic integration beyond the mechanical loss of an independent monetary policy.

Keywords: European Monetary Union, Phillips curve, Structural vector autoregressions, Informative priors

JEL-Codes: C11, C30, E30, E52

*We thank for fruitful discussions and suggestions Christiane Baumeister, Ján Beka, Robert Czudaj, Michal Horváth, Jochen Mankart, Thaïs Masseï, Anushka Mukherjee, Joan Paredes, Arslan Razmi, Mark Spiegel, as well as conference and seminar participants at Corvinus University, Budapest, the ifo Dresden Workshop on Macroeconomics and International Finance 2026, the 30th ICMAIF (Crete), the IAAE 2026 (Lisbon), the Národná banka Slovenska and the Halle Institute for Economic Research (IWH). A special thanks goes to Christian Merkl for strategic advice. The authors gratefully acknowledge financial support from Národná banka Slovenska under the Visiting Researcher 2026 scheme. The opinions expressed in this paper are those of the authors and do not necessarily reflect the views of Národná banka Slovenska or the Eurosystem. All errors and omissions remain the authors' responsibility.

1 Introduction

Understanding whether major institutional changes alter the structural relationships governing the business cycle is a central question in applied macroeconomics. This paper studies this issue in the context of Slovakia's adoption of the euro. Using a parsimonious structural VAR estimated on Slovak and euro area data, we find that both the slopes of aggregate demand and supply curves and the transmission of demand shocks changed markedly after euro adoption. In particular, the post-euro Slovak economy exhibits demand and supply relationships that are much closer to those estimated for the euro area, with demand shocks being absorbed relatively more through output adjustments and less through inflation.

The macroeconomic effects of euro adoption have been widely studied, with an emphasis on monetary transmission, business-cycle synchronization, and macroeconomic volatility (Giannone et al., 2010, 2019; Bagliano and Morana, 2025).[1] However, small open transition economies pose additional challenges. These economies are highly exposed to external demand and financial conditions, undergo rapid structural change, and experience evolving behavioral relationships as institutions and expectations converge toward euro area norms. As a result, assuming stable structural parameters across the date of euro adoption is particularly restrictive.

To address this issue, we explicitly model the pre- and post-euro periods as distinct regimes within a unified empirical framework. Building on Baumeister and Hamilton (2018) and Camehl and von Schweinitz (2026), we estimate a structural VAR that links output gaps, inflation, and interest rates through aggregate demand, aggregate supply, and monetary policy relationships for Slovakia and the rest of the euro area. By modeling structural relationships jointly, this approach guards against overestimating the potential flattening of the Phillips curve (Bergholt et al., 2024; Furlanetto and Lepetit, 2025). Thus, it allows us to firmly assess that the structural inflation-output trade-off and the internal propagation of demand and supply shocks in Slovakia changed after euro adoption and that they converged toward those observed for the euro area, flattening the Phillips curve and lowering inflation-output ratios after demand shocks. We interpret these findings, compatible with the analysis of Kupkovič (2024), as evidence of structural convergence following euro adoption.

The view that euro adoption may represent a turning point in the inflation-output trade-off is consistent with a large body of evidence on the evolving slope of the Phillips curve. Gali and Monacelli (2005) shows that greater economic openness dampens the inflationary impact of domestic demand shocks, as relative prices and the terms of trade absorb part of the adjustment. This mechanism is particularly relevant to the Slovak context, given the strong pro-trade effects associated with euro adoption (Lalinský and Meriküll, 2021). In parallel, a growing literature emphasizes the role of monetary credibility and firmly anchored inflation expectations in reducing inflation persistence and weakening the responsiveness of inflation to real activity (Coibion and Gorodnichenko, 2015; Hazell et al., 2022).

Our paper builds on and contributes to the strand of studies that seek to identify structural macroeconomic relationships and the transmission of structural shocks in new EU member states, such as Jarociński (2010) and Petz and Zörner (2025), by explicitly allowing these relationships to differ before and after Slovakia's adoption of the euro. Introducing varying structural coefficients across sample splits, we see papers like ours

[1] Most of the literature, including this paper, looks at euro adoption from the perspective of the joining country rather than the monetary union, which is an interesting question in itself (Spiegel, 2001).

and Cardamone and De Santis (2026) as a first steps towards fully time-varying Bayesian structural VARs with informative priors. This complements alternative VAR models with different regimes or full time variation (Lanne et al., 2010; Auerbach and Gorodnichenko, 2012; Koop and Korobilis, 2013) on the reduced form.

The remainder of this paper is organized as follows. Section 3 introduces our empirical framework, including the data and the identification strategy. The results and their economic relevance are discussed in Section 4. Section 5 concludes.

2 Institutional background

Slovakia's adoption of the euro was the culmination of a longer process of European and monetary integration rather than a discrete institutional change occurring only at the time of euro-area entry. Following the dissolution of Czechoslovakia and the establishment of the Slovak Republic on 1 January 1993, European integration became a central component of Slovakia's policy orientation. Slovakia formally applied for EU membership on 27 June 1995, accession negotiations were concluded at the Copenhagen European Council in December 2002, and the Treaty of Accession was signed on 16 April 2003. In the accession referendum held on 16–17 May 2003, 93.7% of participating voters supported EU membership, and Slovakia joined the European Union on 1 May 2004.

The monetary dimension of this process became explicit shortly thereafter. On 16 July 2003, the Slovak authorities published the *Strategy of the Slovak Republic for the Adoption of the Euro* (NBS, 2003), which set out the broad framework for future euro area entry. The strategy reflected the institutional logic of EU accession: as a new Member State without an opt-out, Slovakia entered the Economic and Monetary Union with a derogation, but with the obligation to adopt the single currency once the convergence criteria were fulfilled. The Slovak Koruna subsequently entered ERM II in November 2005 and ultimately adopted the euro on 1 January 2009.

This chronology matters for the interpretation of convergence. Euro adoption should not be treated as a single event beginning only with ERM II participation or with the physical introduction of the euro in 2009. Rather, it was preceded by a sustained period of policy preparation, institutional commitment, and public debate around European integration. The prospect of EU membership, and later of euro area entry, provided an anchor for policy choices well before formal adoption. For this reason, convergence should be viewed as a gradual and anticipatory process, shaped not only by the mechanical fulfilment of formal entry criteria, but also by expectations, credibility effects, and the behaviour of policymakers and economic agents under an increasingly binding European institutional framework.

The evolution of the monetary-policy framework, as described on the website of the National Bank of Slovakia[2], mirrored this broader institutional transition. In the 1990s, the NBS operated within a framework centred on monetary and exchange-rate stability, with monetary developments managed largely through quantitative instruments and the regulation of broad money. Following the stabilisation of 1999, the framework gradually shifted towards interest-rate-based monetary policy and implicit inflation targeting in 2000–2004, before moving to explicit inflation targeting with varying targets under ERM II in 2005–2008. ERM II required exchange-rate stability as a convergence criterion and provided a framework for managing exchange rates prior to euro adoption. The koruna entered ERM II in November 2005 and was revalued twice before the irrevocable

[2]`https://nbs.sk/en/monetary-policy/history-of-nbs-monetary-policy/`

conversion rate was fixed. NBS analyses of euro adoption emphasized the elimination of koruna-euro exchange-rate risk as a direct benefit of joining the euro area (Suster et al., 2006). With euro adoption on 1 January 2009, Slovakia's national monetary policy was replaced by participation in the common monetary policy of the Eurosystem.

At the macroeconomic level, Slovakia's path towards the euro was therefore characterised by a process of nominal convergence that began well before formal ERM II participation. Disinflation, exchange-rate appreciation, and the gradual alignment of macroeconomic conditions with those of the euro area were already underway during the accession period, reflecting both domestic stabilisation efforts and the disciplining effect of the European integration anchor. ERM II participation provided a more explicit institutional framework for exchange-rate stability and the final fulfilment of the Maastricht convergence criteria. In this sense, Slovakia's macroeconomic evolution should not be interpreted merely as a technical adjustment to euro adoption requirements. It was part of a broader transformation in which European integration affected the policy regime, strengthened the perceived credibility of macroeconomic institutions, and shaped the structural dynamics of the Slovak economy.

3 Empirical framework

3.1 Baseline structural model

Our analysis is based on a structural VAR that links output gaps y_t, inflation π_t, and nominal interest rates r_t through aggregate supply, aggregate demand, and monetary policy relationships. Throughout, these variables are interpreted as cyclical measures of real activity and short-term nominal policy rates; precise data definitions and transformations are described in Section 3.4. Following (Baumeister and Hamilton, 2018), the contemporaneous structure for a generic economy can be summarized by the following three equations:

$$
\begin{aligned}
y_t &= \alpha^\pi \pi_t + \mathbf{b}^s \mathbf{x}_{t-1} + u_t^s, \\
y_t &= \beta^\pi \pi_t + \beta^r r_t + \mathbf{b}^d \mathbf{x}_{t-1} + u_t^d, \\
r_t &= (1-\rho)\big(\psi^y y_t + \psi^\pi \pi_t\big) + \mathbf{b}^m \mathbf{x}_{t-1} + u_t^m,
\end{aligned}
$$

where u_t^s, u_t^d, and u_t^m denote mutually orthogonal supply, demand, and monetary policy shocks. The slope parameter α^π is the inverse of the usual Phillips curve slope and governs the inflation–output trade-off, while β^π and β^r capture the sensitivity of aggregate demand to inflation and interest rates. Monetary policy follows a Taylor-type rule with interest rate smoothing ρ. The vector $\mathbf{x}_{t-1}$ contains lags of the endogenous variables and a constant.

3.2 Two-country extension and monetary regimes

This subsection embeds the baseline structural model in a two-country setting with Slovakia (SK) and the rest of the euro area (REA), and formalizes the regime change associated with Slovakia's adoption of the euro in 2009. We first present the full two-country system that applies prior to euro adoption and then describe how this baseline system is modified by a set of additional restrictions after Slovakia joins the monetary union.

Throughout, we impose time-invariant structural and lag coefficients in the euro area block, reflecting the limited quantitative importance of Slovakia for aggregate euro area dynamics at the union level. Against this background, we use superscripts SKK, $SKEUR$, and REA index regime–country specific structural coefficients, referring respectively to Slovakia before euro adoption, Slovakia after euro adoption, and the rest of the euro area. Superscripts SK and REA are used to differentiate observable economic variables by country. For example, $\alpha^{SKK,\pi}$ denotes the supply-curve slope in Slovakia prior to euro adoption, while y_t^{SK} denotes the Slovak output gap.

3.2.1 Pre-euro baseline system

Prior to Slovakia's adoption of the euro in 2009, the model takes the form of a system of seven structural equations describing aggregate supply, aggregate demand, and monetary policy in Slovakia (SK) and in the rest of the euro area (REA), plus an equation for the Koruna-Euro exchange rate. In this baseline regime, both regions are characterized by the structural relationships introduced above, while allowing for cross-region interactions. In particular, exchange rates potentially affect all Slovak equations $(\alpha^\sigma, \beta^\sigma, \psi^\sigma)$. Moreover, Slovak aggregate demand depends on the euro area output gap through the coefficient $\beta^{y^{REA}}$, capturing external demand spillovers, and Slovak monetary policy is allowed to react to the euro area policy rate through the coefficient $\psi^{r^{REA}}$. The euro area block is closed by an independent monetary policy rule that responds to euro area output and inflation. Finally, exchange rates contemporaneously depend on differences of output gaps, inflation and nominal interest rates $(\phi^{\Delta y}, \phi^{\Delta\pi}, \phi^{\Delta r})$.

Throughout, we work with the common lag vector $\mathbf{x}_{t-1}$ defined above, containing four lags of all endogenous variables and a constant. This formulation preserves a fixed state vector across regimes while allowing for regime-specific dynamic restrictions. The full baseline system in the pre-euro regime can be written as:

$$\begin{aligned}
\text{(SK supply)} \quad y_t^{SK} &= \alpha^{SKK,\pi}\,\pi_t^{SK} + \alpha^{SKK,\sigma}\,\sigma_t^{SK} + \mathbf{b}^{SKK,s'}\mathbf{x}_{t-1} + u_t^{SK,s}, \\
\text{(SK demand)} \quad y_t^{SK} &= \beta^{SKK,\pi}\,\pi_t^{SK} + \beta^{SKK,r}\,r_t^{SK} + \beta^{SKK,\sigma}\,\sigma_t^{SK} + \beta^{SKK,y^{REA}}\,y_t^{REA} \\
&\quad + \mathbf{b}^{SKK,d'}\mathbf{x}_{t-1} + u_t^{SK,d}, \\
\text{(SK policy)} \quad r_t^{SK} &= (1-\rho^{SKK})\big(\psi^{SKK,y}\,y_t^{SK} + \psi^{SKK,\pi}\,\pi_t^{SK} + \psi^{SKK,\sigma}\,\sigma_t^{SK} \\
&\qquad + \psi^{SKK,r^{REA}}\,r_t^{REA}\big) + \mathbf{b}^{SKK,m'}\mathbf{x}_{t-1} + u_t^{SK,m},
\end{aligned}$$

$$\begin{aligned}
\text{(REA supply)} \quad y_t^{REA} &= \alpha^{REA,\pi}\,\pi_t^{REA} + \mathbf{b}^{REA,s'}\mathbf{x}_{t-1} + u_t^{REA,s}, \\
\text{(REA demand)} \quad y_t^{REA} &= \beta^{REA,\pi}\,\pi_t^{REA} + \beta^{REA,r}\,r_t^{REA} + \mathbf{b}^{REA,d'}\mathbf{x}_{t-1} + u_t^{REA,d}, \\
\text{(ECB policy)} \quad r_t^{REA} &= (1-\rho^{REA})\big(\psi^{REA,y}\,y_t^{REA} + \psi^{REA,\pi}\,\pi_t^{REA}\big) \\
&\quad + \mathbf{b}^{REA,m'}\mathbf{x}_{t-1} + u_t^{REA,m} \\
\text{(SKK ER)} \quad \sigma_t^{SK} &= \phi^{\Delta y}(y_t^{SK} - y_t^{REA}) + \phi^{\Delta\pi}(\pi_t^{SK} - \pi_t^{REA}) + \phi^{\Delta r}(r_t^{SK} - r_t^{REA}) \\
&\quad + \mathbf{b}^{SKK,\sigma'}\mathbf{x}_{t-1} + u_t^{SKK,\sigma}.
\end{aligned}$$

3.2.2 Post-euro regime restrictions

From 2009Q1 onwards, we impose a set of restrictions that reflect Slovakia's accession to the monetary union and the resulting loss of an independent national monetary policy. Relative to the baseline pre-euro regime, the post-euro regime is obtained as follows.

