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Tobias Schuler, Yiqiao Sun

The current account and monetary policy in the euro area

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Abstract

We investigate the factors driving current account and monetary policy developments in the euro area. We estimate an open-economy structural vector autoregression (VAR) model with zero and sign restrictions derived from a multi-country dynamic stochastic general equilibrium (DSGE) model to identify relevant shocks and analyse their impact on the current account and interest rate. Examining the VAR impulse responses for Germany, Italy and Spain we find that investment shocks and preference shocks drive the current account and interest rates in the opposite directions. By contrast, external demand shocks and productivity shocks cause both the current account balance and interest rate to move in the same direction. We also provide evidence for spillovers to the euro area from US preference shocks and US interest rate policy shocks.

Keywords: current account, monetary policy, macroeconomic shocks.
JEL codes: E32, F32, F45.

Non-technical summary

In this paper, we investigate the factors driving euro area current account and monetary policy developments using an open-economy structural vector auto-regression (VAR) model. Employing zero and sign restrictions derived from a multi-country dynamic stochastic general equilibrium (DSGE) model, we identify shocks that affect both variables, namely the current account balance and interest rates, and study the impulse responses. We examine the transmission of two supply-side aggregate shocks, one related to productivity and one to investment, along with two demand-side aggregate shocks, one related to preferences and one to world demand. The main endogenous variables we consider are real gross domestic product (GDP), the GDP deflator, the current account balance and interest rates. The first three variables are used to identify orthogonal (i.e. independent) shocks, while interest rates are left unrestricted, since our main interest is in the direction of the interest rate response to the identified shocks.

Our findings suggest that preference and investment shocks drive the domestic current account balance and the interest rates in the opposite directions. Conversely, positive external demand shocks and productivity shocks improve the current account and raise the interest rate at the same time. The shocks work in a similar direction for interest rates in Germany, Italy and Spain. By contrast, for France we find non-significant dynamics in the current account balance resulting from the identified shocks. A counterfactual analysis suggests that monetary policy has little influence over the current account. Preference shocks originating from the United States have significant spillovers to GDP in Germany and euro area interest rates. We also find that monetary policy shocks in the United States generate spillovers to the euro area economy. Our results show that interest rates movements can take place without necessarily affecting current account balances.

1 Introduction

The euro area has recorded a persistently increasing current account surplus with the rest of the world over the past decade after undergoing a major internal rebalancing among members countries (see Figure 1).[1] Former deficit countries in the euro area, notably Spain and Italy, have reversed their current account balances so that they are now showing a slight surplus, while core countries such as Germany and the Netherlands, have maintained a high current account surplus. Apart from the political pressure focusing primarily on bilateral goods balances,[2] some observers have also identified a monetary policy dimension (see Galstyan (2019)), arguing that the current account surplus of the euro area contributes to keeping interest rates at persistently low levels. We therefore aim to better understand the internal and external dynamics of the euro area as a monetary union and seek to identify common drivers of the imbalances in linking these to GDP and inflation. In particular, we examine how they interact with monetary policy.

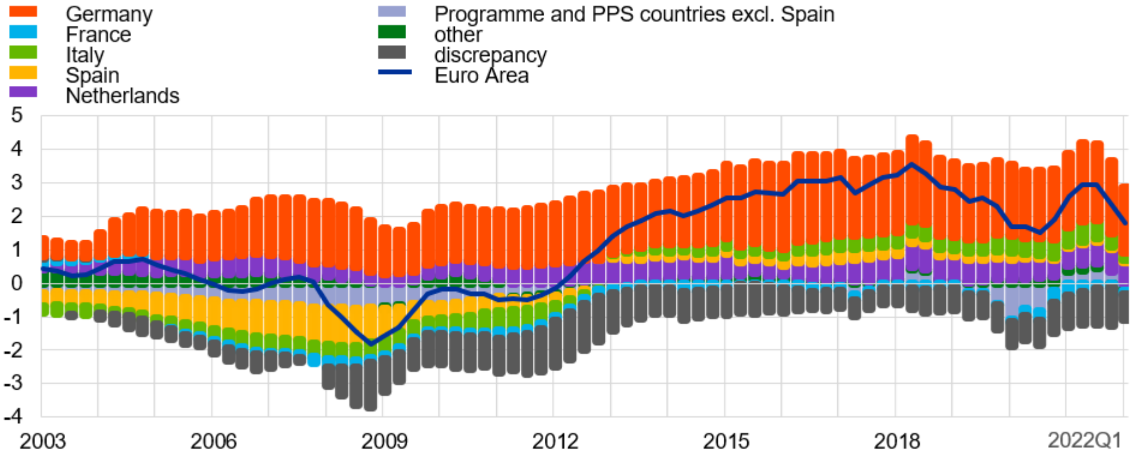
In this paper we identify the underlying drivers of current account balance and interest rate movements in the euro area. We employ a multi-country general equilibrium model based on a New Keynesian approach to derive sign restrictions. We then impose these restrictions to estimate a structural vector autoregression (VAR) model, allowing us to identify the determinants of the cyclical component of the current account and to study its interactions with interest rates. Given the complexity of the interlinkages across regions, we sequentially estimate a VAR model for Germany representing the surplus countries and then include Italy and Spain representing the former deficit countries. We then study international shock spillovers by including the United States.

We identify two shocks on the demand side and two shocks on the supply side that jointly drive the current account imbalances and the monetary policy rate. First, we identify a positive *preference shock* on domestic consumption, which leads to an increase in output, bringing inflationary pressures whilst also dragging down the current account in the domestic economy. Second, the productivity increase from a *technology shock* is widely considered a key determinant of the current account balance in the literature, notably in connection with twin deficits (Bussière, Fratzscher and Müller, 2010). It is well documented that an increase in aggregate output thanks to improved productivity boosts consumption and investment. Productivity innovations have a positive impact on the current account if the immediate

[1] Although in the period 2020–21 the surplus abated for various reasons, e.g., the coronavirus (COVID-19) pandemic (Schuler, 2020), Brexit (Jarvis and Schuler, 2021) and supply bottlenecks (Frohm et al., 2021), the euro area external balance and in particular the balance component of trade in goods and services remained elevated.

[2] This not only led to internal discussions in the euro area and the EU more broadly but also to the US Administration placing increased external pressure on the United States trading partners, particularly Germany and the EU as a whole, during the Trump presidency (2017-21).

Figure 1: Euro area current account balance as share of GDP, by country



Sources: ECB and Eurostat. Notes: Programme and post-programme surveillance (PPS) countries include Cyprus, Greece, Ireland and Portugal. The latest observations are for 2021Q4.

effect of productivity on income exceeds its effect on consumption and investment. *Financial friction shocks* (or investment-specific shocks), according to Klug, Mayer and Schuler (2022), refer to more restrictive bank lending practices, such as a tightening of banking regulation, which negatively impacts corporate investment (Fiore and Uhlig, 2015) and consequently has a positive effect on the current account. Finally, positive shocks to external demand cause the current account balance to rise (Kollmann et al. (2015*a*) and Schuknecht (2014)), given the immediate effect on exports.

1.1 Stylised facts

Since 2013 the euro area has been recording the largest current account surplus in the world, peaking at around 3% of GDP in 2018.[3] The largest bilateral surpluses are with the United States and the United Kingdom while the largest deficit is with China. At the start of the global financial crisis and the sovereign debt crisis, the more vulnerable euro area countries started to reduce their current account deficits and have now achieved a slight surplus. Balances in the surplus countries remained high so that euro area aggregate current account balances have risen to a higher level overall. Germany and the Netherlands have been the main contributors to the aggregate surplus, while former deficit countries such as Italy and Spain have largely re-balanced.

High current account surpluses have been regarded as complicating the conduct of monetary policy, as they can put upward pressure on the exchange rate and thus imply lower import prices. Conversely,

[3]The euro area current account surplus over the past 12 months shrank from 2.8% of GDP at the start of 2020 to 2.2%, or just below €260 billion, in July 2020. This was due to the repercussions of the COVID-19 pandemic.

the low policy rate could be also an important driver of current account surpluses in Germany and the Netherlands. When monetary policy is centralised at a supranational level as it is in the euro area, current account imbalances can be particularly problematic. This was the case with the national deficits driven by domestic spending in the non-core euro area countries in the first decade after the introduction of the euro. Galstyan (2019) contributed an additional layer to the debate by postulating a negative correlation between the current account surplus in the euro area and inflation, arguing that the euro areas external surplus would be an additional source of low inflation. Taking a sectoral approach to external imbalances he claims a trade surplus is associated with lower marginal costs in the tradable goods sector, generates lower tradable inflation, and induces a decline in non-tradable inflation through relative sectoral demand. Under this partial equilibrium approach, an improvement in trade balance results in lower aggregate inflation. This analysis implies that the euro area internal and external imbalances could unwind simultaneously. An unwinding of the euro area aggregate surplus would entail a rise in inflation.

We evaluate the different hypotheses within an open-economy VAR model. We apply a sign-restriction approach as proposed by Rubio-Ramirez, Waggoner and Zha (2010) and Peersman and Straub (2009). We derive robust sign restrictions by employing a multi-country DSGE model for a small open economy for Germany, Italy and Spain, and then perform analyses of spillovers from the United States to the euro area and within the euro area with two-region VAR specifications. In addition, we estimate the impact of monetary policy shocks in the United States.