First, the Slovak monetary policy and exchange rate equations become redundant, and the associated structural shock is restricted to zero. Second, the Slovak policy rate in the Slovak demand equation is replaced by the common euro area policy rate, so that domestic demand depends on r_t^{REA} rather than a separate national instrument. Third, the contemporaneous effect of Koruna-Euro exchange rates drops from Slovak supply and demand equations. Fourth, the coefficients on lagged Slovak interest and exchange rates are set to zero in all equations (not only Euro area ones), implying that Slovak dynamics are driven by the euro area policy rate both contemporaneously and through lagged effects, consistent with the absence of an independent Slovak policy instrument. Fifth, euro area monetary policy is described by a single ECB rule that responds to GDP-weighted averages of euro area and Slovak output gaps and inflation rates, such that Slovak macroeconomic conditions enter common monetary policy only through their (small) weight in the monetary union (Staffa and von Schweinitz, 2023). Finally, we allow only the contemporaneous Slovak supply and demand coefficients to differ across regimes.

Under these restrictions, the Slovak equations in the post-euro regime are given by

$$\begin{aligned}
&\text{(SK supply)} \quad y_t^{SK} = \alpha^{SKEUR,\pi}\,\pi_t^{SK} + \mathbf{b}^{SKEUR,s'}\mathbf{x}_{t-1} + u_t^{SK,s},\\
&\text{(SK demand)} \quad y_t^{SK} = \beta^{SKEUR,\pi}\,\pi_t^{SK} + \beta^{SKEUR,r}\,r_t^{REA} + \beta^{SKEUR,y^{REA}}\,y_t^{REA}\\
&\qquad\qquad\qquad + \mathbf{b}^{SKEUR,d'}\mathbf{x}_{t-1} + u_t^{SK,d}
\end{aligned}$$

Euro area supply and demand continue to follow the baseline structure, while monetary policy is governed by a single ECB rule:

$$\begin{aligned}
\text{(ECB policy)} \quad r_t^{REA} = (1-\rho^{REA})\big(&\psi^{REA,y}\,(\omega_{REA}y_t^{REA} + \omega_{SK}y_t^{SK})\\
&+\psi^{REA,\pi}\,(\omega_{REA}\pi_t^{REA} + \omega_{SK}\pi_t^{SK})\big)\\
&+ \mathbf{b}^{REA,m'}\mathbf{x}_{t-1} + u_t^{REA,m},
\end{aligned}$$

with ω_{SK} reflecting Slovakia's GDP weight in the monetary union, and $\omega_{REA}+\omega_{SK} = 1$.

3.2.3 Discussion of parsimonious modeling choices

Before 2009, the empirical model described above can be interpreted as a two-country economy model, where one country (Slovakia) is modeled as an open economy, while the other one (the rest of the Euro zone) is treated as a closed economy. Afterwards, we model a single currency area split into two regions.

Treating the euro area as a closed economy comes with disadvantages. In reality, the euro area is not immune to the influence of foreign shocks – the economic effects of oil supply shocks and wars are a painful reminder. Importantly, our model does not assume that these foreign shocks do not exist. Instead, all foreign shocks are mapped into the set of shocks included in our model. In a series of robustness checks, we change this mapping by explicitly adding global variables such as global industrial production, global economic policy uncertainty or gas prices to our model.

A second disadvantage lies in the identification of constant structural coefficients for Slovakia in each of period. The transition of Slovakia from a communist economy towards membership in the Eurozone could instead be modelled using time-varying coefficients. Such a rich model comes with extreme identification problems. Instead, we remove trends that can be associated with transition dynamics (like time-varying inflation and exchange rate targets) from the data, as described in section 3.4. This should limit the need for a complete time-varying model, a fact that we can confirm in robustness checks where parts of the sample are dropped. Yet, our results should still be interpreted as a comparison of sample averages, where we cannot differentiate between a clean structural break or a smooth transition.

A third disadvantage comes from the use of vector autoregressive models for structural identification, which cannot fully account for shifts in expectation formation. Our model identification draws heavily on small-scale New-Keynesian models, both in terms of the formulation of structural equations and the derivation of the priors in the following subsection. Theory puts a strong emphasis on the forward-looking behavior of households and firms. We emulate this in two ways. First, Baumeister and Hamilton (2018) show that the assumption of steady-state dynamics is sufficient to derive priors on current-period elasticities from future-period coefficients in theoretical models. Second, we test whether our results are subject to the insufficient information problem (Forni and Gambetti, 2014) by adding forward-looking variables like global economic policy uncertainty, energy prices and the VSTOXX to our baseline model in a set of robustness checks.

3.3 Identification and estimation

Identification follows Baumeister and Hamilton (2018) and relies on the contemporaneous structural relationships implied by the supply, demand, and monetary policy equations together with the assumption that structural shocks are mutually orthogonal. Each equation is associated with a single structural shock – supply, demand, or monetary policy – whose interpretation is invariant across regimes. In the post-euro regime, the variance of the Slovak monetary policy shock is restricted to zero, reflecting the absence of an independent national policy instrument.

Normalization is imposed as in Baumeister and Hamilton (2018) by setting the coefficient on the left-hand-side variable in each structural equation to unity. The same normalization is used in all regimes, ensuring that regime-specific coefficients are directly comparable and retain a common economic interpretation as (semi-)elasticities.

We adjust the Minnesota prior for lag coefficients to account for the fact that Slovak economic developments are likely irrelevant for the rest of the euro area (i.e., in $\mathbf{b}^{REA,s}, \mathbf{b}^{REA,d}, \mathbf{b}^{REA,m}$). To capture this, we multiply the prior variance of the coefficients on lagged Slovak output gaps and inflation in these equations with 0.1^2, which heavily shrinks posterior distributions towards zero. The coefficients on lagged Slovak interest rates and exchange rates (which only exist in the pre-euro regime) are restricted to be zero and therefore excluded from the estimation. The soft restrictions embody our prior belief on the importance of Slovakia for the rest of the euro area, while the hard restrictions allow us to estimate common lag coefficients for these equations across the two regimes.

Crucially, euro adoption affects the economic environment captured by the model – most notably the loss of an independent Slovak monetary policy and changes in the contemporaneous ECB reaction function – but not the identifying assumptions themselves. Posterior inference is based on a Metropolis-within-Gibbs sampler as in Baumeister and Hamilton (2018), but adapted to two regimes as in Cardamone and De Santis (2026). Prior distributions for all structural coefficients are specified in Baumeister and Hamilton (2018) and are held identical across regimes. As a result, differences between pre- and post-euro posterior distributions primarily reflect differences in the data-generating process rather than differences in prior information. Details on the prior distributions and details on the estimation algorithm are provided in Appendix B.

3.4 Data and variable construction

The empirical analysis uses quarterly data on output gaps, inflation, and short-term policy interest rates for Slovakia (SK) and the rest of the euro area (REA). The resulting system comprises seven observable variables: the Slovak and euro area output gaps y_t^{SK} and y_t^{REA}, inflation rates π_t^{SK} and π_t^{REA}, nominal policy rates r_t^{SK} and r_t^{REA}, and the Slovak-Euro exchange rate σ_t. All interest and exchange rates are expressed as quarterly averages.

After euro adoption, published euro area aggregates include Slovak observations. We therefore use the Slovak GDP weight $\omega_{SK} = 0.007$ together with Slovak output gaps and inflation rates to decompose aggregate euro area series into a Slovak component and a rest-of-the-euro-area (REA) component. The same GDP weight is later used to recombine Slovak and REA variables into GDP-weighted aggregates in the ECB monetary policy rule.

The Slovak output gap is computed by the National Bank of Slovakia using a unobserved component model - production function approach similarly to Tóth (2021); national estimates of potential GDP are aggregated by the ECB to obtain a euro area measure. Inflation is measured as the year-on-year growth rate of the Harmonised Index of Consumer Prices (HICP) for Slovakia and for the euro area, respectively. Short-term interest rates correspond to quarterly averages of the relevant policy rates.

The sample is split according to Slovakia's adoption of the euro. The pre-euro period runs from 1999Q1 to 2008Q4 and features an independent Slovak monetary policy rate r_t^{SK}. As discussed in Section 2, the first period is characterized by constant structural changes to the monetary, fiscal and legal framework with the final goal of Euro introduction. These transformations result in trends in the Slovak data. However, we are mostly interested in business cycle fluctuations around these trends. To detrend the data, we would ideally have knowledge about the steady-state path in each quarter. We could statistically approximate this path using an HP filter. In practice, however, this filter would also interpret a part of the inflationary spike in 2022 as trend rather than cycle. Therefore, we provide results based on HP-filtered data only in a robustness check. As our baseline, we use simple economic assumptions instead to replace time-varying trends x_t^* in Slovak inflation, interest rates and exchange rates with a constant $\bar{x}$:

$$\begin{aligned}
\tilde{\pi}_t^{SK} &= \pi_t^{SK} - \pi_t^* + \bar{\pi} \\
\tilde{r}_t^{SK} &= r_t^{SK} - r_t^* + \bar{r} \\
\tilde{\sigma}_t^{SK} &= \sigma_t^{SK} - \sigma_t^* + \bar{\sigma}
\end{aligned}$$

This simple approach results in Slovak data that are fluctuating around a constant trend that is comparable to the one in the data from the rest of the Euro Area. We display euro area data as well as the original and detrended data for Slovakia in Appendix Figures A.1 to A.3.

For inflation, we split the pre-sample period in three distinct phases with different inflation trends π_t^*: first, the time from 1999Q1 to 2001Q4 is characterized by a temporary inflationary spike due to a wave of deregulation, most importantly of energy prices. For this time, we assume a constant inflation trend of $\pi_t^* = 6\%$. This corresponds roughly to the average inflation before the deregulation in 1997 and 1998. The second phase, from 2002Q1 to 2005Q3, reflects a continuous improvement of the monetary policy framework by the National Bank of Slovakia, starting with a switch from money supply to implicit targeting at the beginning of 2002 and ending with the explicit inflation targeting under ERM II in 2005Q4. We model this with a linearly decreasing inflation trend between 6% (2001Q4) and 3.5% (2005Q4). The third phase, from 2005Q4 to 2008Q4, covers the time under ERM II. In this time, the national bank of Slovakia used explicit inflation targets (3.5% for 2005Q4, 2.5% for 2006Q4, 2% from 2007Q4 onwards), aimed at bringing inflation rates within the bands defined by the convergence criteria. We use the three inflation targets as breakpoints in a piecwise linear function. The constant inflation target is set to $\bar{\pi} = 2\%$.

For interest rates, there is no administrative target that we could use or derive. However, the adjustment term $(-r_t^* + \bar{r})$ for nominal interest rates is the same as the one for inflation $(-\pi_t^* + \bar{\pi})$, if we assume a constant real interest rate r_{real} between 1999Q1 and 2008Q4:

$$-r_t^* + \bar{r} = -(r_{real} + \pi_t^*) + (r_{real} + \bar{\pi}) = -\pi_t^* + \bar{\pi}.$$

For exchange rates, we use the same three phases as for inflation. In the first phase (1999Q1-2001Q4), we set the exchange rate trend to the average during that time, $\sigma_t^* =$ 43.34 SKK/EUR. In the second phase, we use a linear appreciating exchange rate trend, reaching 38.455 SKK/EUR in 2005Q4. This was the official exchange rate target when Slovakia joined the ERM II in November 2005. These targets where changed twice (to 35.4424 SKK/EUR in March 2007 and 30.13 SKK/EUR in May 2008). As with inflation, we use these official targets as breakpoints of a piecewise linear function for σ_t^* in the third phase (2005Q4-2008Q4).[3]

The post-euro subsample runs from 2009Q1 to 2025Q1. In this sample, the Slovak policy rate and exchange rate are no longer observed, and monetary conditions are summarized by the common euro area policy rate r_t^{REA}. To account for the effective lower bound on nominal interest rates, we replace the euro area policy rate with the Wu-Xia shadow rate (Wu and Xia, 2020) from 2009Q2 to 2022Q3. Outside this period, the observed policy rate is used. Observations associated with the COVID-19 pandemic are downweighted following the approach of Cascaldi-Garcia (2022). We adapt his pandemic-prior methodology to our multi-country structural VAR setting in order to mitigate the influence of extreme observations during the pandemic period without discarding them entirely. Details on the implementation of this procedure are provided in Appendix A.

4 Results

4.1 Convergence of structural elasticities after euro adoption

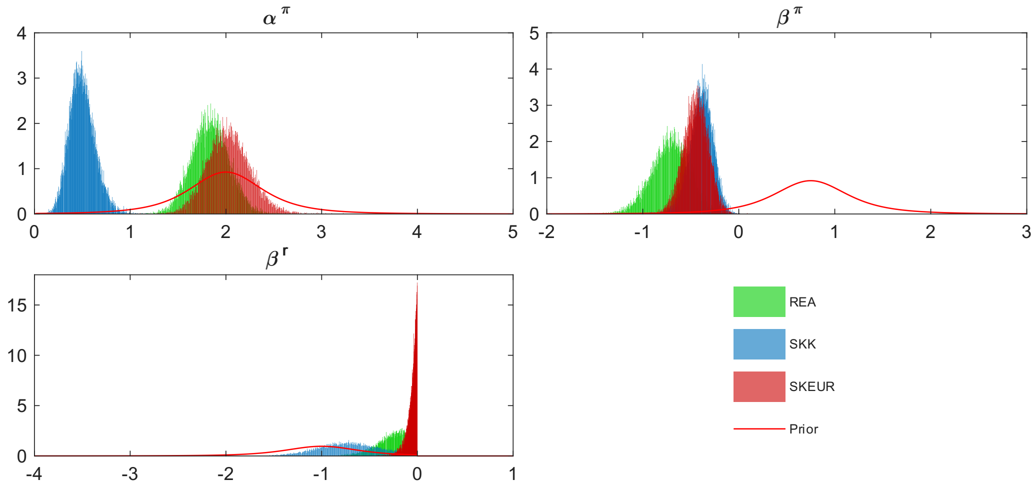
Figure 1 reports the posterior distributions of the contemporaneous slope parameters in the supply and demand equations for Slovakia before and after euro adoption, together with the corresponding estimates for the rest of the euro area. The figure shows that the Slovak posterior distributions shift substantially after euro adoption. This shift brings Slovakia closer to the euro-area benchmark most clearly in the supply equation, while the evidence for the demand equation is more heterogeneous across elasticities.