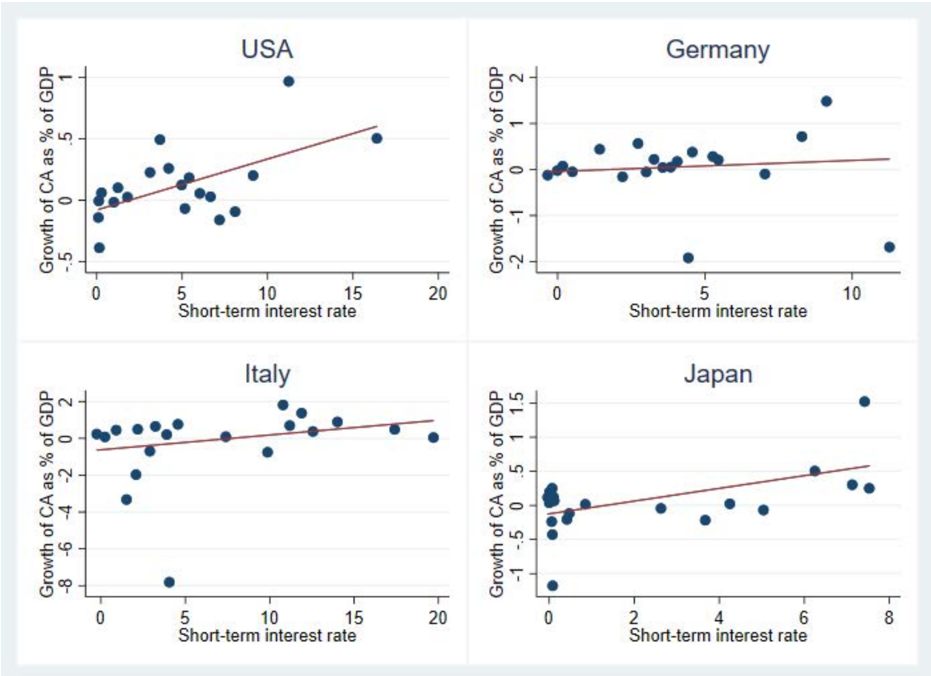
Our findings suggest that negative preference and investment shocks drive up the current account and lower the interest rate. By contrast, positive external demand and productivity shocks cause the current account balance and interest rate to rise simultaneously. The shocks imply a similar direction for interest rates both for Germany and for the rest of the euro area, specifically Italy and Spain; for France, we find no significant movements in the current account balance as a result of the shocks identified. US preference shocks have significant spillovers onto GDP and interest rates in Germany and the rest of the euro area. We also find that monetary policy decisions in the United States have significant spillovers to the euro area.

Our results suggest that a lack of internal consumer demand and low corporate investment could be potential reasons for the high surplus in Germany and low interest rates in the euro area. It also follows that the question of asymmetry of adjustment is partly misleading, as positive shocks in the form of world demand and productivity-enhancing shocks which affected Germany over the period from 2013 tend to drive up interest rates.[4] Thus, a positive current account movement is favourable for an increase in interest rates (see Schuknecht (2014)).

1.2 Nexus between current account movements and the interest rate

Current account dynamics and monetary policy are positively correlated as reflected in Figure 2, which plots changes in the current account against nominal short-term interest rates in the United States, Germany, Italy and Japan.[5] In this paper we are interested in disentangling those shocks that simultaneously drive up the current account and the interest rate from those that push the two variables in opposite directions, and subsequently in quantifying these effects.

Figure 2: Current account and interest rate



Source: Macro-financial history database provided by Jordà, Schularick and Taylor (2017); sample shows annual data from 1980 to 2017. Notes: X-axis: short-term nominal interest rate. Y-axis: annual growth rate of current account as percentage of GDP. The binscatter groups the x-axis variable into equal-sized bins and computes the mean of the y and x-axis variables. CA stands for current account.

Ex ante, it is unclear whether an increase in the current account balance is associated with an increase or a decrease in the interest rate. If both variables are positively related, then this may indicate that countries with positive changes in the current account surplus have a lower output gap and higher

[4]Despite the negative effect on inflation, productivity growth exerts a positive effect on growth and lending (see Schuler and Corrado (2019)), and thereby on interest rates.

[5]The same result holds true also for real and long-term rates. Here, we focus on nominal rates as these are in the focus of the policy debate on the nexus of the interest rate environment and the current account.

inflation, and therefore have higher interest rates. The reverse would be true if the correlation between the two variables were negative. We therefore aim to quantify the net effect by identifying the opposing forces. A positive movement in the current account balance may support activity by generating additional demand (the volume effect), implying higher interest rates, or drive down inflation through appreciation (the price effect) and lower the interest rate. Higher interest rates affect consumer spending by making savings more attractive. Lower consumer spending will reduce imports and thus improve the current account. However, an interest rate rise leads to an appreciation of the exchange rate; this makes exports more expensive and imports cheaper, thereby worsening the current account balance.

1.3 Related literature

We draw on theoretical concepts and modelling aspects from the existing literature on open-economy modelling frameworks. Our approach is close to that of Kollmann et al. (2015*a*), who estimate a three-region general equilibrium model to understand the drivers of the German current account and its impact on other euro area countries. They find that the most important determinants of the German current account surplus are shocks to the German savings rate and foreign demand for German exports, German labour market reforms, and other positive aggregate supply shocks in Germany. Using an open-economy structural VAR, Klug, Mayer and Schuler (2022) find that investment shocks are one of the main drivers of the cyclical component in the current account, with labour market shocks and world demand shocks also playing a dominant role. To model the euro area economy it is essential to devise an open-economy macro-type model as highlighted in the international business cycle literature, pioneered by Benigno (2009), Gali and Monacelli (2005) and Gillman et al. (2018). For our purposes this is even more important, as the current account is one of the main channels for transmitting foreign shocks. General equilibrium models for global imbalances are also best suited to tracking sources of fluctuations and propagation mechanisms in a holistic view. The analysis by Caballero, Farhi and Gourinchas (2008) is a pioneering example of a study of imbalances in a global equilibrium environment. For monetary unions, internal imbalances are an additional aspect to consider, alongside external imbalances with the rest of the world. Kollmann et al. (2015*b*), Chen, Milesi-Ferretti and Tressel (2013), Kang and Shambaugh (2016) have all integrated intra- and extra-area dimensions into their work.

The rest of the paper is organised as follows. Section 2 presents the sign restrictions derived from the theoretical model and the estimation layout. Section 3 studies the impulse responses resulting from the structural VAR estimation for surplus and deficit countries separately, while Section 4 studies spillovers estimated from a two-country structural VAR analysis. Secion 5 includes a set of robustness checks. Finally, Section 6 discusses the policy implications, while Section 7 presents the conclusions.

2 Model

2.1 Multi-country model

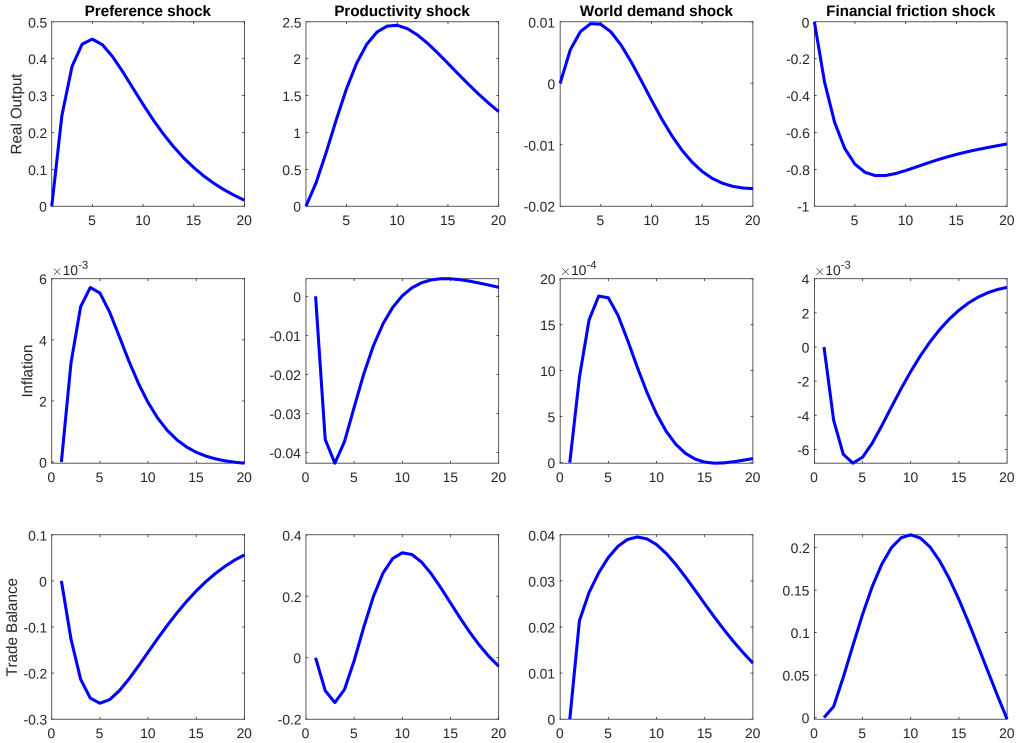
We rely on the multi-country "EAGLE" (Euro Area and Global Economy) model by Gomes, Jacquinot and Pisani (2012), which is calibrated to euro area economies and the rest of the world, to generate sign restrictions. The main model comprises households, firms, and a government sector. The main model equations are presented in Appendix B.

2.2 Generating sign restrictions

We generate sign restrictions that allow us to identify two demand-side shocks and two supply-side shocks, which are orthogonal to one another. Preference shocks and world demand shocks feature on the demand side; productivity shocks and investment shocks on the supply side. Figure 3 shows how the four different shocks propagate through the domestic economy within the DSGE modelling framework in a euro area country, in this case calibrated to Germany. A preference shock, which is a shock to the propensity to consume in the theoretical model, see equation B.1, leads to an increase in real output, inflation, with the trade balance turning negative. A productivity shock to equations, B.4 and B.3, leads to an increase in GDP with falling inflation and a medium-term increase in the trade balance. The world demand shock modelled as a preference shock in the US leads to an increase in domestic GDP. The domestic investment shock or investment-specific shock, implemented via equation B.5, leads to a decline in output and has a negative impact on inflation, but has an ambiguous short run and long run effect, and so argues in favour of the zero restriction. The effect on the trade balance is positive.

We summarise identified sign restrictions for individual countries in Table 1. Preference shocks and world demand shocks can be classified as demand-side shocks, while productivity shocks and financial friction shocks are supply-side shocks. For each shock and for all variables we impose the restrictions on impact and one-period ahead, while leaving the interest rate unrestricted. The same shocks and their identification scheme are applied across euro area surplus and deficit countries and serve as the

Figure 3: Theoretical impulse responses for domestic shocks



Notes: percentage deviations from steady state. The model is calibrated to the German economy.

basis for the spillover analysis later.[6] The sign restrictions from the shocks identified also cover other shocks mentioned in the literature. The productivity shock has a medium run positive impact on the current account. It looks similar (with opposite signs) to the cost-push shock in this parsimonious set-up. According to Kamber, Smith and Thoenissen (2015), a financial friction shock supplants an investment shock when financial friction is modelled in the form of a collateral constraint. As an expansionary risk premium shock loosens the borrowing constraint faced by entrepreneurs, the cost of transforming household savings into productive capital is reduced and thus resembles an investment shock.

Figure A2 shows spillovers from US shocks to the domestic economy in Germany. The shocks generate similar responses to those for the domestic economy. The preference shock also coincides with the world demand shock for the domestic economy. The sign restrictions employed for the structural VAR are summarised in Table 2.

The spillover analysis then applies the same restrictions to the US data, to which the euro area country data (for Germany, Italy and Spain) react in an unrestricted manner and as shown in Table 2.

[6]In the spillover analysis they serve as global shocks.

Table 1: DSGE Sign Restrictions

	Preference shock	Productivity shock	World demand shock	Investment shock
GDP	$\uparrow$	$\uparrow$	$\uparrow$	$\downarrow$
Prices	$\uparrow$	$\downarrow$	$\uparrow$	0
Current account	$\downarrow$	$\uparrow$	$\uparrow$	$\uparrow$
Interest rate				

Note: The table reports sign restrictions based on the DSGE model. Note that $\uparrow$ and $\downarrow$ denote that the restriction was set explicitly. The restriction horizon is derived from the DSGE model. We apply impact plus one for all variables except prices, where the restriction is set on impact to disentangle supply from demand shocks.

Table 2: spillover DSGE sign restrictions

	Preference shock US	Productivity shock US	Investment shock US	US monetary shock
y_{US}	$\uparrow$	$\uparrow$	$\downarrow$	$\downarrow$
pi_{US}	$\uparrow$	$\downarrow$	0	$\downarrow$
ca_{US}	$\downarrow$	$\uparrow$	$\uparrow$	$\downarrow$
i_{US}				$\uparrow$
y_{DE}				
pi_{DE}				
ca_{DE}				
i_{EA}				

Note: y denotes GDP, pi prices, ca current account balance and i interest rate.

While the US monetary policy shock is fully identified by sign restrictions, the table is agnostic about the variables relating to Germany and the euro area policy rate, i_{EA}. The sign restrictions are given for an increase in the policy rate in the United States. Next, to analyse spillovers within the euro area we apply a similar identification scheme to surplus countries, e.g. Germany, and to deficit countries, e.g. Italy or Spain. Sign restrictions are then imposed on Germany.

2.3 Estimation

We use quarterly data from 1995 to 2017 for real GDP, the GDP deflator, the current account balance to GDP ratio and the interest rate to estimate the zero-restricted and sign-restricted VAR model. Further details on data and sources are tabulated in Appendix A.

Consider a reduced form VAR model as follows:

$$\boldsymbol{X}_t = c + \sum_{j=1}^{P} A_j X_{t-j} + \varepsilon_t, \text{ where } E[\varepsilon_t] = 0 \text{ and } E[\varepsilon_t \varepsilon_t{}'] = \Sigma_\varepsilon. \tag{2.1}$$

X_t is the vector of n endogenous variables and c is a $n \times 1$ vector of intercepts. A_j is a $n \times n$ matrix comprising the AR-coefficients at lag $j = 1, ..., P$ and ε_t is a vector of residuals with covariance matrix $\Sigma_\varepsilon = E[\varepsilon_t \varepsilon_t{}']$, and X_t comprises the following n endogenous variables

$$\boldsymbol{X}_t = \left[\begin{array}{cccc} \text{GDP}_t & \text{GDPDEF}_t & \frac{CA}{GDP}_t & \text{i}_t \end{array}\right]'. \tag{2.2}$$

GDP_t denotes the log level of the real gross domestic product, GDPDEF_t is the GDP deflator, $\frac{CA}{GDP}_t$ is the current account to GDP ratio and i_t is the interest rate.

To capture spillover effects from foreign country shocks to domestic aggregates, we include the same set of variables for the foreign country in the VAR, which are denoted with an asterisk. Hence, we define:

$$\boldsymbol{X}_t^* = \left[\begin{array}{cccc} \text{GDP}_t^* & \text{GDPDEF}_t^* & \frac{CA}{GDP}_t^* & \text{i}_t^* \end{array}\right]'. \tag{2.3}$$

The total set of variables included in the open-economy VAR framework are summarised as follows:

$$\boldsymbol{Y}_t = \begin{bmatrix} X_t^* \\ X_t \end{bmatrix} \tag{2.4}$$

2.4 Identification of structural shocks

We impose sign restrictions from Tables 1 and 2 on the impulse responses to identify structural shocks (see, for example Arias, Rubio-Ramirez and Waggoner, 2014; Canova and de Nicolo, 2002; Faust, 1998; Peersman, 2005; Rubio-Ramirez, Waggoner and Zha, 2010; Uhlig, 2005). The structural shocks, η_t, and the reduced form residuals, ε_t, are related through the linear mapping:

$$\eta_t = B^{-1}\varepsilon_t, \text{ with } \mathbb{E}[\eta_t] = 0 \text{ and } \mathbb{E}[\eta_t \eta_t'] = \Sigma_\eta, \tag{2.5}$$

where $B = U\Sigma_\eta^{1/2}Q$. $U\Sigma_\eta^{1/2}$ is one Cholesky factor from the Bayesian estimation exercise, and $\mathbb{E}$ denotes the expectation operator. Since Σ_η is a diagonal matrix, we obtain mutually orthogonal structural shocks. Identification through sign restrictions consists of finding random matrices Q, such that candidate shocks, η_t, produce impulse response functions, $\phi_{j,t+k} = A(L)^{-1}B_j\eta_t$, which satisfy the restrictions obtained, where L denotes the lag operator. Drawing from a standard-normal density, $\mathcal{N}(0,1)$, delivers a random matrix Z and applying the QR decomposition to Z generates an orthonormal matrix Q such that $QQ' = I$. Thus, we obtain a variety of matrices B for each Bayesian draw and therefore a different structural model for each Q. Specifically, we keep drawing Q matrices until either a permissible transformation is found or 500 draws of the matrix Q is reached without obtaining a permissible model.

The estimation uses Bayesian techniques with a flat normal-Wishart prior. For the implementation we use the toolbox as made available by Breitenlechner and Geiger (2018). Structural shocks are identified by drawing on the distribution of reduced-form parameters obtained. We take the Cholesky factor and use random orthonormal matrices. For zero restrictions, the Gram-Schmidt algorithm is employed.

3 Results from the structural VAR estimation

Figures 4 to 8 show the propagation of the identified shocks through the endogenous variables in X_t. As is customary, the shaded area comprises the median and the 16% and 84% (grey) or 10% and 90% (blue) quantiles of the posterior distribution of impulse responses. We first simulate the impulse responses of the shocks identified for an individual country and evaluate the impact on the current account and the interest rate. Then we include another country to study spillover effects from outside the euro area.

3.1 Impulse responses for Germany

We now present the results on how the VAR impulse responses react to the identified shocks in the case of Germany. Figure 4 shows the impulse response functions (IRFs) for each of the shocks. The first panel shows that following a preference shock output, inflation and the current account balance follow the signs imposed on impact, while the interest rate significantly increases without any restriction being set. The interest rate response follows a hump-shaped pattern and reaches a peak after five quarters.

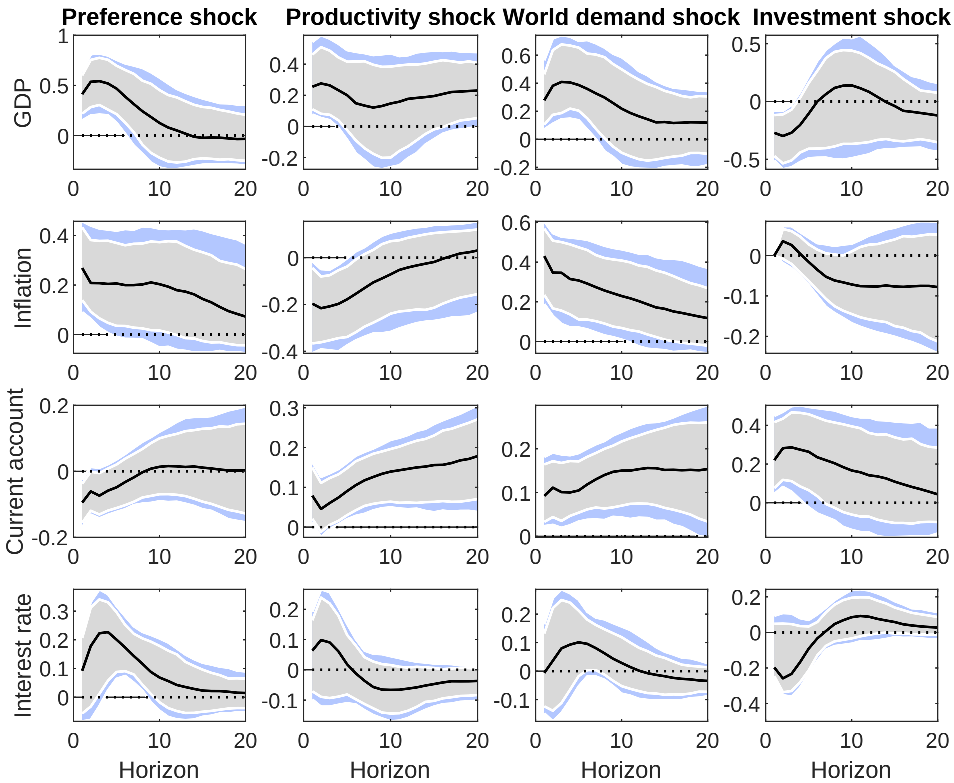
The second panel presents the results in the case of a productivity shock which drives up GDP and the current account, while inflation falls as imposed on impact. The interest rate reacts positively at first, although not significantly, while in the long run the effect becomes slightly negative.