Table 1 complements the visual evidence by reporting quantitative similarity measures for the three coefficients that are directly comparable across the three regimes: α^π, β^π, and β^r. The first measure, reported in the column "P(closer to EA)", is the posterior probability that the Slovak coefficient is closer to its euro-area counterpart after euro adoption than before euro adoption.[4] The second measure is the overlap coefficient (Inman and Bradley Jr, 1989), reported separately for the pre-euro and post-euro Slovak posterior distributions relative to the euro-area posterior. It measures the share of posterior mass that is common to the compared distributions. For both statistics, higher values indicate greater similarity between Slovakia and the euro-area benchmark.

[3] The constant exchange rate target $\bar{\sigma}$ is set to zero.

[4] Formally, for a given coefficient θ, we calculate the absolute distances $\Delta^{SKK,REA} = |\theta^{SKK} - \theta^{REA}|$ and $\Delta^{SKEUR,REA} = |\theta^{SKEUR} - \theta^{REA}|$, and report $P(\Delta^{SKEUR,REA} < \Delta^{SKK,REA})$.

Fig. 1: Comparable contemporaneous coefficients in supply and demand equations



Note: Prior (red lines) and posterior distributions (histograms) of contemporaneous coefficients. Different colors correspond to the euro area, Slovakia in the pre-euro period, and Slovakia in the post-euro period.

Table 1: Similarity measures of structural supply and demand coefficients

	P(closer to EA)	Overlap (pre)	Overlap (post)
α^π	99.3%	0.0%	65.2%
β^π	59.8%	31.4%	41.2%
β^r	74.3%	33.5%	35.1%
Average	77.8%	21.6%	47.2%

Note: The first column reports the posterior probability that Slovak coefficients are closer to euro-area coefficients after euro adoption than before. For a given parameter θ, we calculate $P(|\theta^{SKEUR} - \theta^{REA}| < |\theta^{SKK} - \theta^{REA}|)$. The second and third columns report the density overlap between the posterior distributions of Slovak and euro-area coefficients before and after euro adoption, $\int \min(f_{SKK}(\theta), f_{REA}(\theta))d\theta$ and $\int \min(f_{SKEUR}(\theta), f_{REA}(\theta))d\theta$. The last row reports averages across the three coefficients.

The strongest evidence of convergence comes from the supply equation. The parameter α^π governs the contemporaneous relationship between output and inflation and can be interpreted as the inverse slope of the Phillips curve. In the pre-euro period, the Slovak posterior distribution is concentrated at relatively low values, with a posterior median around 0.5. This implies a comparatively steep Phillips curve: demand pressures are associated with a strong contemporaneous inflation response. The distribution is clearly separated from the euro-area posterior, with an overlap coefficient of zero. After euro adoption, the Slovak posterior shifts markedly to the right, with a posterior median close to 2, and becomes closely aligned with the euro-area estimate. The Slovak coefficient moves closer to the euro-area coefficient in 99.3% of posterior draws, and the overlap with the euro-area posterior increases to 65.2%.

Economically, the post-euro increase in α^π points to a substantial flattening of the Slovak Phillips curve. The most natural interpretation is that euro adoption strengthened the nominal anchor relevant for Slovak price setters. Once monetary policy was delegated to the ECB, firms' inflation expectations became more closely tied to the euro-area price-stability regime, reducing the inflationary response to domestic demand pressures. This interpretation is consistent with evidence that inflation expectations are central for

Phillips-curve dynamics and that better anchoring lowers the sensitivity of inflation to domestic slack (Coibion and Gorodnichenko, 2015; Hazell et al., 2022). While stronger trade integration and greater exposure to common euro-area price dynamics may have reinforced this pattern, the coefficient shift is most directly suggestive of improved nominal anchoring after euro adoption.

The evidence for convergence in the demand equation is more mixed. The inflation semi-elasticity of demand, β^{π}, is estimated to be negative in all three blocks, consistent with the interpretation that higher inflation lowers contemporaneous real demand. The posterior distributions are shifted substantially away from the prior and towards negative values, suggesting that the sign of the coefficient is mainly informed by the data rather than imposed by the prior. However, the scope for convergence is limited because Slovakia was already relatively close to the euro-area benchmark before euro adoption: the pre-euro overlap with the euro-area posterior is 31.4%. After euro adoption, the overlap increases moderately to 41.2%, while the probability of moving closer to the euro-area coefficient is 59.8%. Thus, the inflation sensitivity of demand becomes somewhat more euro-area-like after euro adoption, but the change is modest relative to the shift observed in the supply equation.

We interpret the negative and relatively stable estimate of β^{π} as evidence for a purchasing-power channel rather than a monetary-policy-regime channel. Higher current inflation reduces real disposable income and household confidence, and therefore depresses demand, especially when nominal incomes adjust sluggishly. This sign is the opposite of the narrow Euler-equation channel, where higher expected inflation lowers the real interest rate and stimulates current spending. However, current inflation is only indirectly related to the expectations concept that enters household decisions: households form inflation expectations partly through their perceived current inflation, which in turn depends on their exposure to price changes (DâĂŹAcunto et al., 2021; Weber et al., 2022). Moreover, even higher inflation expectations do not conclusively predict higher spending; household-level evidence finds weak or even negative effects on readiness to spend (Bachmann et al., 2015). The stability of β^{π} across regimes therefore suggests that euro adoption changed the nominal anchor and the inflation process, but not the basic contemporaneous way in which households respond to inflation-induced losses in purchasing power.

The interest-rate semi-elasticity of demand, β^{r}, displays a different pattern. The pre-euro Slovak posterior is centered at a relatively large negative value, implying a strong contemporaneous association between higher interest rates and lower domestic demand. After euro adoption, the posterior shifts towards zero and moves closer to the euro-area coefficient in 74.3% of posterior draws. At the same time, the overlap with the euro-area posterior barely changes, increasing only from 33.5% to 35.1%. This reflects that the post-euro Slovak posterior does not simply converge smoothly to the euro-area distribution; instead, it becomes tightly concentrated around values close to zero.

The interpretation of β^{r} is therefore more regime-dependent than that of β^{π}. Before euro adoption, Slovak interest rates combined several components, see Section 2: the intertemporal price of consumption, exchange-rate stabilization, domestic credibility concerns, and country-specific financial conditions. This makes the coefficient more negative because an increase in the policy rate did not only raise borrowing costs; it also signaled a broader tightening of domestic financial conditions, greater exchange-rate pressure, or weaker monetary credibility. Households and firms therefore reacted not merely to a higher interest rate, but to the adverse macroeconomic information embedded in that rate increase. After euro adoption, these Slovakia-specific credibility and exchange-rate-risk components largely disappeared as monetary policy was delegated to the ECB.

The movement of β^r towards zero is therefore consistent with the policy rate becoming a cleaner and more credible monetary instrument, rather than with the disappearance of monetary transmission. Evidence that more credible central banks require less short-term interest-rate volatility to achieve their objectives supports this interpretation and also helps rationalize the stronger interest-rate smoothing that we estimate for the ECB relative to the NBS (Levieuge et al., 2018).

Taken together, the coefficient evidence points to substantial post-euro convergence in Slovak structural relations, but the convergence is uneven across equations. The clearest change is the flattening of the supply curve, which brings Slovakia much closer to the euro-area benchmark and suggests improved nominal anchoring after euro adoption. In the demand equation, the inflation semi-elasticity is negative and relatively stable, consistent with a regime-invariant purchasing-power channel. By contrast, the interest-rate semi-elasticity changes substantially because the economic meaning of the policy rate changes across regimes. Before euro adoption, Slovak rates reflected not only monetary tightening but also domestic credibility and exchange-rate stabilization concerns. After euro adoption, these components largely disappeared under ECB monetary policy. Overall, the evidence suggests that euro adoption was associated with a more euro-area-like macroeconomic structure in Slovakia mainly through the supply side, while the demand-side evidence points to a stable inflation-demand relationship and a regime-dependent role of interest rates in domestic demand.

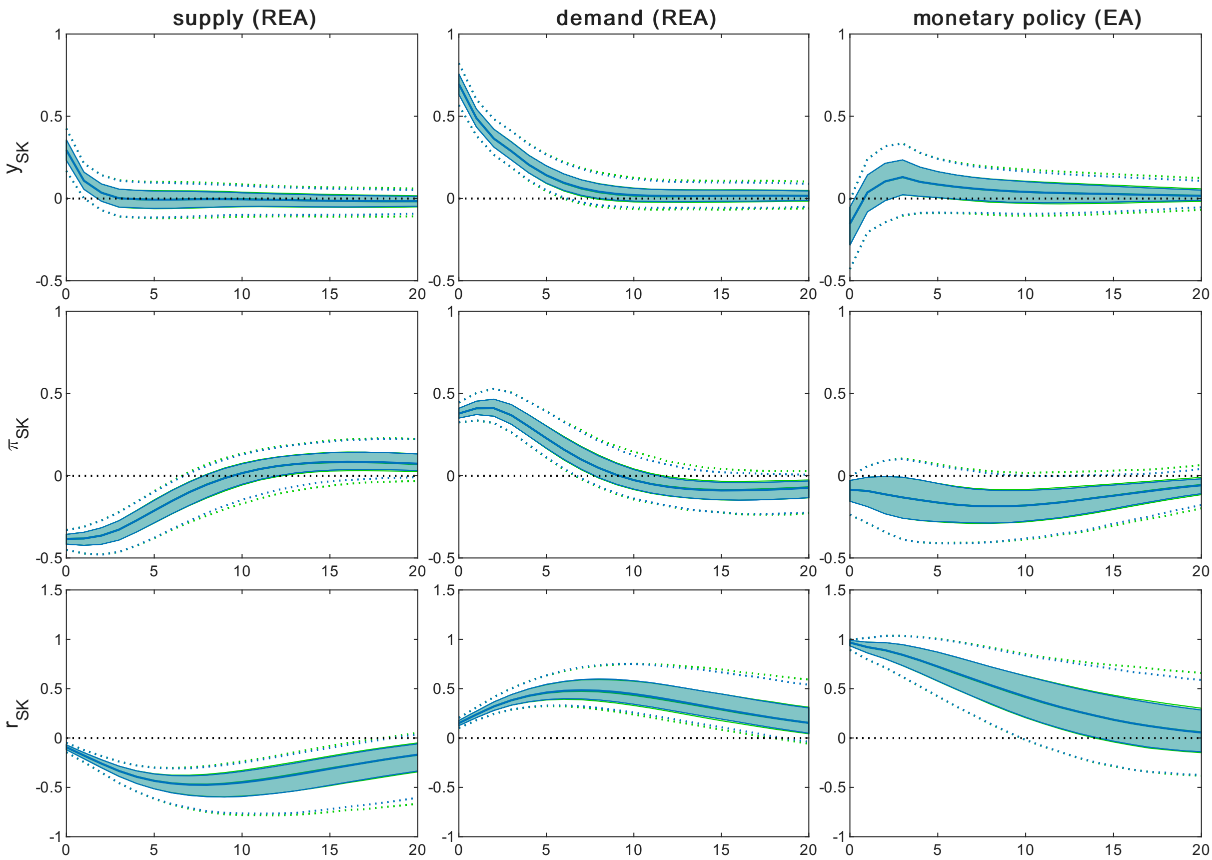
4.2 Convergence of dynamic responses to domestic shocks

The coefficient convergence documented above also appears in the dynamic responses to structural shocks. After euro adoption, Slovak domestic demand and supply shocks generate output and inflation responses that are much closer to those observed in the euro area. This convergence is strongest on impact and for output responses over the first two years, while inflation responses become more similar mainly at short horizons. We focus on domestic responses to domestic shocks—that is, the responses of Slovak variables to Slovak shocks and of euro area variables to euro area shocks—because these responses are informative about changes in internal propagation mechanisms. All impulse responses are computed under the estimated endogenous monetary-policy rules. The reported dynamics therefore combine private-sector propagation with the systematic policy response implied by the model, rather than holding policy fixed. Figures 2 and 3 report responses of output, inflation, and interest rates to domestic demand, supply, and monetary policy shocks. A full set of IRFs is presented in Appendix Figures C.7 and C.8.

The euro-area responses provide a stable benchmark. As shown in Figure 2, the estimated euro-area dynamics are very similar across the two subsamples, which is expected since the euro-area block is estimated over the full sample and Slovakia has only negligible feedback effects on the euro area by assumption. Demand shocks are absorbed somewhat more through output than inflation, with an impact ratio of inflation to output of around 0.5. Supply shocks generate output and inflation responses of similar magnitude, though both are muted at around 0.3–0.4 in absolute terms. After impact, output gaps begin converging back to zero immediately, while inflation displays a delay of two to four quarters before converging. These patterns provide the reference dynamics against which we evaluate Slovak convergence.

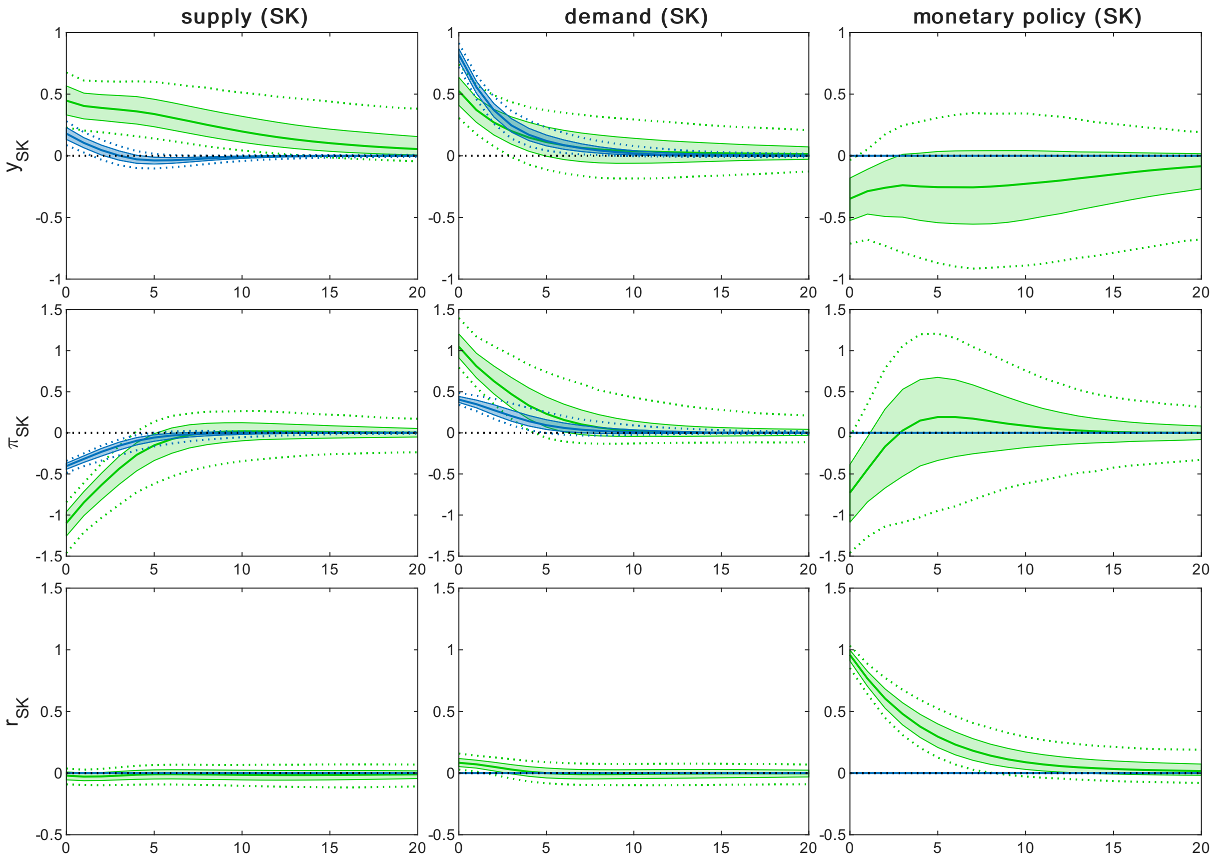
For Slovak demand shocks, the main change is the composition of adjustment. Before euro adoption, domestic demand shocks were absorbed disproportionately through inflation: the impact response of inflation was more than twice as large as the output

Fig. 2: Impulse response functions to domestic shocks, rest of the euro area



Note: Structural impulse-response functions of euro area variables to one-unit domestic shocks. Solid green (blue) lines denote posterior medians for the pre-euro (post-euro) subsamples. Shaded regions indicate the 68% posterior credible set, while dotted lines represent the 95% posterior credible set.

Fig. 3: Impulse response functions to domestic shocks, Slovakia



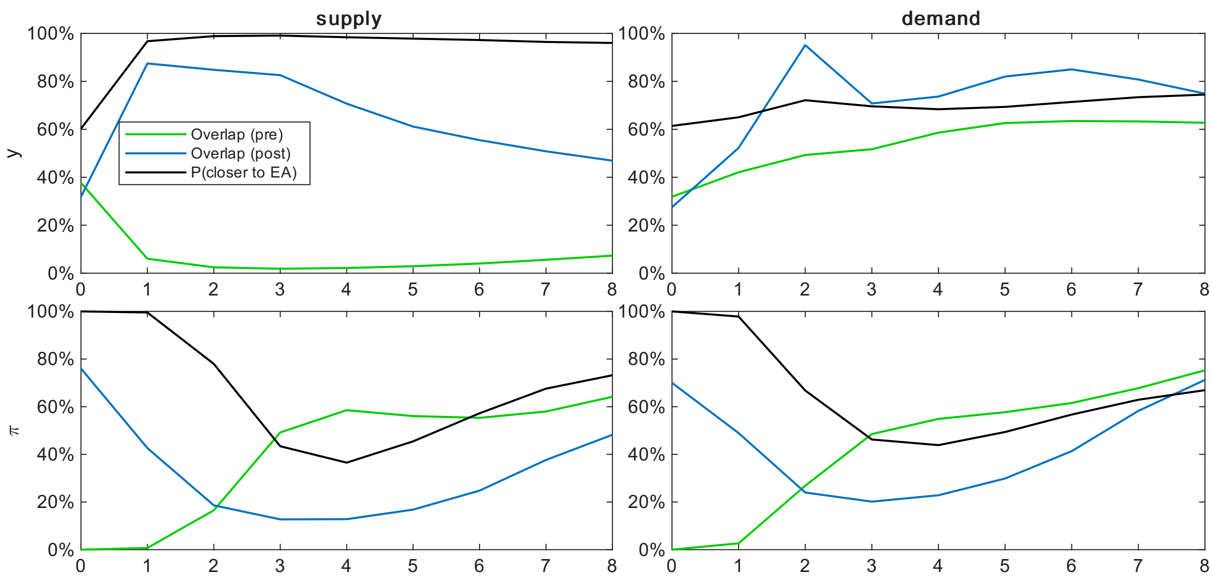
Note: Structural impulse-response functions of Slovak variables to one-unit domestic shocks. Solid green (blue) lines denote posterior medians for the pre-euro (post-euro) subsamples. Shaded regions indicate the 68% posterior credible set, while dotted lines represent the 95% posterior credible set.

response. After euro adoption, the inflation response falls sharply while the output response increases, reducing the impact ratio of inflation to output from around 2.1 to roughly 0.5. This brings the Slovak response close to the euro-area benchmark and dynamically confirms the flattening of the Slovak supply curve documented above. Demand disturbances therefore become less inflationary after euro adoption and are absorbed increasingly through quantity adjustments rather than price changes.

For Slovak supply shocks, the main change is the scale of propagation. As shown in Figure 3, the responses of both Slovak output and inflation are much smaller after euro adoption, at roughly one third of their pre-euro magnitudes. This attenuation is consistent with the coefficient evidence that both the supply and demand schedules became flatter. Domestic supply disturbances therefore generate less pronounced movements in both output and inflation after euro adoption. Overall, Slovak responses to domestic supply and demand shocks are far from their euro-area counterparts before euro adoption, but become much more similar afterwards. The main remaining visual difference is that Slovak inflation responses do not display the delayed convergence pattern observed for the euro area.

The IRFs thus provide the dynamic counterpart to the coefficient evidence. The coefficient estimates show that the contemporaneous supply and demand schedules changed after euro adoption; the impulse responses show that these changes mattered for shock propagation. In an AS–AD interpretation, the sharp decline in the inflation-output ratio following demand shocks is primarily driven by the flattening of the supply curve, while the reduced magnitudes of responses to supply shocks reflect the joint flattening of supply and demand schedules. Slovakia therefore did not merely move closer to the euro area in static elasticities. It also began to absorb domestic shocks in a more euro-area-like way.

Fig. 4: Similarity of Slovak and euro area IRFs (domestic to domestic)



Note: The figure compares the impulse response functions in Figure 3 (domestic responses to Slovak shocks) to the ones in Figure 2 (domestic responses to euro area shocks). We focus on responses within the first two years after the shock. The figure reports the overlap coefficient of posterior distributions horizon by horizon (green: pre-euro period; blue: post-euro period). In black, we also report the posterior probability that the Slovak response moves closer to the corresponding euro-area response. Higher values indicate greater similarity.

Figure 4 quantifies where this dynamic convergence is statistically strongest. We apply the same similarity measures as in Table 1 on a horizon-by-horizon basis to four impulse responses: Slovak output and inflation to Slovak demand and supply shocks, compared with euro area output and inflation to their respective domestic demand and supply shocks. Since the relevant responses are close to zero after two years, we focus on the first eight quarters after the shock. The posterior probability that Slovak responses move closer to their euro-area counterparts averages around 75%. It is highest shortly after impact, when the large pre-euro differences in impact responses matter most. The overlap coefficients show a similar pattern. For output responses, overlap with the euro-area posterior is systematically higher after euro adoption at all horizons. For inflation responses, the statistical evidence indicates greater similarity mainly during the first two quarters. At longer horizons, the convergence measures weaken because Slovak and euro-area inflation responses differ in their timing: euro-area inflation converges with a delay, while Slovak inflation adjusts more quickly.

The figures also report responses to monetary policy shocks for completeness. These responses display broadly plausible qualitative patterns: contractionary monetary policy shocks reduce output and inflation, though with differences in transmission speed and posterior precision across regimes. Since monetary policy shocks are not central to our research question and are less stable across specifications than responses to supply and demand shocks, we treat them as a diagnostic check rather than as primary evidence.

Taken together, the dynamic evidence reinforces the coefficient evidence. Euro adoption was associated not only with more euro-area-like structural elasticities, but also with economically meaningful changes in the way domestic shocks propagate through the Slovak economy. Dynamic convergence is strongest for the immediate absorption of shocks and for output responses over business-cycle horizons. Inflation dynamics also become more euro-area-like on impact, but convergence is less complete at later horizons because the timing of inflation adjustment remains different. Thus, Slovakia's post-euro adjustment mechanism becomes substantially closer to the euro-area benchmark, but the convergence is not uniform across variables or horizons.

4.3 Interpreting post-euro convergence

The preceding subsections show that euro adoption was associated with convergence in both structural elasticities and dynamic adjustment. Slovakia's Phillips curve flattened markedly, domestic demand shocks became much less inflationary, and the responses of Slovak output and inflation to domestic shocks moved closer to their euro-area counterparts. At the same time, convergence was not uniform: it was strongest on the supply side and in the immediate absorption of shocks, while demand-side elasticities and longer-horizon inflation responses remained more heterogeneous. This section interprets these patterns as the result of three complementary mechanisms: the formalization of the euro-area nominal anchor, the changing information content of the policy rate, and deeper real-side integration with the euro area.

The estimated monetary-policy rules provide direct evidence on the regime change underlying these mechanisms. As discussed in Section 2, pre-euro Slovak monetary policy was conducted in a setting shaped by inflation targeting, exchange-rate stabilization, and convergence towards euro adoption. Our Taylor-rule estimates show how this institutional setting is reflected in the data. Before euro adoption, Slovak monetary policy displayed a strong dependence on ECB policy rates. In the estimated Slovak policy rule, the posterior distribution of the coefficient on euro-area interest rates shifts decisively away from its prior centered at zero, with a posterior median of about 2.6; see Figure C.6 in the Appendix. This indicates that the NBS imported a substantial part of the euro-area nominal anchor even before formal entry into the monetary union. At the same time, the estimated rule also makes clear that the pre-euro Slovak policy rate was not simply the ECB rate. It was a domestic policy instrument set in a hybrid regime: strongly aligned with ECB rates, but still embedded in Slovakia's own inflation-targeting and exchange-rate-stabilization framework. After euro adoption, this hybrid policy instrument was replaced by the ECB rate itself. The estimated ECB rule is also smoother and more precisely identified than the pre-euro Slovak rule, consistent with a more predictable policy environment. This is in line with evidence that more credible central banks require less short-term policy-rate volatility to achieve their objectives (Levieuge et al., 2018).

This reading of the Taylor-rule estimates helps rationalize the joint pattern of coefficient and impulse-response results. The strong pre-euro dependence on ECB rates suggests that Slovakia was already partially anchored to euro-area monetary conditions before 2009, which helps explain why some convergence was visible even before formal adoption. But because the NBS rate remained a domestic policy instrument, movements in that rate could still contain information about Slovakia-specific monetary conditions beyond the pure intertemporal price of consumption. A rate increase could reflect tighter borrowing conditions, but also the domestic policy response to inflationary pressure, exchange-rate tensions, or convergence-related credibility concerns. This makes the pre-euro interest-rate semi-elasticity of demand more negative: households and firms react not only to higher borrowing costs, but also to the broader macroeconomic signal embedded in a domestic policy-rate increase. After euro adoption, the policy rate relevant for Slovakia became the ECB rate, which was no longer set in response to Slovakia-specific conditions. The post-euro decline in the absolute value of β^r is therefore best interpreted as a change in the information content of the policy rate, rather than as evidence that monetary transmission disappeared.

The same regime interpretation also helps explain the supply-side results. A more credible and formalized nominal anchor reduces the extent to which domestic demand pressures translate into inflation. This is exactly what we observe in the post-euro increase in α^π and in the sharp decline of the inflation response to Slovak demand shocks. The evidence is therefore consistent with a shift in the expectations environment faced by price setters: after euro adoption, firms' pricing decisions became more closely tied to the euro-area price-stability regime and less sensitive to domestic cyclical conditions. This interpretation is consistent with evidence that inflation expectations are central for Phillips-curve dynamics and that better anchoring reduces the sensitivity of inflation to domestic slack (Coibion and Gorodnichenko, 2015; Hazell et al., 2022). It is also consistent with open-economy arguments linking external integration to lower inflation sensitivity (Romer, 1993; Temple, 2002; Gali and Monacelli, 2005; Lubik and Schorfheide, 2007).

Real-side integration provides a complementary channel for the observed changes in shock propagation. Deeper trade integration implies that domestic demand expansions are increasingly accommodated through imports rather than domestic price increases, while supply disturbances can be partly absorbed through cross-border sourcing and production networks. This shifts adjustment away from prices and towards quantities, dampening inflation responses and changing the output-inflation composition of domestic shocks. For Slovakia, the scale of this integration was large: exports and imports jointly amounted to around 60% of GDP in 1999, rose to 170% in 2008, and averaged 182% after euro adoption. This mechanism aligns closely with the post-euro decline in the inflation-output impact ratio following demand shocks and reinforces the interpretation that Slovakia's adjustment dynamics became more closely tied to those of the euro area.

The resulting pattern is one of economically meaningful but uneven convergence. The supply side adjusts strongly because price setting and wage formation are directly affected by nominal anchoring, institutional credibility, common euro-area price dynamics, and external competitive pressures. The demand side converges more selectively because parts of household and firm expenditure behavior remain governed by purchasing-power effects, financial frictions, and balance-sheet heterogeneity that are less directly transformed by the monetary-policy regime. From this perspective, euro adoption is best interpreted not merely as a change in the institution setting the policy rate, but as a broader regime shift affecting the environment in which firms and households make pricing, production, and spending decisions. The Slovak case is therefore informative beyond Slovakia: it shows how monetary integration can reshape private-sector propagation mechanisms in a small open economy, particularly when formal currency-union entry consolidates a nominal anchor that had already influenced domestic policy before adoption.

4.4 Robustness

This subsection assesses the robustness of the main empirical findings to a range of alternative specifications and identification choices. Across most robustness checks considered, the central results of the paper – the convergence of Slovak supply and demand elasticities toward their euro area counterparts after euro adoption, and the associated convergence in domestic adjustment dynamics – remain intact, see the average statistics reported in Table 2. On the level of individual coefficients, our results show that the slope of the Slovak Phillips curve has certainly converged. By contrast, inflation elasticities of demand seem to change little with the introduction of the euro. The interest rate sensitivity changes strongly, but overshooting creates some uncertainty on whether this coefficient converges or not.