The third panel shows how a world demand shock simultaneously drives up GDP, inflation and the current account balance. The increases in GDP, inflation and the current account balance are significant after the impact period where restrictions apply. The median response of the interest rate reacts positively in a hump-shaped pattern becoming significant with a lag.

Finally, the fourth panel shows that the investment shock exerts a downward pressure on GDP and inflation – which is restricted to zero on impact – but induces an upward movement in the current account balance. The interest rate reacts negatively. The responses of output and the current account are significant after the initially restricted periods. The median response of the interest rate is negative on impact, changing signs after eight quarters.

From this exercise, we conclude that in the event of a negative preference shock and an investment shock the current account increases and the interest rate falls. By contrast, positive productivity shocks and world demand shocks drive up the current account and the interest rate simultaneously.

Figure 4: Impulse responses for Germany



Notes: IRF from the estimated VAR. The solid line represents the median IRF model. The shaded area represents the 16% and 84% (grey) or 10% and 90% (blue) quantiles of the posterior distribution.

3.2 FEVD and historical decomposition for Germany

We report the importance of each shock with a forecast error variance decomposition (FEVD) in Table 3. This reflects the extent to which the error variance in each variable can be attributed to the respective shock over a specified time horizon.[7] The investment specific (financial friction) shock is important at a one-year horizon for both the current account balance and the interest rate, explaining 38% and 30% of the changes respectively. For GDP and the interest rate, preference shocks account for a significant 35% and 25% of the forecast error variances, respectively, at a one-year horizon. Inflation dynamics are externally driven to a large extent, with almost 39% coming from world demand shocks. Productivity shocks play a less significant role in this sample for all variables, and only become more relevant in the longer run, with 24% of variation explained at the four-year horizon.

Figure 5 shows historical decompositions of the contribution of the four shocks to the cyclical component of the underlying variables, reflecting their relative importance at each point in time. The four identified shocks , i.e. preference, productivity, world demand and investment, are assumed to explain the entire variation in GDP, inflation, a measure of the current account and the interest rate. GDP shows weakness at the end of the 1990s and recovers up to the global financial crisis. This is followed by relative weakness in the subsequent years. The current account-to-GDP ratio fluctuates cyclically by two percentage points and peaks after the global financial crisis and during the 2017 boom. Negative preference shocks in 2015 account for more than half the decrease in GDP and half the increase in the current account balance. This period overlaps with negative pressure on the interest rate reaching the effective lower bound.

3.3 Former euro area deficit countries: Italy and Spain

We conducted the same analysis for Italy and Spain, two (former) euro area deficit countries accounting for two-thirds of the deficit in the 2000s. A preference shock in Italy (see Figure 6) propagates by increasing output and inflation. The current account turns negative and the unrestricted interest rate reacts positively but not significantly at the 68% level as in the case of Germany. The second column in Figure 6 shows how a productivity shock drives up GDP and the current account on impact, while inflation falls. The interest rate reacts positively with a time lag.[8]

[7]FEVDs are based on the median draw, with 68% reported as credible.

[8]Despite the negative effect on inflation, productivity growth exerts a positive effect on growth and lending (see Schuler and Corrado (2019)), and in turn on interest rates.

Table 3: Forecast Error Variance Decomposition for Germany

	Horizon	GDP	Inflation	CA/GDP	Interest Rate
Preference shock	Impact	29.51	17.05	16.53	18.23
		(8.55, 63.36)	(4.74, 41.78)	(2.40, 43.53)	(1.49, 56.23)
	1 Year	34.94	14.77	11.32	24.94
		(10.54, 65.56)	(4.92, 39.34)	(2.19, 33.49)	(3.85, 65.68)
	4 Years	31.66	19.51	9.75	35.47
		(15.15, 55.53)	(5.60, 42.56)	(3.53, 22.82)	(14.92, 56.53)
Productivity shock	Impact	11.76	8.94	11.49	11.13
		(2.22, 38.64)	(0.65, 29.83)	(0.77, 40.17)	(1.28, 38.81)
	1 Year	8.68	13.16	8.66	10.4
		(1.53, 28.16)	(2.07, 34.32)	(1.39, 32.22)	(1.51, 31.74)
	4 Years	12.35	11.54	24.25	12.29
		(3.87, 31.78)	(2.65, 30.56)	(6.20, 50.03)	(4.27, 30.85)
World demand shock	Impact	14.18	43.03	15	10.31
		(1.74, 39.01)	(13.04, 74.18)	(1.89, 45.83)	(0.46, 36.44)
	1 Year	19.13	38.52	21.34	9.73
		(4.97, 45.25)	(11.11, 70.09)	(4.45, 51.60)	(2.19, 34.29)
	4 Years	24.92	37.24	30.46	14.06
		(8.53, 48.29)	(9.18, 69.54)	(10.98, 59.12)	(5.25, 33.64)
Investment Shock	Impact	19.96	13.74	33.6	34.73
		(5.13, 52.53)	(1.19, 39.24)	(8.78, 71.52)	(2.27, 77.95)
	1 Year	17.62	16.03	38.16	30
		(3.04, 43.30)	(3.73, 44.35)	(10.69, 68.91)	(3.87, 72.95)
	4 Years	18.16	14.31	19.45	25.49
		(5.63, 37.37)	(3.75, 37.97)	(7.99, 42.23)	(6.58, 53.47)

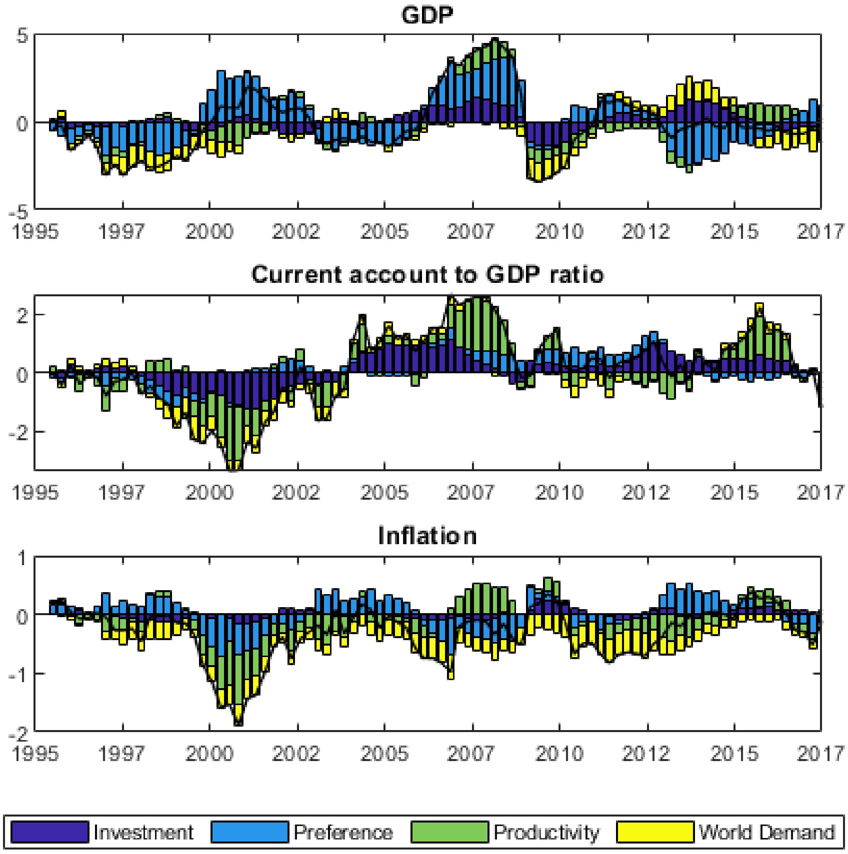
Notes: Results are in percentage and we report the 16% and 68% quantiles in brackets.

Furthermore, the world demand shock in the third column drives up GDP, inflation and the current account. The median response of the interest rate reacts is significantly positive after three quarters before turning negative at the end of the response horizon. Finally, in the fourth column the investment shock drives down GDP and drives up the current account, while the median response of inflation is persistently negative. The median response of the interest rate is negative, but not significant. Similar though less significant patterns hold for Spain; see Figure 7 .