Table 2: Average similarity measures of structural supply and demand coefficients, robustness checks

	P(closer to EA)	Overlap (pre)	Overlap (post)	Δ(Overlap)
baseline	77.8%	21.6%	47.2%	25.5%
cost-push spillovers	75.5%	21.4%	33.9%	12.4%
incl. VSTOXX	74.8%	25.1%	46.1%	21.0%
incl. log gEPU	75.8%	25.3%	44.5%	19.2%
incl. world IP growth	57.0%	32.8%	24.8%	-8.0%
incl. oil price growth	77.5%	21.1%	40.6%	19.5%
incl. gas price growth	73.1%	20.2%	33.2%	13.1%
more crisis dummies	60.9%	19.7%	42.4%	22.7%
HP filter	84.2%	15.5%	40.7%	25.2%
drop adj period (07Q1-10Q4)	71.5%	28.0%	41.1%	13.1%
drop quant manag (99Q1-01Q4)	70.0%	33.9%	47.0%	13.1%
separate coefficients, EA	42.8%	16.5%	28.9%	12.4%

Note: The first column shows the probability that Slovak coefficients are closer to EA coefficients post euro introduction compared to before. The second and third column report the density overlap between the posterior distributions of Slovak (pre/post) and euro area coefficients. For each robustness check, we report the average of statistics across $(\alpha^{\pi}, \beta^{\pi}, \beta^{r})$.

In a first set of robustness checks, we vary the level of detail of the links between Slovakia and the rest of the euro area, see the first block of Table 2. In one model variation, we add a direct dependence of Slovak supply to euro area inflation (*cost-push spillovers*). In a set of variations, we allow for common fluctuations of demand in Slovakia and the rest of the euro area due to global developments (stock market volatility $VSTOXX$, global economic policy uncertainty $log\ gEPU$ or world industrial production growth *world IP growth*). Contemporaneously, these variables enter demand curves, and depend on euro area variables only. In a last set of variation, we treat common sources of supply fluctuations (specifically, oil and gas price growth) similar to the previous group of tests – with the difference that the additional variable enters supply curves instead. More detailed sources of common variation and spillovers does not qualitatively affect our results. In all but one case, the average probability that coefficients move closer is above 73%. The overlap of posterior distributions is larger post euro introduction, see the positive values in the column Δ(Overlap). Differences in this column arise mostly because the overlap of the interest rate sensitivity of demand β^r post euro introduction depends on how far this coefficient is pressed against zero. An extreme case is the robustness check with world industrial production. Here, the Slovak interest rate sensitivity falls so much that β^r is farther away from its euro area counterpart after euro introduction, and that distributional overlap falls.

In a second group of tests, we vary the treatment of the data, see the second block of Table 2. In one test, extend the outlier treatment using pandemic priors to the global financial crisis and the sovereign debt crisis. In another variation, we estimate the model with HP-filtered cyclical components (for inflation and interest rates in Slovakia and the rest of the euro area) instead of the detrending mechanism proposed above. We also drop a four year adjustment period from 2007Q1 to 2010Q4 altogether from the data, or the three-year period at the beginning of our sample (1999Q1-2001Q4) when the Slovak National Bank still conducted monetary policy through quantitative management of money supply. We find qualitatively similar results: coefficients move closer and overlap coefficients increase. This indicates that the documented convergence is not driven by the specific detrending procedure, or specific times.

As our last robustness check, we allow euro area coefficients to also vary across subsamples. Effectively, this leads to two structural VAR models, each estimated on a different sample of the data. This test indicates differences to the baseline model. A breakdown to the level of supply and demand elasticities shows that this is because Slovak demand elasticities do not converge with the introduction of the euro. However, supply elasticities are surprisingly similar: The probability to move closer is above 75%, and the post-euro overlap coefficient is around 70%.

Moving beyond structural contemporaneous coefficients, we find that impulse responses to identified monetary policy shocks are less robust across specifications. While the qualitative responses – contractionary policy shocks reducing output and generating delayed disinflation – are broadly plausible, their magnitude and persistence are more sensitive to modeling choices than the responses to supply and demand shocks. For this reason, and in line with recent evidence emphasizing the growing difficulty of identifying monetary policy shocks in rule-based policy environments (Ramey, 2016), we treat these responses as diagnostic rather than as central to the convergence analysis.

Taken together, the robustness checks reinforce the interpretation that euro adoption was associated with economically meaningful changes in the structure of the Slovak economy. The convergence of supply and demand elasticities and of domestic adjustment dynamics persists across alternative transmission channels, data treatments and identification schemes, while the relative fragility of monetary policy shock responses underscores the importance of focusing on the propagation of real shocks when assessing structural convergence.

5 Conclusion

This paper studies how Slovakia's adoption of the euro in 2009 altered the structural macroeconomic relationships governing inflation, output, and monetary policy. Using a two-country structural VAR with regime-specific restrictions, we document a pronounced change in the Slovak economy's adjustment mechanisms following euro adoption. In the pre-euro period, Slovakia was characterized by highly elastic supply and demand curves and correspondingly large inflation responses to macroeconomic shocks. After joining the monetary union, the Phillips curve flattens substantially and the inflation elasticity of aggregate demand declines, leading to a markedly reduced inflation-output trade-off.

A key finding is that these changes are not merely qualitative. Post-euro Slovak supply and demand relationships become quantitatively similar to their euro area counterparts. This convergence extends beyond the disappearance of an independent national monetary policy rule and reflects a broader alignment in how macroeconomic disturbances are transmitted and absorbed. In particular, the dampened inflation responses to both supply and demand shocks indicate a shift away from price adjustment toward quantity adjustment, bringing Slovak dynamics closer to those prevailing in the euro area.

While our empirical framework does not identify the underlying microeconomic channels, the pattern of results is consistent with two complementary mechanisms emphasized in the literature. First, euro adoption strengthened nominal anchoring by credibly tying Slovak monetary conditions to those of the ECB, stabilizing inflation expectations and reducing the sensitivity of price setting to domestic cyclical conditions. Second, deeper real integration with the euro area increased the scope for cross-border adjustment through trade and production networks, allowing domestic shocks to be partially absorbed via external reallocation rather than domestic price changes.

Taken together, our findings suggest that euro adoption should be interpreted not only as a change in the conduct of monetary policy, but as a regime shift that reshapes the economic environment in which firms and households make pricing, production, and spending decisions. For small open economies, monetary integration can therefore lead to genuine structural convergence, altering the nature of macroeconomic adjustment well beyond the mechanical loss of an independent policy instrument.

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A Data

This section provides additional details on the data. Table A gives a data description, Figure A.1 plots EA data, and Figures A.2 and A.3 show original and detrended Slovak data. Section A.1 describes how we combine the pandemic priors of Cascaldi-Garcia (2022) with the structural VAR framework of Baumeister and Hamilton (2015).

Table A.1: Data description

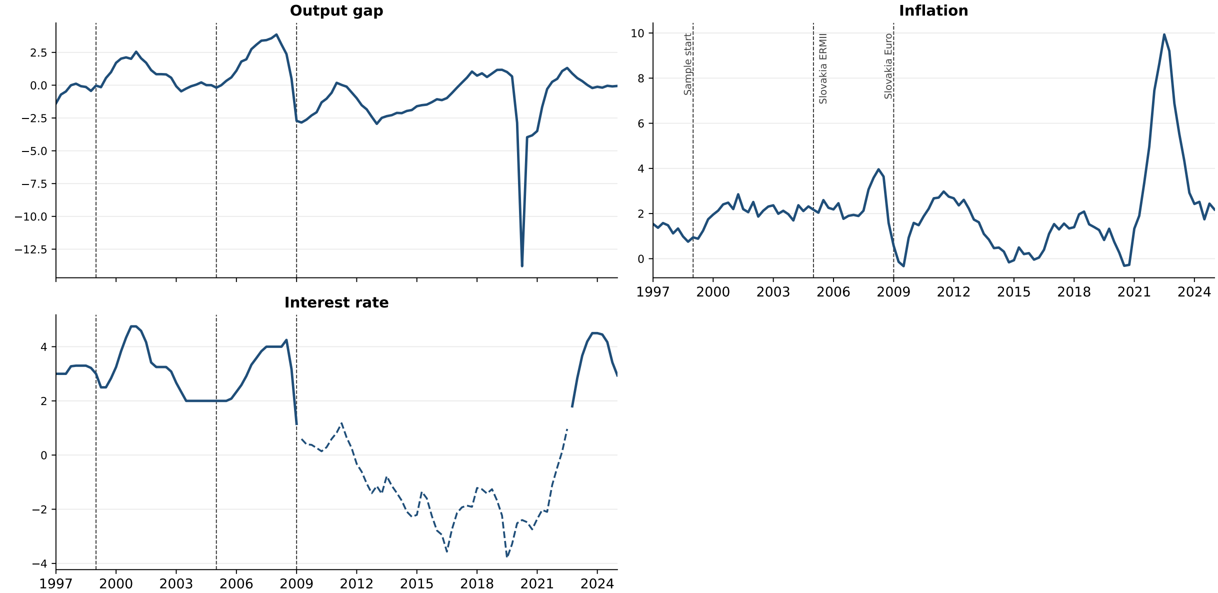
Variable	Description	Source	Treatment
	Baseline model		
y	output gap	ECB and NBS (confidential)	none
π	year-on-year inflation rate calculated from harmonized indices of consumer prices (all items)	ECB	detrended (SK)
r	monthly policy rates and Wu-Xia shadow rates	ECB, NBS, and Cynthia Wu's website	quarterly average, detrended (SK)
σ	nominal exchange rate, Slovak crowns per euro	Macrobond	quarterly average, detrended
	Robustness checks		
VSTOXX	European stock market volatility	Macrobond	
gEPU	global economic policy uncertainty	Baker et al. (2016)	log
world IP	IP index, OECD + 6 NME	Baumeister and Hamilton (2019)	yoy growth
oil	Crude Oil $/BBl	ECB	yoy growth
gas	XYZ	Macrobond	yoy growth
	Country weights		
$GDP(real)$	use to calculate *GDP weights* $\omega_{SK}, \omega_{REA}$	Eurostat	average (post-euro)

A.1 Outlier treatment

We treat the outliers occuring in periods of extreme fluctuations like Covid using the pandemic priors of Cascaldi-Garcia (2022). These priors use dummy observations for Covid observations in a Minnesota prior framework. By increasing or decreasing the prior precision ϕ of these dummies, we can choose the degree of downweighting. The optimal precision ϕ maximizes the marginal likelihood of the data.

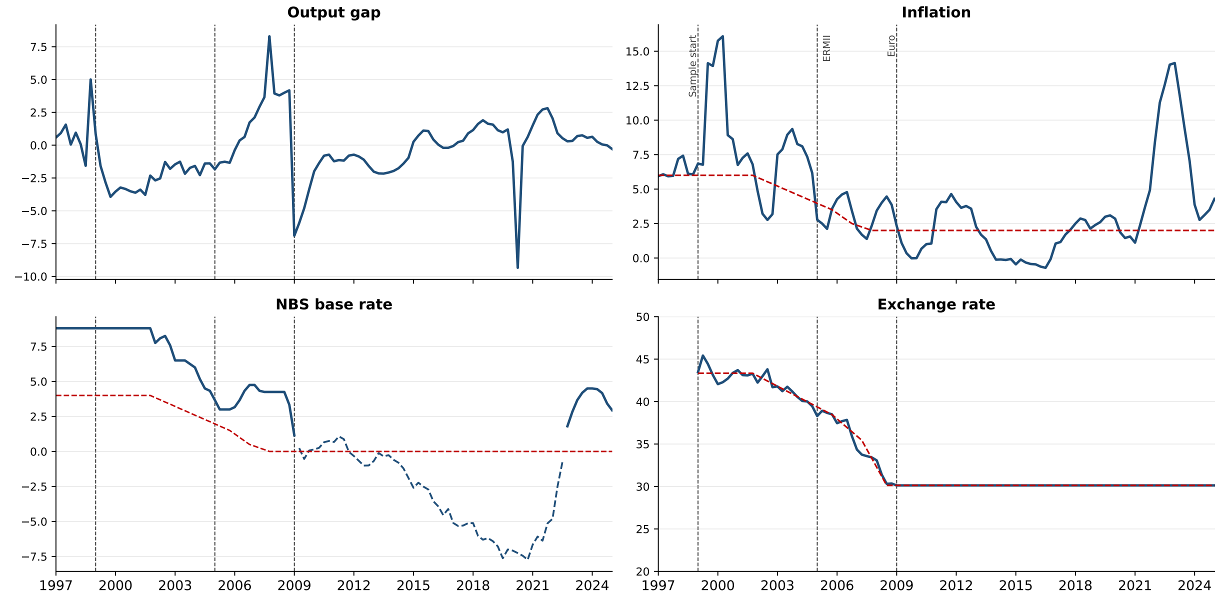
The important feature for us is that the optimal precision ϕ depends on the specification of the reduced form model, and is independent of priors on the structural form.

Fig. A.1: Endogenous variables, euro area



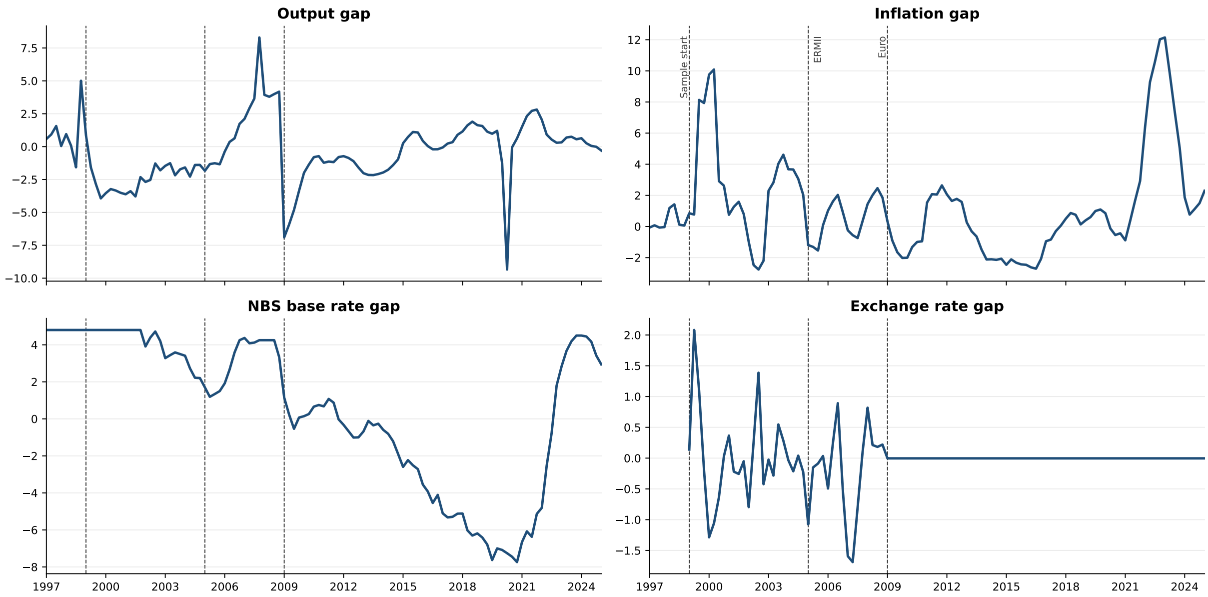
Note: The original data are shown in blue. During the ZLB (dashed lines), we replace the ECB base rate with Wu-Xia shadow rates.

Fig. A.2: Original endogenous variables, Slovakia



Note: Original Slovak data are shown in blue. We replace NBS base rate with the ECB base rate after 2009. Red dashed lines indicate the time-varying trends explained in section 3.4: π_t^* for inflation, $r_t^* - \bar{r}$ for the NBS base rate and σ_t^* for the exchange rate.

Fig. A.3: Detrended endogenous variables, Slovakia



Note: Detrended Slovak data are shown in blue.

That is, we integrate the approach of Cascaldi-Garcia (2022) into the informative prior framework of Baumeister and Hamilton (2015) by performing the following steps:

- Specify a Minnesota prior for reduced form lags and variances. Include a dummy for Covid observations (2020Q1-2020Q3) with yet-unknown precision ϕ.
- Choose precision ϕ^* that maximizes the marginal likelihood of the data. We find $\phi^* = 0.69$ in the baseline model.
- Use the same Minnesota prior given ϕ^*, together with the priors on structural contemporaneous coefficients $\mathbf{A}$ (see below) to identify the structural VAR.

On top of a single dummy for all Covid observations, we tested individual weights for each period (which effectively removes the observations). We also ran regressions where we used the same approach to reduce the role of observations during the financial crisis (2008Q3-2009Q1) and sovereign debt crisis (2011Q3-2012Q2). Results are robust to these alternative specifications.

B Empirical model

This section summarizes the empirical implementation of the model, including the treatment of sample splits, prior specification, and posterior sampling.

B.1 Dealing with sample splits

To formalize the two-country structural VAR described in the main text, we aim to write the model in matrix notation as

$$\mathbf{A}^{(r)}\mathbf{y}_t = \mathbf{B}^{(r)}\mathbf{x}_{t-1} + \mathbf{u}_t, \qquad \mathbf{u}_t \sim \mathcal{N}(0, \mathbf{D}^{(r)}), \qquad r \in \{\text{pre}, \text{post}\}, \tag{B.1}$$

where $r \in \{\text{pre}, \text{post}\}$ indexes the two regimes. The $(n \times 1)$ vector of endogenous variables is $\mathbf{y}_t = (y_t^{SK}, \pi_t^{SK}, r_t^{SK}, \sigma_t^{SK}, y_t^{REA}, \pi_t^{REA}, r_t^{REA})'$. The $(k \times 1)$ vector $\mathbf{x}_{t-1}$ stacks $p = 4$ lags of all endogenous variables and a constant. The $(n \times 1)$ vector of structural shocks $\mathbf{u}_t = (u_t^{SK,s}, u_t^{SK,d}, u_t^{SK,m}, u_t^{SK,\sigma}, u_t^{REA,s}, u_t^{REA,d}, u_t^{REA,m})'$ is independently normally distributed with mean zero and (regime-dependent) variance $\mathbf{D}^{(r)}$.

The notation above brushes across three features of our model: first, the number of endogenous and lagged variables is not identical across structural equations. Second, the number of structural equations is not the same in each regime. Third, the equations in the rest of the euro area are restricted to be equal across regimes in the baseline model. In the following, we break these features down. To do so, we need to introduce some notation first, which we will use to define selection matrices. These selection matrices map the structural model in equation-by-equation form into the matrix notation.

Our baseline model consists of $n_s = 9$ distinct structural equations (indexed j): four Slovak equations in the pre-euro regime, two Slovak equations in the post-euro regime, and three euro-area equations that are common across regimes. For each equation j, let $R_j \subseteq \{\text{pre}, \text{post}\}$ denote the set of regimes in which the equation is active. Within each active regime $r \in R_j$, equation j corresponds to a unique type of structural equation $i \in \{1, \cdots, 7\}$, where the first four equations relate to Slovakia (supply, demand, monetary policy and exchange rates) and the last three to the rest of the euro area. Because of the structural break, Slovak supply and demand appears twice. The correspondence between j, r and i by the mappings $m(r, i) = j$ and $i = m^{-1}(r, j)$.

Overall, we have $n = 7$ endogenous variables $\mathbf{y}_t$. However, for Slovakia during the post regime and for equations on the rest of the euro area, this number drops to five as Slovak interest and exchange rates drop out. Let $\mathcal{N}_j \subset \{1, \ldots, n\}$ denote the (sub-)set of contemporaneous variables included in equation j, and $\mathbf{y}_t^{(j)}$ the corresponding vector of endogenous variables. We can formalize these subsets using a selection matrix S_j^y: For each structural equation j, let $\mathcal{N}_j \subset \{1, \ldots, n\}$ denote the (sub-)set of contemporaneous variables included in that equation. Then, the $(|\mathcal{N}_j| \times n)$-matrix S_j^y is the corresponding selection matrix for which $\mathbf{y}_t^{(j)} = S_j^y \mathbf{y}_t$.

We work with three different selection matrices. First, Slovak equations prior to euro introduction include all variables. Second, Slovak equations post euro introduction and REA equations exclude Slovak interest and exchange rates. Third, ECB monetary policy post euro introduction adds size weights for output gaps and inflation.

$$S_j^y = \mathbf{I}_7, \qquad j \in \{m(r,i) | r = pre; i \in 1, \ldots, 4\}$$

$$S_j^y = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix}, \qquad \begin{array}{r} j \in \{m(r,i) | (r = pre; i \in \{5,6,7\}) \cap \ldots \\ (r = post; i \in \{1,2,5,6\})\} \end{array}$$

$$S_j^y = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ \omega_{SK} & 0 & 0 & 0 & \omega_{REA} & 0 & 0 \\ 0 & \omega_{SK} & 0 & 0 & 0 & \omega_{REA} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix}, \quad j \in \{m(r,i) | (r = post; i = 7)\}$$

Similarly, the vector $\mathbf{x}_t^{(j)}$ contains the subset of variables relevant in equation j from the $(k \times 1)$ vector $\mathbf{x}_{t-1}$ (which stacks $p = 4$ lags of all seven endogenous variables and a constant). We define the $(|\mathcal{K}_j| \times k)$-matrix S_j^x be the corresponding selection matrix that selects the $\mathcal{K}_j \subset \{1,\ldots,k\}$ the (sub-)set of lagged regressors, i.e. $\mathbf{x}_{t-1}^{(j)} = S_j^x \mathbf{x}_{t-1}$. Here, we work with two different selection matrices because we keep the role of lagged variables for ECB monetary policy fixed across regimes.

$$S_j^x = \mathbf{I}_k, \qquad j \in \{m(r,i)|r = pre; i \in 1,\ldots,4\}$$

$$S_j^x = \begin{pmatrix} kron\left(\mathbf{I}_p, \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix}\right) & \mathbf{0}_{|\mathcal{K}_j|-1,1} \\ \mathbf{0}_{1,k-1} & 1 \end{pmatrix}, \qquad \begin{matrix} j \in \{m(r,i)|(r = pre; i \in \{5,6,7\}) \cap \ldots \\ (r = post; i \in \{1,2,5,6,7\})\} \end{matrix}$$

These selection matrices allow us to write the structural equations in vector form

$$\begin{aligned} \mathbf{a}_j^{'}\mathbf{y}_t^{(j)} &= \mathbf{b}_j^{'}\mathbf{x}_{t-1}^{(j)} + u_t^{(j)} \\ \iff \left(\mathbf{a_j}^{'} S_j^y\right)\mathbf{y}_t &= \left(\mathbf{b_j}^{'} S_j^x\right)\mathbf{x}_{t-1} + u_t^{(j)}. \end{aligned}$$

Using the mapping $j = m(r,i)$, the vectors of structural contemporaneous coefficients $\mathbf{a}_j^{'}$ during the Slovak pre-regime are:

$$\begin{aligned} \mathbf{a}_{SK,s}^{pre} &= (1,\, -\alpha^{SKK,\pi},\, 0,\, -\alpha^{SKK,\sigma},\, 0,\, 0,\, 0)^{'}, \\ \mathbf{a}_{SK,d}^{pre} &= (1,\, -\beta^{SKK,\pi},\, -\beta^{SKK,r},\, -\beta^{SKK,\sigma},\, -\beta^{SKK,y^{REA}},\, 0,\, 0)^{'}, \\ \mathbf{a}_{SK,m}^{pre} &= \big(-(1-\rho^{SKK})\psi^{SKK,y},\, -(1-\rho^{SKK})\psi^{SKK,\pi},\, 1,\, \ldots \\ &\quad -(1-\rho^{SKK})\psi^{SKK,\sigma},\, 0,\, 0,\, -(1-\rho^{SKK})\psi^{SKK,r^{REA}}\big)^{'}, \\ \mathbf{a}_{SK,\sigma}^{pre} &= (-\phi^{\Delta y},\, -\phi^{\Delta\pi},\, -\phi^{\Delta r},\, \phi^{\Delta y},\, \phi^{\Delta\pi},\, \phi^{\Delta r},\, 1)^{'}. \end{aligned}$$

Slovak interest and exchange rates do not appear in equations j corresponding to the REA (both regimes) or Slovakia post euro introduction. The corresponding $\mathcal{N}_j \times 1$ vectors of structural contemporaneous coefficients are therefore:

$$\begin{aligned} \mathbf{a}_{SK,s}^{post} &= (1,\, -\alpha^{SKEUR,\pi},\, 0,\, 0,\, 0)^{'}, \\ \mathbf{a}_{SK,d}^{post} &= (1,\, -\beta^{SKEUR,\pi},\, -\beta^{SKEUR,y^{REA}},\, 0,\, -\beta^{SKEUR,r})^{'}, \\ \mathbf{a}_{REA,s}^{pre} = \mathbf{a}_{REA,s}^{post} &= (0,\, 0,\, 1,\, -\alpha^{REA,\pi},\, 0)^{'}, \\ \mathbf{a}_{REA,d}^{pre} = \mathbf{a}_{REA,d}^{post} &= (0,\, 0,\, 1,\, -\beta^{REA,\pi},\, -\beta^{REA,r})^{'}, \\ \mathbf{a}_{REA,m}^{pre} = \mathbf{a}_{REA,m}^{post} &= \big(0,\, 0,\, -(1-\rho^{REA})\psi^{REA,y},\, -(1-\rho^{REA})\psi^{REA,\pi},\, 1\big)^{'}. \end{aligned}$$

Since $\left(\mathbf{a_j}^{'} S_j^y\right)$ is a $(1 \times n)$ vector (and $\left(\mathbf{b_j}^{'} S_j^x\right)$ a $(1 \times k)$ vector) for all equations j, we can stack the vectorized structural equations. For each regime r, this results in the matrix formulation in B.1 with:

$$\mathbf{A}^{(r)} = \left(\mathbf{a_j}^{'} S_j^y\right)_{j=m(r,\cdot)} \qquad \mathbf{B}^{(r)} = \left(\mathbf{b_j}^{'} S_j^x\right)_{j=m(r,\cdot)} \qquad \mathbf{D}^{(r)} = diag(d_j)_{j=m(r,\cdot)}$$

Note that $\mathbf{A}^{post}$ is a (5×7) matrix. In some instances, squared matrices are needed, for example for the computation of impulse response functions. In this case, we remove the 3rd and 4th column, which correspond to Slovak interest and exchange rates.

In the following, we will first describe our priors for the different elements in $\mathbf{A}^{(r)}, \mathbf{B}^{(r)}, \mathbf{D}^{(r)}$. Afterwards, we will describe the posterior sampler.

Table B.2: Prior on contemporaneous parameters

Parameter	Prior mode	Prior scale	Restrictions
Parameters set as in Baumeister and Hamilton (2018) for regime-country $c \in \{SKK, SKEUR, REA\}$			
Student-t distribution with 3 degrees of freedom			
$\alpha^{c,\pi}$	2	0.4	≥ 0
$\beta^{c,r}$	-1	0.4	≤ 0
$\beta^{c,\pi}$	0.75	0.4	
$\psi^{c,\pi}$	1.5	0.4	≥ 0, drop for $c = SKEUR$
$\psi^{c,y}$	0.5	0.4	≥ 0, drop for $c = SKEUR$
Beta(2.6,2.6)			
ρ^c	0.5	0.2	$0 \leq \rho^c \leq 1$, drop for $c = SKEUR$
Additional parameters for Slovakia			
Student-t distribution with 3 degrees of freedom			
$\beta^{SKK,y^{REA}}$	0.5	0.4	≥ 0
$\beta^{SKEUR,y^{REA}}$	0.5	0.4	≥ 0
$\psi^{SKK,r^{REA}}$	0	0.4	

B.2 Informative priors on contemporaneous parameters

We implement prior beliefs on the structural contemporaneous coefficients $p(\mathbf{A}^{pre}, \mathbf{A}^{post})$ as in Baumeister and Hamilton (2018). We set a t-distribution with a prior scale of 0.4 and three degrees of freedom for the majority of parameters, allowing for heavier tails compared to a normal distribution. We follow Baumeister and Hamilton (2018) in the prior specifications for the parameters of their closed-economy model, shown in the upper block of Table B.2. For the elasticity of Slovak demand with respect to euro-area output, $\beta^{SKK,y^{REA}}$, $\beta^{SKKEUR,y^{REA}}$, we follow the prior specification of Camehl and von Schweinitz (2026). The coefficient $\psi^{SKK,r^{REA}}$ is chosen to be relatively uninformatively centered at zero.