4 Shock spillovers from the United States to Germany

In this section we study shock spillovers from the United States to Germany using the identification scheme given in Table 2. Figure 8 shows the spillovers to Germany from US shocks. For spillover

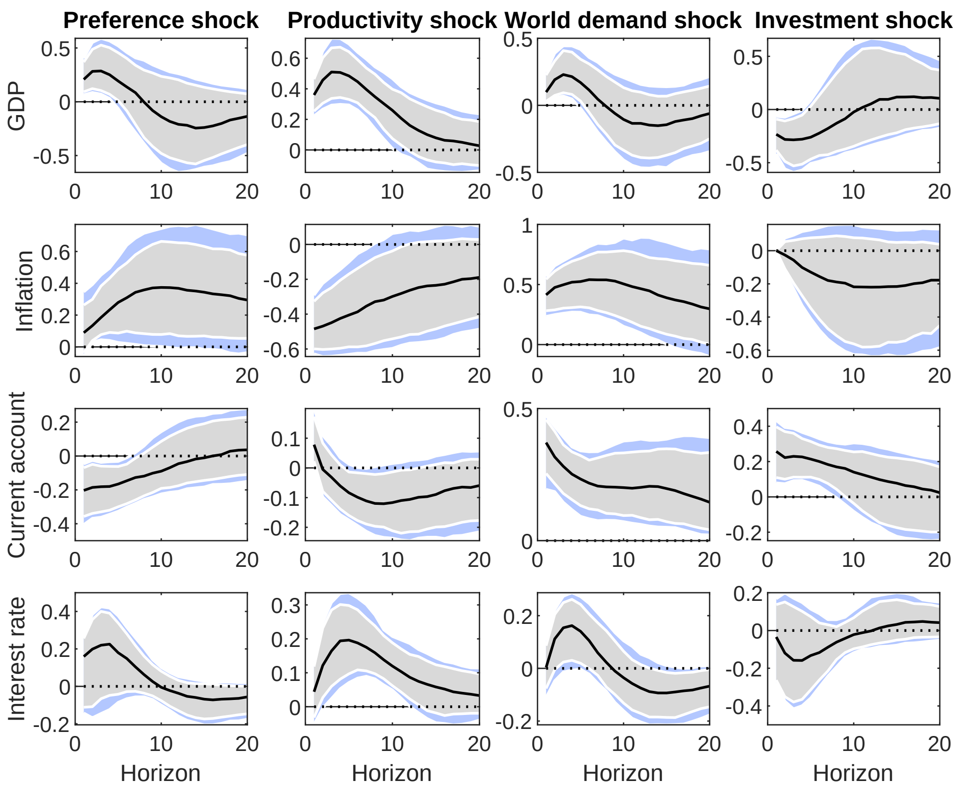
Figure 5: Historical decomposition for Germany



shocks we assume the US shocks as global shocks for Germany. For the monetary policy shock the restrictions are set contemporaneously as in Fry and Pagan (2011) for two periods. The results are robust to restricting the impact on US GDP only to the second period, while being agnostic regarding the sign restriction for US GDP in the first period (see Uhlig (2005)).

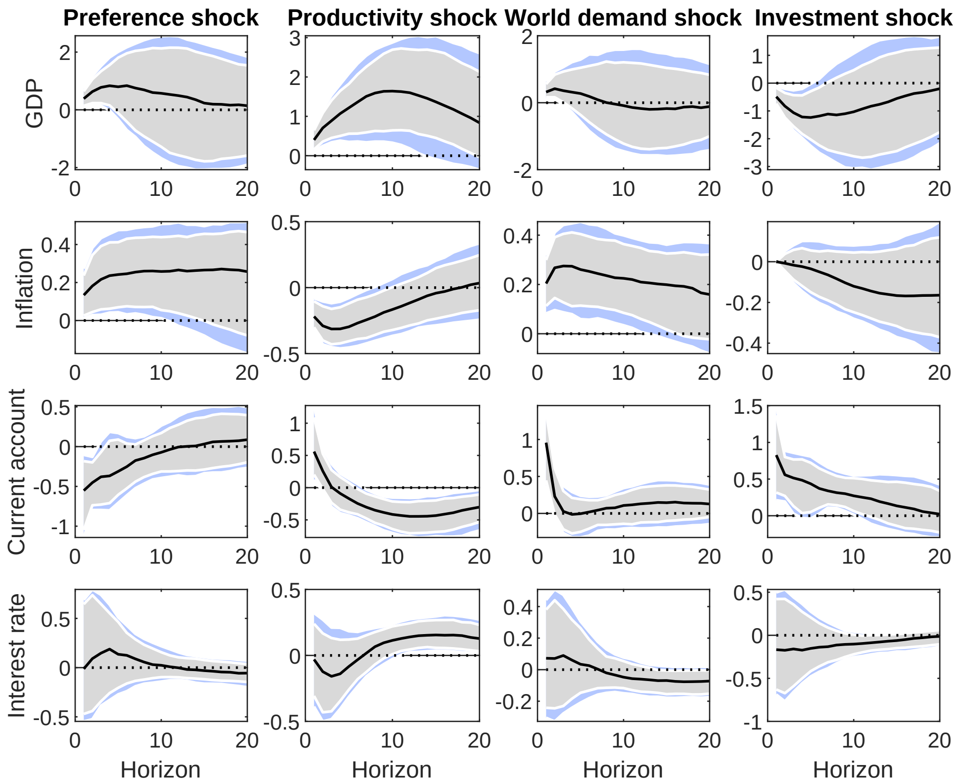
A preference shock in the United States leads to an increase in US GDP with positive spillovers to German GDP and its current account balance. The spillovers to GDP are stronger than those to the German current account, and the euro area interest rate increases. A productivity shock in the United States increases GDP and lowers inflation, but the impact on the US current account is ambiguous. In addition, there are no significant interest rate spillovers. A US investment shock lowers GDP and inflation after initial restriction. Finally, a monetary shock in the United States as shown in the last column of Figure 8 dampens GDP and inflation in the United States, has a clearly non-significant impact on the current account, but has a positive median impact on the interest rate with lags. A pure monetary

Figure 6: Impulse responses for Italy

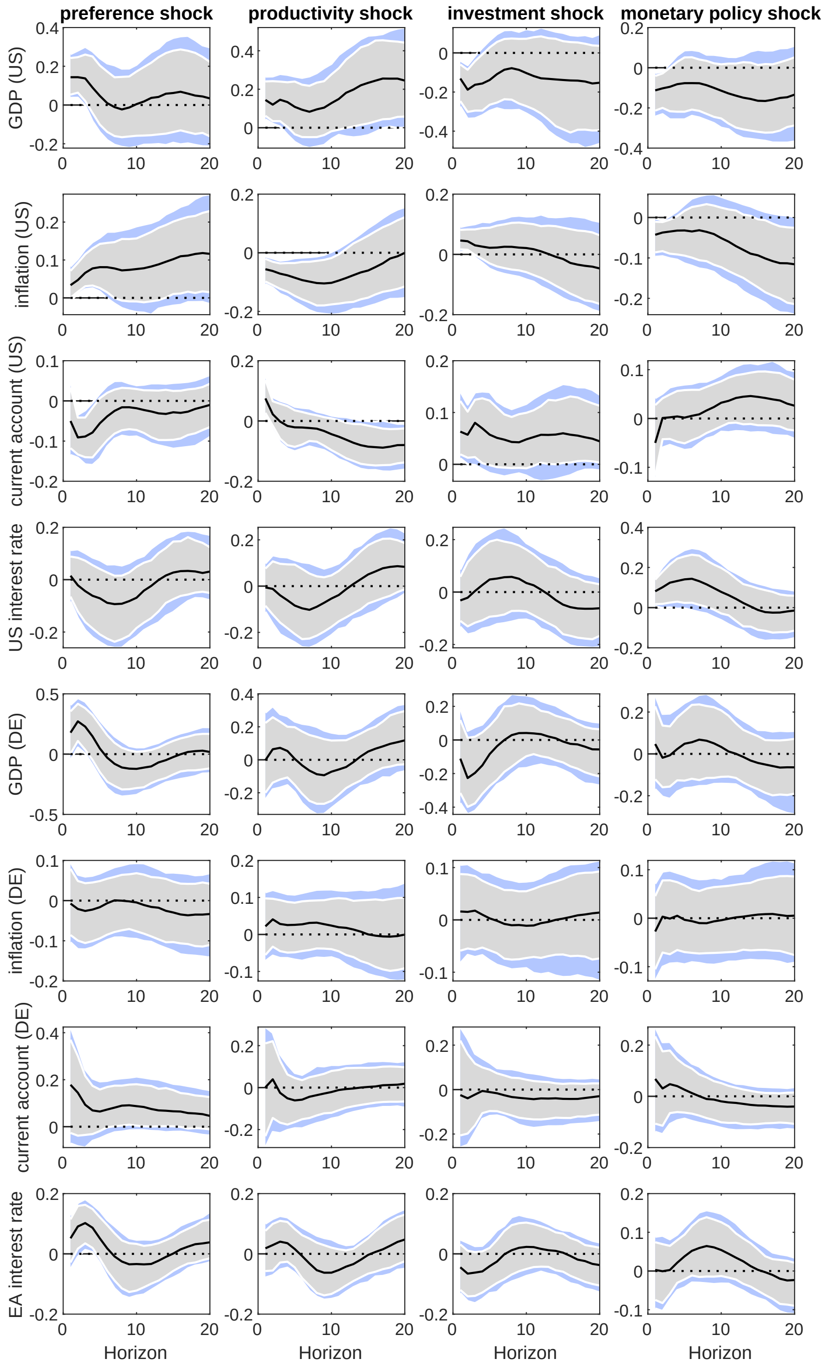


Notes: IRF from the estimated VAR. The solid line represents the median IRF model. The shaded area represents the 16% and 84% (grey) or 10% and 90% (blue) quantiles of the posterior distribution.

Figure 7: Impulse responses for Spain



Notes: IRF from the estimated VAR. The solid line represents the median IRF model. The shaded area represents the 16% and 84% (grey) or 10% and 90% (blue) quantiles of the posterior distribution.