Following Baumeister and Hamilton (2018), we impose two additional sets of priors related to impact responses to economic shocks. For these priors, we use non-dogmatic asymmetric t-distributions with location parameter μ, scale parameter σ, degrees of freedom ν, and shape parameter λ, the latter one controlling the degree of asymmetry. First, we assume for every regime-country combination that the output response to a contractionary domestic monetary policy shock is smaller than the interest rate response ($\mu = -0.3; \sigma = 0.5; \nu = 3; \lambda = -2$). This prior leaves 12.5% chance that the output reaction is (in absolute terms) larger than the interest rate response, and a 4.5% chance that it is positive. Second, we set a prior distribution on $\beta^{c,\pi} - \beta^{c,r}(1-\rho^c)\psi^{c,\pi}$ as in Baumeister and Hamilton (2018). In a New-Keynesian model, this element describes the slope of the IS curve after replacing nominal interest rates by the monetary policy rule. Because we assume a negative slope, we use an asymmetric t-distribution with mode $\mu = -0.1$, scale $\sigma = 1$, degrees of freedom $\eta = 3$ and asymmetry parameter $\lambda = -4$, allowing for a 6.5%

chance of a positive slope.

B.3 Remaining priors

We use normal-inverse gamma prior distributions for the structural lag and variance coefficients in each equation j, $p(d_j|\mathbf{A}^{pre}, \mathbf{A}^{post})$ and $p(\mathbf{b}_j|\mathbf{A}^{pre}, \mathbf{A}^{post}, d_j)$ (Baumeister and Hamilton, 2018). These priors come from a standard Minnesota prior which is cast into a structural form using the structural contemporaneous coefficients. Priors are defined for all structural equations j. When we calculate these priors, we account for differences in equations and regimes.

Let $\mathbf{S}^{(r)}$ be the variance-covariance matrices of reduced-form residuals from AR(p) regressions of the endogenous variables, and T_r the number of observations in regime r. Let T be the total number of observations. Using the mapping $i = m^{-1}(r, j)$, the prior distribution of structural variances in equation j is given by:

$$\begin{aligned} p(d_j^{-1}|\mathbf{A}^{pre}, \mathbf{A}^{post}) &= \gamma(\kappa, \tau_j) \\ \kappa &= 2 \\ \tau_j &= \kappa \sum_{r\in R_j} \frac{T_r}{T} \mathbf{a}_i^{(r)} \mathbf{S}^{(r)} \mathbf{a}_i^{(r)\prime} \end{aligned}$$

For Minnesota scaling, we require regressor-specific variance estimates constructed from the reduced-form AR(p) residual covariances. Let $s_q^{(r)} \equiv \mathbf{S}_{q,q}^{(r)}$ denote the reduced-form residual variance of variable $q \in \{1, \ldots, 7\}$ in regime r, and let $\bar{s}_q \equiv \sum_{r\in\{\text{pre,post}\}} \frac{T_r}{T} s_q^{(r)}$ denote the corresponding observation-weighted pooled variance. For euro-area variables we use the pooled variance $\bar{s}_q$ throughout. For Slovak variables, the appropriate regressor scale depends on whether the structural equation is regime-specific or estimated over both regimes: if $R_j = \{r\}$ (Slovak equations) we use $s_q^{(r)}$, whereas if $R_j = \{\text{pre,post}\}$ (REA equations) we use $\bar{s}_q$. We denote the resulting regressor scale by $s_q(j)$.

Let the $n \times k$ matrix η encode standard Minnesota prior means for reduced-form autocorrelation of variables with value 0.75 for the first own lag of the dependent variable and zero otherwise. However, remember that the vector of structural lagged coefficients $\mathbf{b}_j \in \mathbb{R}^{|\mathcal{K}_j|}$ does not include coefficients on excluded variables. Therefore, we rely on the selector matrix S_j^x to pick the right columns of η. Moreover, let us introduce a regressor index $\iota \in \mathcal{K}_j$, and let $q(\iota) \in \{1, \ldots, n\}$ denote the associated variable and $\ell(\iota) \in \{1, \ldots, p\}$ the associated lag order.

Then, the prior distribution of $\mathbf{b}_j$ is (conditional on $\mathbf{A}$ and d_j)

$$\begin{aligned} p(\mathbf{b}_j|\mathbf{A}^{pre}, \mathbf{A}^{post}, d_j) &= \mathcal{N}(\mathbf{b}_j; \mathbf{m}_j, d_j\mathbf{M}_j) \\ \mathbf{m}_j &= \left(\mathbf{a}_j' \eta_j\right)' \end{aligned}$$

where $\tilde{\mathbf{M}}_j$ is diagonal with ι-th diagonal element

$$\left(\tilde{\mathbf{M}}_j\right)_{\iota,\iota} = \begin{cases} \lambda_0^2 \, \frac{\lambda(j,\iota)^2}{\ell(\iota)^2} \, \frac{1}{s_{q(\iota)}(j)} & \text{if } \iota \text{ corresponds to lagged endogenous} \\ 100 & \text{if } \iota \text{ corresponds to constant} \\ \frac{1}{(\phi^*)^2} & \text{if } \iota \text{ corresponds to Covid dummies} \end{cases} .$$

We introduce two different confidence factors: $\lambda_0 = 0.1$ describes our overall confidence in the Minnesota prior, and $\lambda(j, \iota)$ is an additional scaling parameter which we set to 0.1 for

Slovak variables in REA equations, and 1 otherwise. This parameter embodies our belief that Slovak developments have little to no influence on euro area economic outcomes.

In the two monetary policy equations, we additionally incorporate our belief that the central banks smooth interest rate adjustments over time. Therefore, we add a second prior for this equation that the first lag coefficient on domestic interest rates should be centered around ρ^{SKK}, ρ^{REA}, and set a variance of $V = 10$ around these two priors (Baumeister and Hamilton, 2018).

B.4 Posterior sampling

Posterior inference is based on a Metropolis-within-Gibbs algorithm that targets the joint posterior distribution

$$p\big(\mathbf{A}^{pre}, \mathbf{A}^{post}, \{d_j, \mathbf{b}_j\}_{j=1}^{n_s} \mid \mathbf{Y}_T\big)\,.$$

Following Baumeister and Hamilton (2015, 2018) and Camehl and von Schweinitz (2026), marginal posterior draws of the contemporaneous coefficient matrices $\mathbf{A}^{pre}$ and $\mathbf{A}^{post}$ are obtained using a Metropolis–Hastings step, while structural variances d_j and lag coefficients $\tilde{\mathbf{b}}_j$ are drawn from their known conditional posterior distributions.

The marginal posterior density of the contemporaneous coefficients is given by

$$p(\mathbf{A}^{pre}, \mathbf{A}^{post} \mid \mathbf{Y}_T) \propto \; p(\mathbf{A}^{pre}, \mathbf{A}^{post}) \prod_{r \in \{\text{pre,post}\}} \big[\det(\mathbf{A}^{(r)}\mathbf{S}^{(r)}\mathbf{A}^{(r)\prime})\big]^{T_r/2} \times \prod_{j=1}^{n_s} \frac{|\mathbf{M}_j^*|^{1/2}}{|\mathbf{M}_j|^{1/2}} \frac{(\tau_j)^{\kappa}}{(2\tau_j^*/T_j)^{\kappa_j^*}} \frac{\Gamma(\kappa_j^*)}{\Gamma(\kappa)}, \tag{B.2}$$

where $\mathbf{S}^{(r)}$ denotes the reduced-form residual covariance matrix in regime r. The posterior hyperparameters $\mathbf{M}_j^*$, $\mathbf{m}_j^*$, κ_j^*, and τ_j^* are obtained using standard Bayesian updating formulas for the normal–inverse-gamma model. Because of the independence of structural shocks, we can do this equation-by-equation. In each equation, we can use the appropriate selection matrices S_j^x and the number of observations T_j. Importantly, this differentiates our model from a VAR identified through restrictions on the reduced form, where cross-equation dependencies would not easily allow for differences in the number of regressors and observations across equations.

Conditional on $\mathbf{A}^{pre}$ and $\mathbf{A}^{post}$, the posterior distributions of structural variances and lag coefficients in each structural equation j are given by

$$p(d_j^{-1} \mid \mathbf{A}^{pre}, \mathbf{A}^{post}, \mathbf{Y}_T) \sim \gamma\big(\kappa_j^*, \tau_j^*\big)\,, \tag{B.3}$$

$$p(\mathbf{b}_j \mid \mathbf{A}^{pre}, \mathbf{A}^{post}, d_j, \mathbf{Y}_T) \sim \mathcal{N}\big(\mathbf{m}_j^*,\, d_j\mathbf{M}_j^*\big)\,. \tag{B.4}$$

It is not possible to sample directly from the posterior density $p(\mathbf{A}^{pre}, \mathbf{A}^{post} \mid \mathbf{Y}_T)$. Therefore, we proceed in two steps. First, starting from the posterior mode, we conduct an initial presampling phase with 520,000 draws, discarding the first 400,000 draws as burn-in and retaining every 500th draw. These draws are used to obtain suitable starting values and proposal directions for the final Metropolis–Hastings step. Second, the full posterior sampler retains 20,000 draws (5,000 draws for robustness checks) after a burn-in of 200,000 draws and thinning every 50 iterations.

Trace plots of selected parameters (Figure B.4) and autocorrelation functions of the retained draws (Figure B.5) indicate satisfactory convergence of the algorithm.

C Additional model results

Fig. B.4: Trace plot of structural contemporaneous coefficients

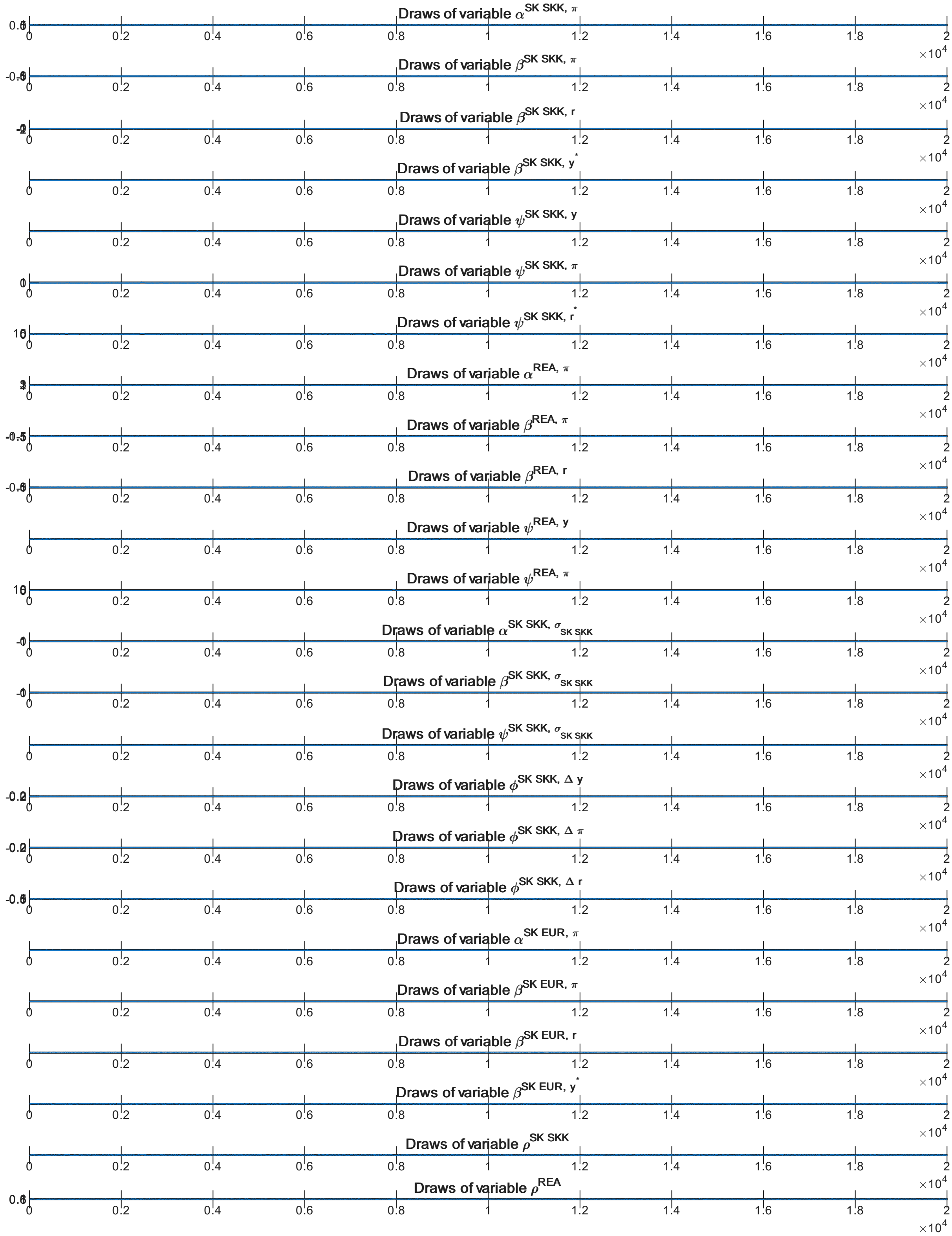


Fig. B.5: Autocorrelation plot of retained draws of structural contemporaneous coefficients

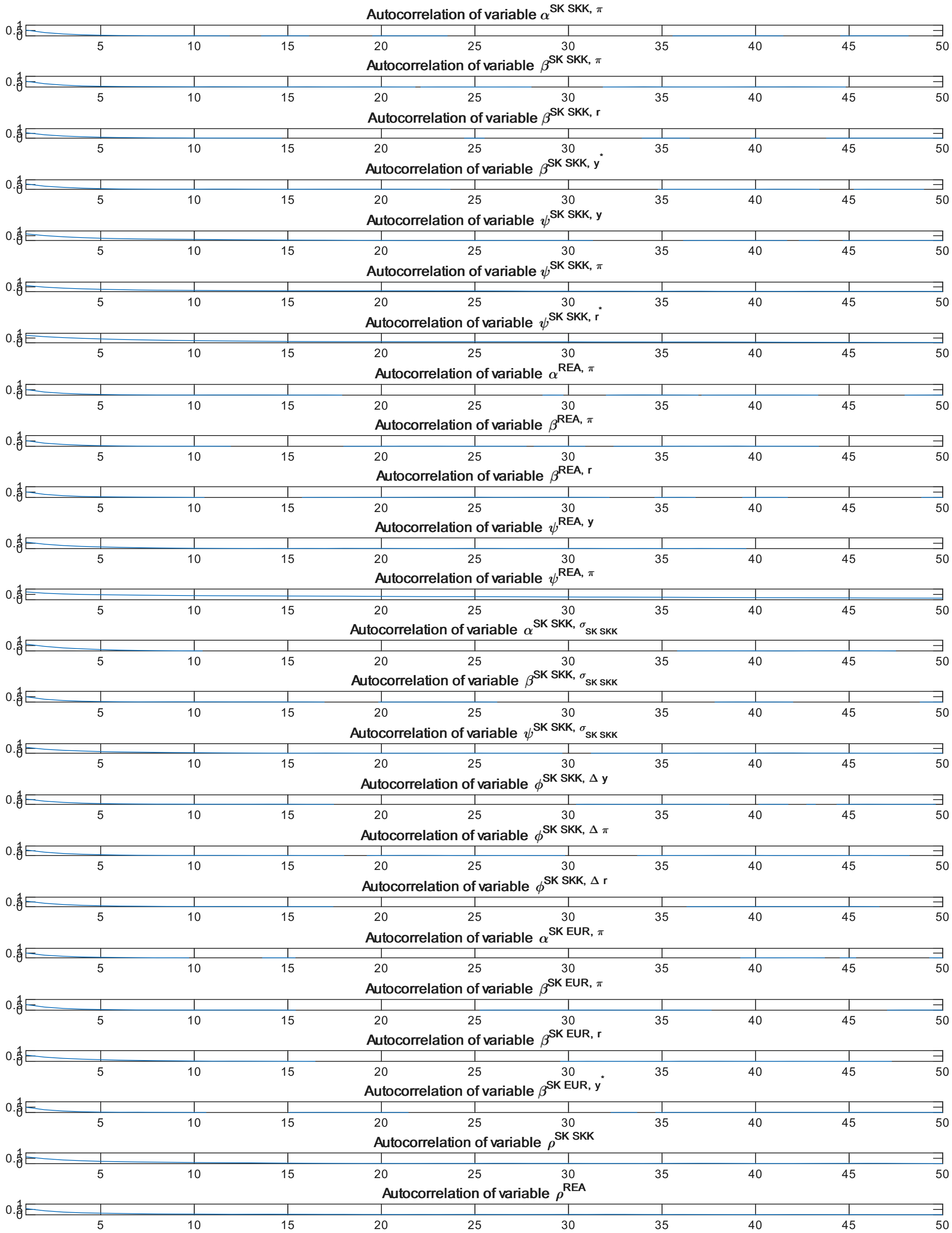
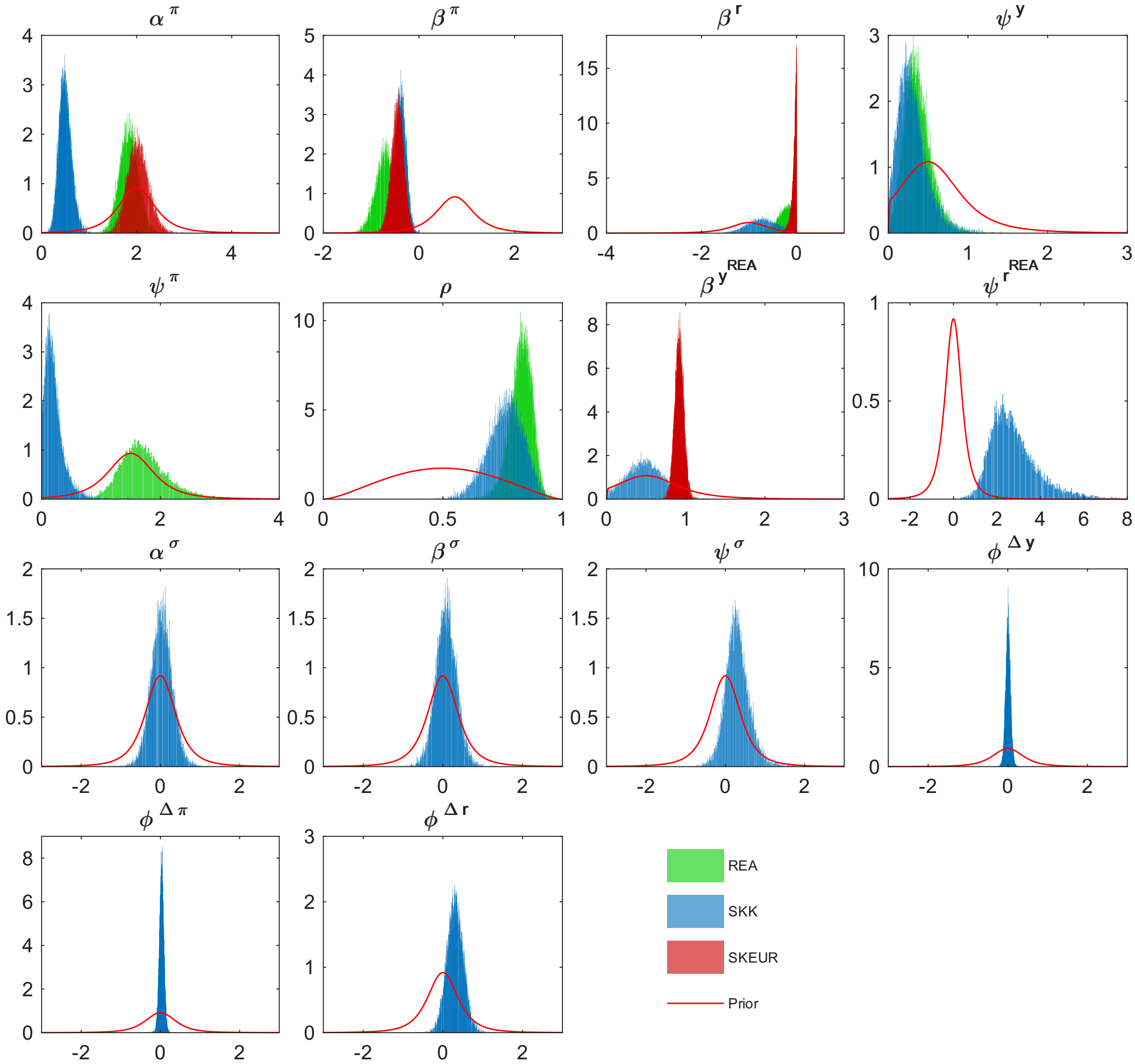
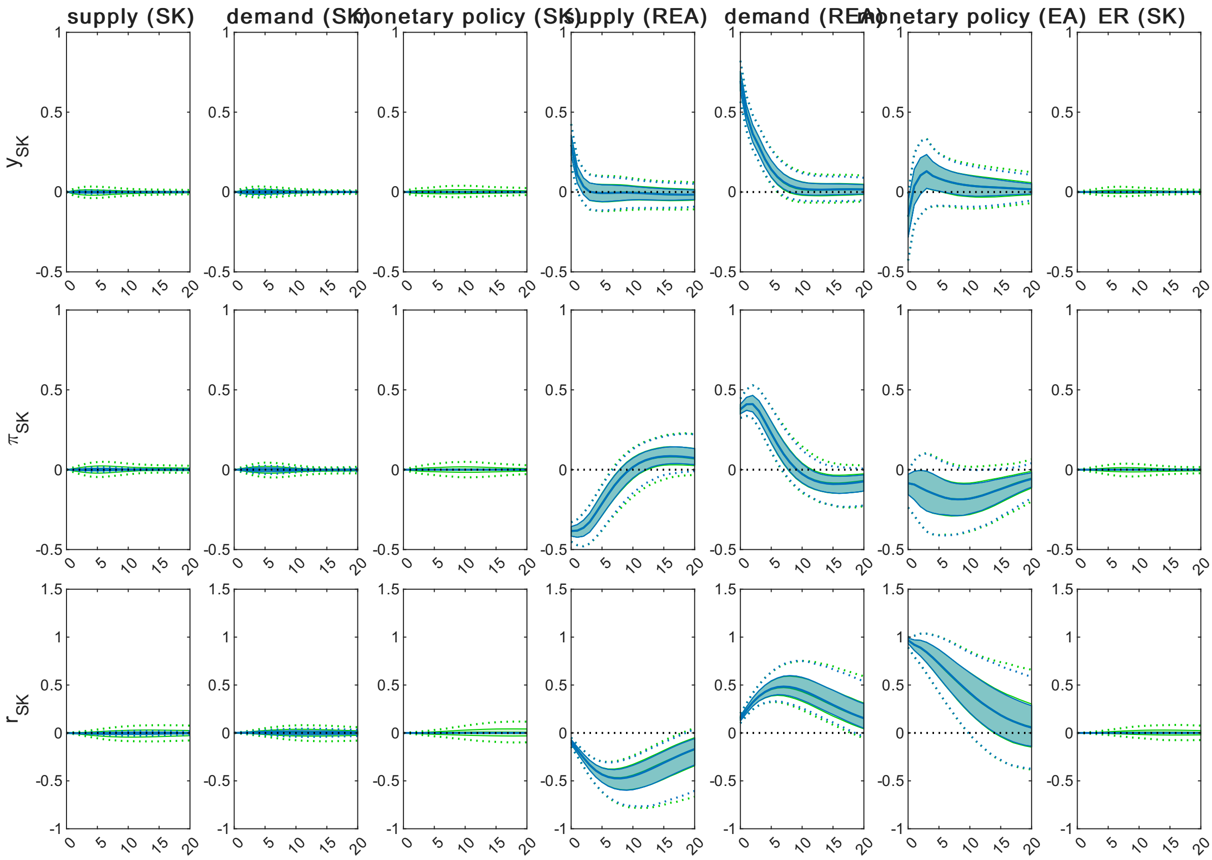


Fig. C.6: Contemporaneous coefficients, all equations



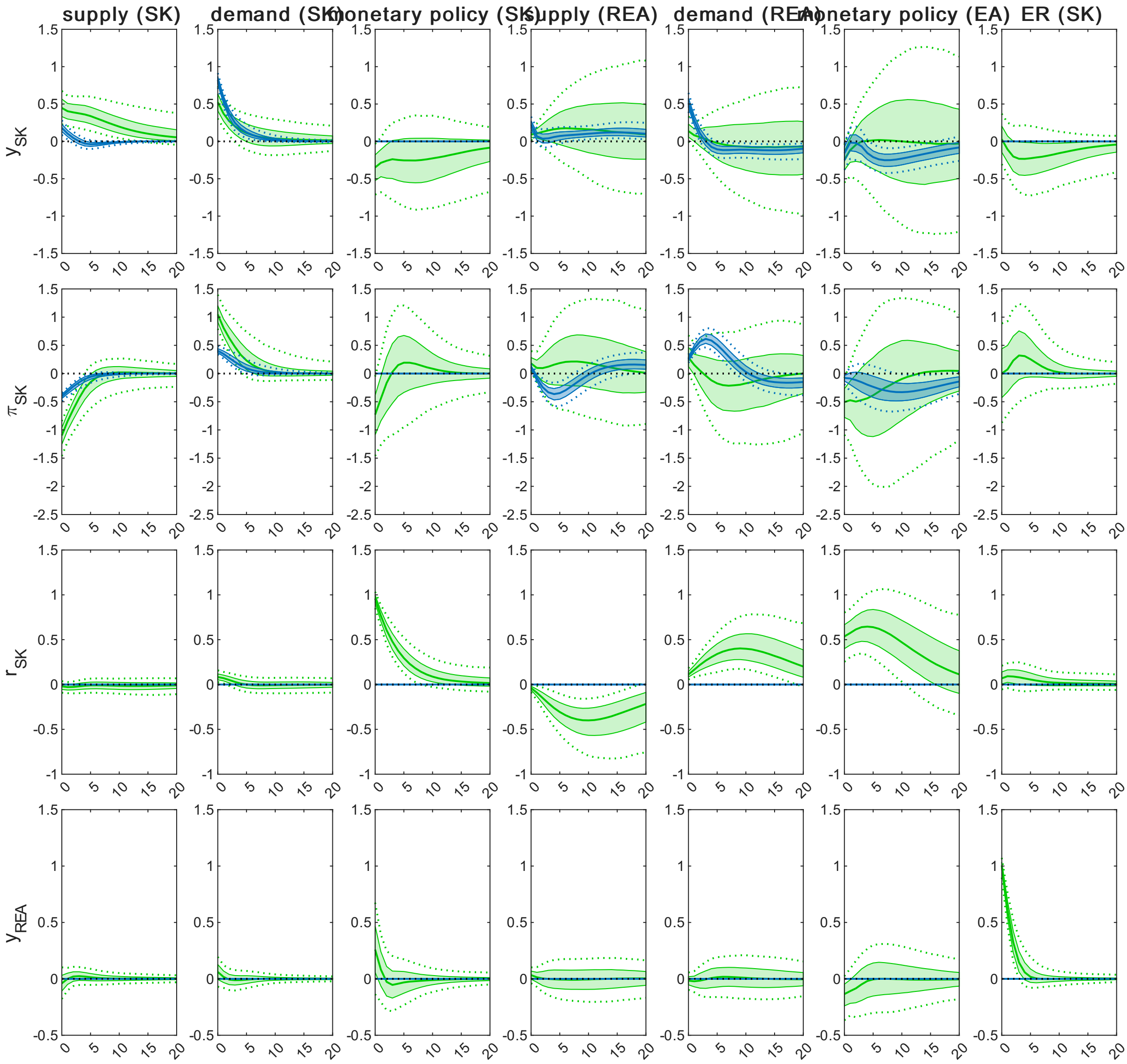
Note: Prior (red lines) and posterior distributions (histograms) of contemporaneous coefficients. Different colors correspond to the euro area, Slovakia in the pre-euro period, and Slovakia in the post-euro period.

Fig. C.7: Impulse response functions to all shocks, rest of the Euro Area



Note: Structural impulse-response functions of euro area variables to one unit structural shocks. Solid green (blue) lines denote posterior medians for the pre-euro (post-euro) subsamples. Shaded regions indicate the 68% posterior credible set, while dotted lines represent the 95% posterior credible set.

Fig. C.8: Impulse response functions to all shocks, Slovakia



Note: Structural impulse-response functions of Slovak variables to one unit structural shocks. Solid green (blue) lines denote posterior medians for the pre-euro (post-euro) subsamples. Shaded regions indicate the 68% posterior credible set, while dotted lines represent the 95% posterior credible set.