Notes: IRF from the estimated VAR. The solid line represents the median IRF model. The shaded area represents the 16% and 84% (grey) or 10% and 90% (blue) quantiles of the posterior distribution. EA stands for euro area.

tightening in the United States, i.e. an orthogonal positive shock to the US monetary policy rate, would also lead to monetary tightening for the euro area policy rate. The effect regarding interest rate spillovers probably comes from the information in Federal Reserve policy changes on the course of the business cycle, given that the business cycles in the United States and the euro area co-move with a lag. This means that there are no inflation spillovers to which monetary policy would react in that case, only direct interest rate spillovers.[9]

5 Robustness

We perform a number of robustness checks on both the theoretical DSGE model and the structural VAR. For the DSGE model we test the responses for a set of parameters, while for the structural VAR we perform the simulations with shadow interest rates and identify the role of interest rates in the propagation of shocks.

5.1 Robustness of theoretical model to parameter variation

To check the robustness of the theoretical DSGE model we employ different persistence assumptions and calibrated parameter values as in Klug, Mayer and Schuler (2022). We show different persistence for domestic shocks and spillover shocks ranging from 0.8 to 0.99 (Figures A1 and A2). We calibrate for different investment adjustments costs γ ranging from 4.8 to 8.9 in Figure A3. We also perform variations with different parameter for substitution between traded and non-traded goods, μ_C, in Figure A4. The different parameter values do not materially change the responses and thus do not materially change the derived sign restriction tables either.

5.2 Employing shadow interest rates

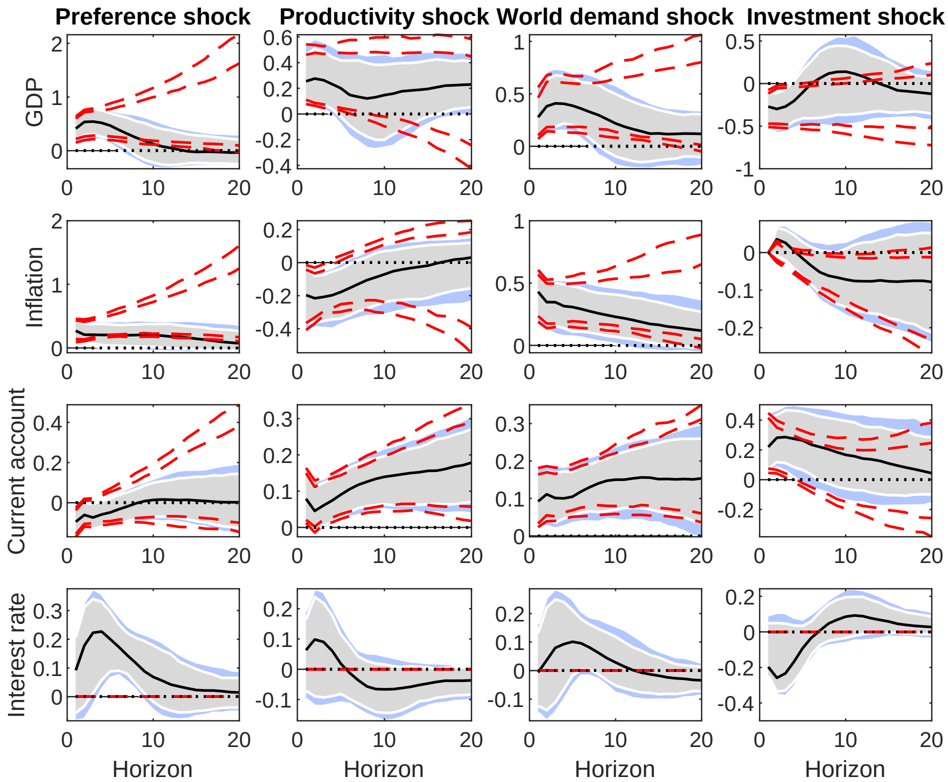
We re-estimate the model with shadow interest rates for the euro area provided by Krippner (2020). Figure A7 shows that interest spillovers matter somewhat less. We relate this to the significant time gap in between the announcement of quantitative easing programs in the United States and in the euro area.

[9] We also found evidence for this in the literature. Breuss (2002) and Ullrich (2005) estimate Taylor rules for the ECB augmented by the lagged federal funds rate and show that the US interest rate enters the euro area monetary policy reaction function in a statistically significant way. Belke and Cui (2010), estimate Taylor rules for the ECB augmented by the lagged federal funds rate and show that the US interest rate enters the euro area monetary policy reaction function in a statistically significant way. Mandler (2010), in a VAR model, finds evidence that an optimal monetary policy reaction function for the ECB reacts to unexpected federal funds rate changes.

5.3 Counterfactual analysis with interest rate channel shut

We study the importance of monetary policy impact on the variables in the VAR via a counterfactual analysis. Following Bachmann and Sims (2011)[10] we restrict the coefficients of the underlying VAR in such a way as to force the response of interest rate variable to shocks to zero, and then compare the restricted impulse responses with the unrestricted ones for all other endogenous variables. Figure

Figure 9: Germany: Counterfactual exercise shutting interest rate channel



Notes: IRF from the estimated VAR. The solid line represents the median IRF model. The shaded area represents the 16% and 84% (grey) or 10% and 90% (blue) quantiles of the posterior distribution.

9 shows that shutting the interest rate channel results in a widening of confidence bands. In the event of a preference shock, GDP and inflation no longer return to zero. However, the current account reacts similarly, with a widening of error bands at the end of the response horizon. With regard to the productivity shock, the interest rate has limited influence on the current account. The same result is also valid for the world demand shock, which is an external shock with little interaction with monetary policy. The investment shock counterfactual exhibits a somewhat lower path for the current account reaction. Overall, the current account is only marginally affected by shutting the interest rate channel, showing

[10] Sims and Zha (2006) first constructed a counterfactual analysis in a structural VAR context by constraining the interest rate or M2 money such that they were unresponsive to all other variables in the system. Their counterfactual can be adopted in order to evaluate the role of monetary policy in the Great Recession.

that monetary policy setting short-term interest rates has a limited influence on the current account.

6 Discussion

While economic adjustments can evolve endogenously in the long-run, current account imbalances can persist for some time. This raises the question of the role that policy could play in supporting a rebalancing process. This paper arrives at several results which could help inform the policy discussion. While the responses of the interest rates are not systematically significant for all types of shocks, the median response can provide insights on the nexus between current account movements and interest rates. For Germany, the results suggest that to reduce its current account surplus, the country could strengthen its internal demand given that positive preference shocks significantly drive the current account balance downwards and the euro area interest rate upwards. While the results regarding investment shocks are less significant, they point to the important role that domestic investment conditions play in lowering the current account surplus. The response for a positive world demand shock could be interpreted as supporting higher interest rates in the case of Germany. The results for the two former deficit countries, i.e. Italy and Spain, while being less significant than in the case of Germany, show an improving current account position and higher interest rates in the event of world demand shocks, and deteriorating current account positions and higher interest rates in the case of positive preference shocks. Positive preference shocks from the United States have a significant positive effect on euro area interest rates. We interpret this to mean that if the United States targeted a lower deficit, implying a negative preference shock, this would be to the detriment of world and euro area demand. In a counterfactual analysis, we show that euro area monetary policy has limited influence over the development of the current account.

7 Conclusions

After considering a range of shocks, we find that preference and investment shocks drive the euro area current account and interest rates in the opposite direction. This could be interpreted that a lack of internal demand and adverse domestic investment conditions might be possible explanations for the high current account surplus and low interest rates in the euro area. Meanwhile, positive shocks from world demand and productivity-enhancing shocks tend to drive up the interest rates. In this case, a positive current account movement is favourable for the development of interest rates. In the multi-country analysis, we find that US preference shocks spillover to Germany's GDP and euro area interest rates. In addition, we show that US and euro area interest rates co-move in response, irrespective of the current account dynamics. As the responses of the interest rate are not systematically significant for all shocks, this limits somewhat the extent to which the conclusions on how to affect the level of interest rates in the euro area can be applied.

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A Data documentation

Table A1: Variable definitions

GDP	= $LN(GDP) \times 100$
Price level	= $LN(GDPDEF) \times 100$
Current account balance-to-GDP ratio	= $(CA/GDP) \times 100$
Interest rate	= in percent

Table A2: Euro area data

Description	**Source**	**Haver or ECB SDW code**
EA11-19: 3-Month Money Market Interest Rate (AVG, %)	Statistical Office of the European Communities	I023M@EUDATA
Euro Area 11-19: Real 3-Month EURIBOR (%)	European Central Bank	I023IB3C@EUDATA
EA19: Gross Domestic Product (SWDA, Mil.EUR)	Statistical Office of the European Communities	J025GDPN@EUDATA
Current Account Balance / GDP	EABCN	Q023CANY@EUDATA*100
EA19: Gross Domestic Product (SWDA, Mil.Ch.2015.EUR)	Statistical Office of the European Communities	J025GDPT@EUDATA/1000
EA19: Nat Curr Price Index: Gross Domestic Product (SWDA, 2015=100)	Statistical Office of the European Communities	J025GDPP@EUDATA

Table A3: Italy data

Description	**Source**	**Haver or ECB SDW code**
3 Month Money Market Interest Rate: Average (%)	DISC	I136M@EUDATA
EA11-19: 3-Month Money Market Interest Rate (AVG, %)	Eurostat	I023M@EUDATA
Gross Domestic Product (SWDA, Mil.Ch.15.EUR)	Eurostat	J136GDPT@EUNA
Nat Curr Price Index: Gross Domestic Product (SWDA, 2015=100)	Eurostat	J136GDPP@EUDATA
Harmonized Consumer Price Index (SA, 2015=100)	ESTAT/H	H136H@EUDATA

Table A4: Germany data

Description	Source	Haver or ECB SDW code
Gross Domestic Product (SWDA, Mil.Ch.15.EUR)	Statistical Office of the European Communities	J134GDPT@EUNA
Gross Domestic Product Deflator (SWDA, 2015=100)	Deutsche Bundesbank	DESNGDPJ@GERMANY
Harmonized Consumer Price Index (NSA, 2015=100)	Federal Statistical Office	DENPCH@GERMANY
BOP: Current Account Balance (SWDA, Mil.Euros)	Deutsche Bundesbank	DESBC@GERMANY
BOP: Current Account: Net(NSA, Mil.EUR) - Seasonal Adjustment, All	Statistical Office of the European Communities	sa(B134N993@EUDATA)
Gross Domestic Product (SA, Mil.EUR)	Statistical Office of the European Communities	S134GDPN@EUDATA

Table A5: Spain data

Description	Source	Haver or ECB SDW code
Interbank Market: Nontransferable Deposits, 3-months (AVG, % p.a.)	Banco de España	ESNRIN3@SPAIN
Gross Domestic Product (SWDA, Mil.Ch.15.EUR)	Eurostat	J184GDPT@EUNA/1000
Nat Curr Price Index: Gross Domestic Product (SWDA, 2015=100)	Eurostat	J184GDPP@EUDATA
Harmonized Consumer Price Index (SA, 2015=100)	ESTAT/H	H184H@EUDATA
BOP: Current Account Balance (NSA, Mil.Euros)	Banco de España	ESNBC@SPAIN
Gross Domestic Product (NSA, Mil.Euros)	Instituto Nacional de Estadstica	ESNNGDP@SPAIN

Table A6: US data

Description	Source	Haver or ECB SDW code
Federal Funds [effective] Rate (%)	Federal Reserve Board	N111RIO@G10
Real Gross Domestic Product (SAAR, Bil.Chn.2012$)	Bureau of Economic Analysis	GDPH@USNA
Gross Domestic Product: Chain Price Index (SA, 2012=100)	Bureau of Economic Analysis	JGDP@USNA
Balance on Current Account, NIPAs (SAAR, Bil.$)	Bureau of Economic Analysis	MINET@USNA
Gross Domestic Product (SAAR, Bil.$)	Bureau of Economic Analysis	GDP@USNA

B Theoretical model

We provide the main equations[11] of the theoretical model indicating the shocks to derive the sign restrictions in the impulse response. We follow the DSGE model and calibration as in Gomes, Jacquinot and Pisani (2012). The preference shock, e_U, enters the consumption part (marginal) utility function of households:

$$U = e_U \frac{1}{1-\sigma}(C_t - \kappa C_{t-1})^{1-\sigma} - \frac{1}{1+\zeta} N_t^{1+\zeta}, \tag{B.1}$$

where C_t is the household consumption and N_t reflects a measure of hours worked. The parameter κ ($0 \leq \kappa \leq 1$) measures the degree of external habit formation in consumption. σ ($\sigma > 0$) denotes the inverse of the inter-temporal elasticity of substitution and ζ ($\zeta > 0$) is the inverse of the elasticity of work effort with respect to the real wage (Frisch elasticity).

The productivity shocks, $z_{T,t}$ and $z_{N,t}$, respectively, are innovations to the technology in the Cobb-Douglas production function of intermediate goods producers in the tradable sector, $Y_{T,t}$, and the production function of intermediate goods producers in the non-tradable sector, $Y_{N,t}$:

$$Y_{T,t} = z_{T,t}(K_{T,t})^{\alpha_T} N_{T,t}^{1-\alpha_T} - \psi_T \tag{B.2}$$

$$Y_{N,t} = z_{N,t}(K_{N,t})^{\alpha_N} N_{N,t}^{(1-\alpha_N)} - \psi_N \tag{B.3}$$

Here $K_{T,t}$ and $K_{N,t}$ is the capital used in the tradable and non-tradable sector, respectively. ψ_T and ψ_N are the fixed costs across firms belonging to the tradable and non-tradable sector. Two intermediate inputs are used in the production of the consumption good C_t.

The world demand shock, $z_{T,t}^{US}$, is modelled as the preference shock in the utility function of US households, which is otherwise equivalent to equation B.1.

$$Y_{T,t}^{US} = z_{T,t}^{US}(K_{T,t}^{US})^{\alpha_T} N_{T,t}^{US 1-\alpha_T} - \psi_T^{US} \tag{B.4}$$

The investment-specific shock, $e_{inv,t}$, enters the law of motion for the capital stock owned by the household sector :

$$K_t = (1-\delta)K_{t-1} + (1 - \Gamma_I\left(\frac{I_t}{I_{t-1}}\right) I_t e_{inv} \tag{B.5}$$

[11] The equations shown are simplified with the main objective to indicate where the shocks occur.

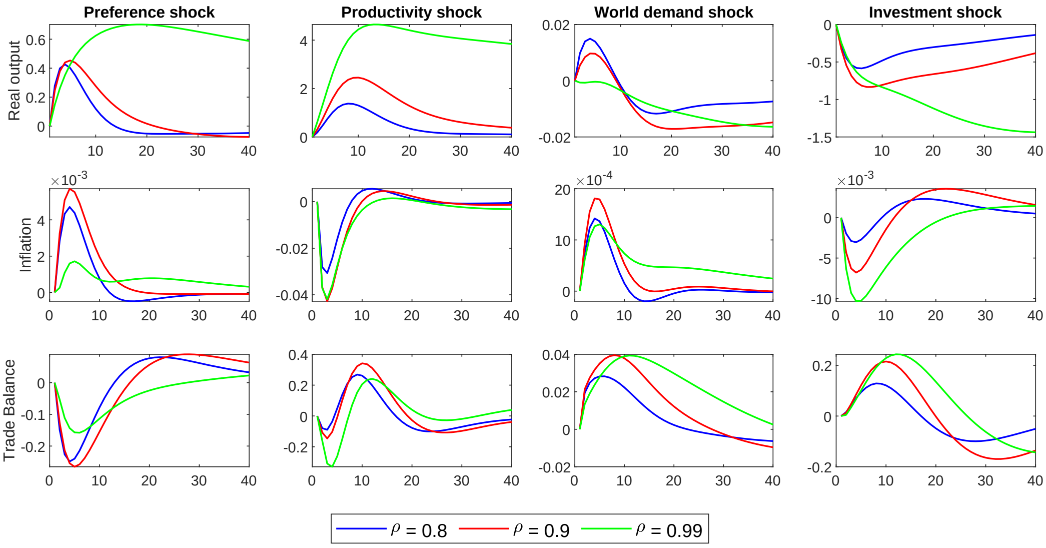
with δ the rate at which capital depreciates, I_t investment and Γ_t represents an adjustment cost formulated in terms of changes in investment.

The monetary policy shock, $\epsilon_{R,t}$, enters the Taylor rule of the monetary authority for the interest rate R_t specified in terms of annual CPI inflation, Π_t^4, and quarterly output growth, Ygr_t:

$$R_t^4 = \phi_R R_{r-1}^4 + (1 - \phi_R)\left[(\bar{R}^4 + \phi_\Pi(\Pi_t^4 - \bar{\Pi}^4) + \phi_Y(Ygr_t - 1)\right] + \epsilon_{R,t} \tag{B.6}$$

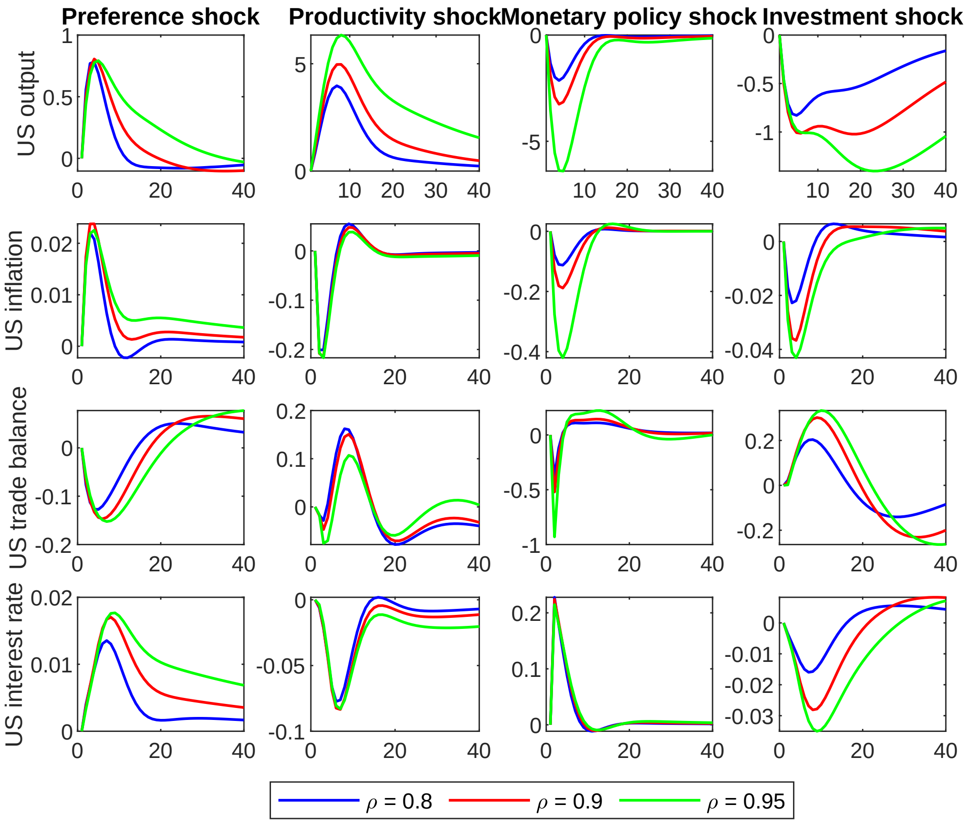
with ϕ_Π and ϕ_Y being the weight of inflation and output growth in the Taylor rule. ϕ_R is the weight of the previous period in interest rate smoothing.

Figure A1: Theoretical impulse responses for domestic shocks



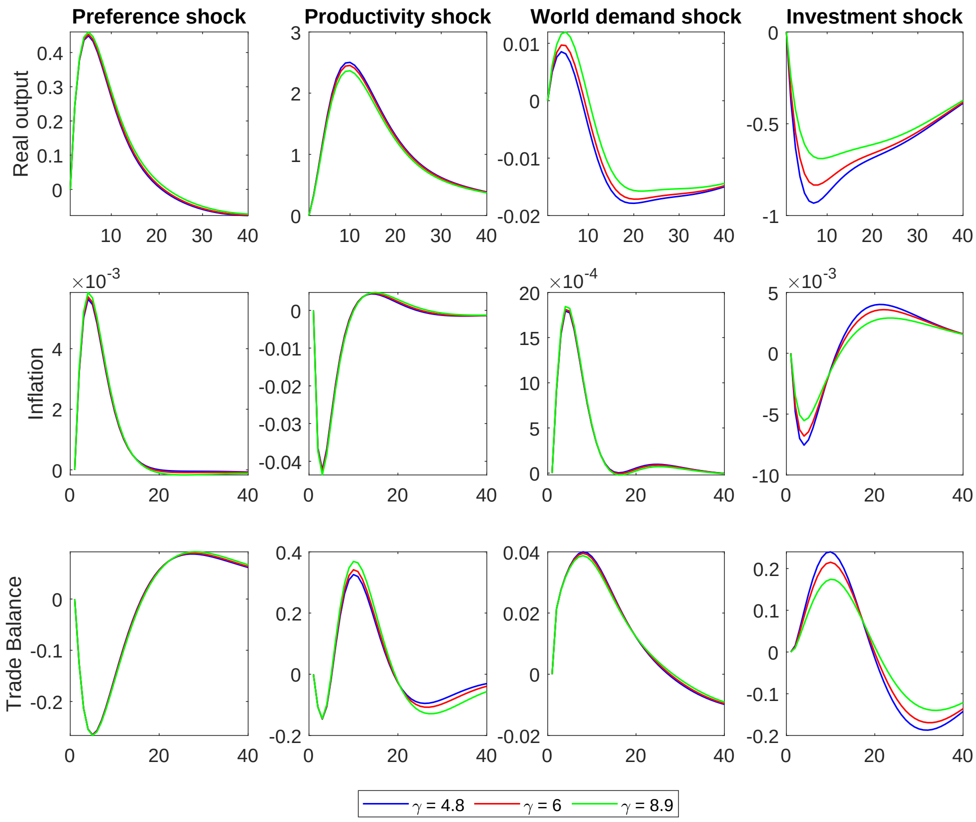
Notes: percentage deviations from steady state. The model is calibrated to the German economy.

Figure A2: Theoretical impulse responses of US shocks to Germany



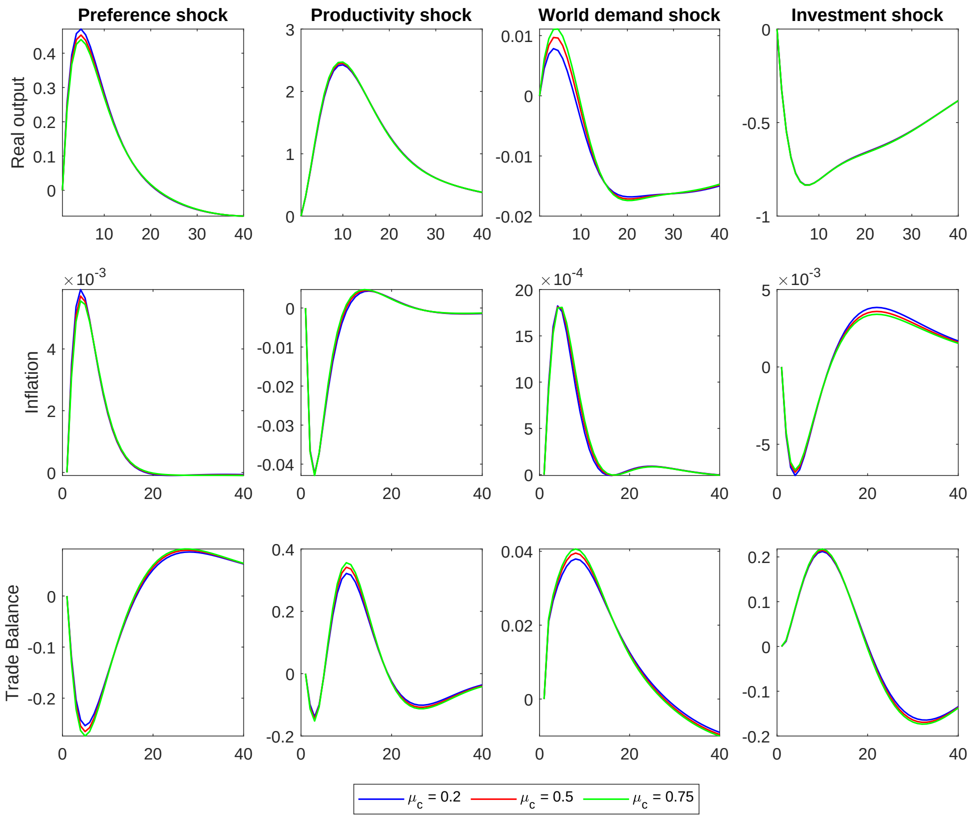
Notes: percentage deviations from steady state. The model is calibrated to the US and German economy.

Figure A3: Theoretical impulse responses for domestic shocks: γ, investment adjustment cost



Notes: Percentage deviations from steady state. The domestic economy is calibrated to the German economy.

Figure A4: Theoretical impulse responses for domestic shocks: μ_c, substitution between traded non traded



Notes: Percentage deviations from steady state. The domestic economy is calibrated to the German economy.

C Empirical IRF

C.1 Intra-euro area spillovers

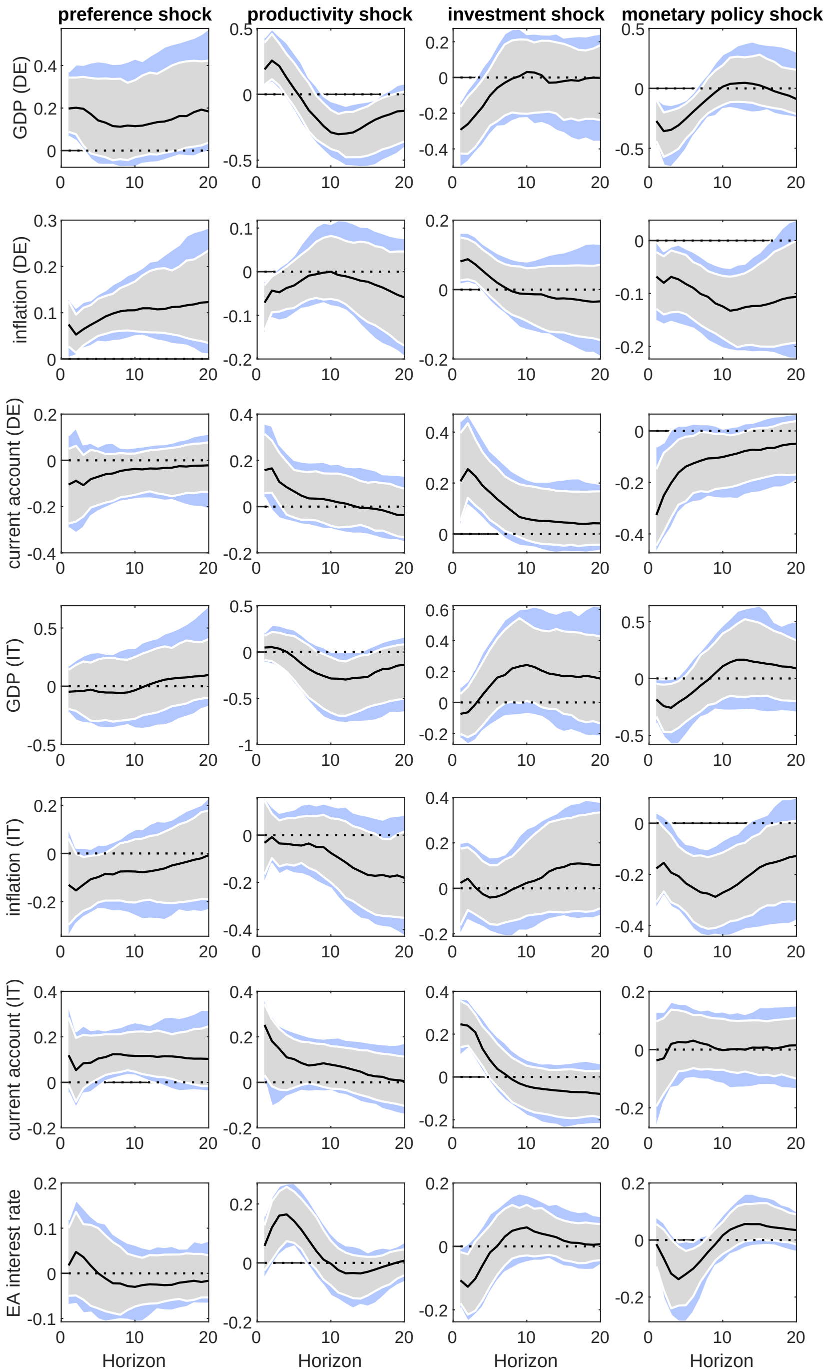
In a monetary union, interest rates are driven both by domestic shocks and spillovers from other countries with the common currency. We therefore perform a spillover analysis for intra-euro area shocks. We study spill-vers from Germany imposing sign restrictions on this economy and leaving the variables for Italy and Spain as well as the euro area interest rate unrestricted. This analysis shows potential mechanisms of euro area rebalancing and to which extent the current account is involved.

C.2 Shock spillovers to Italy

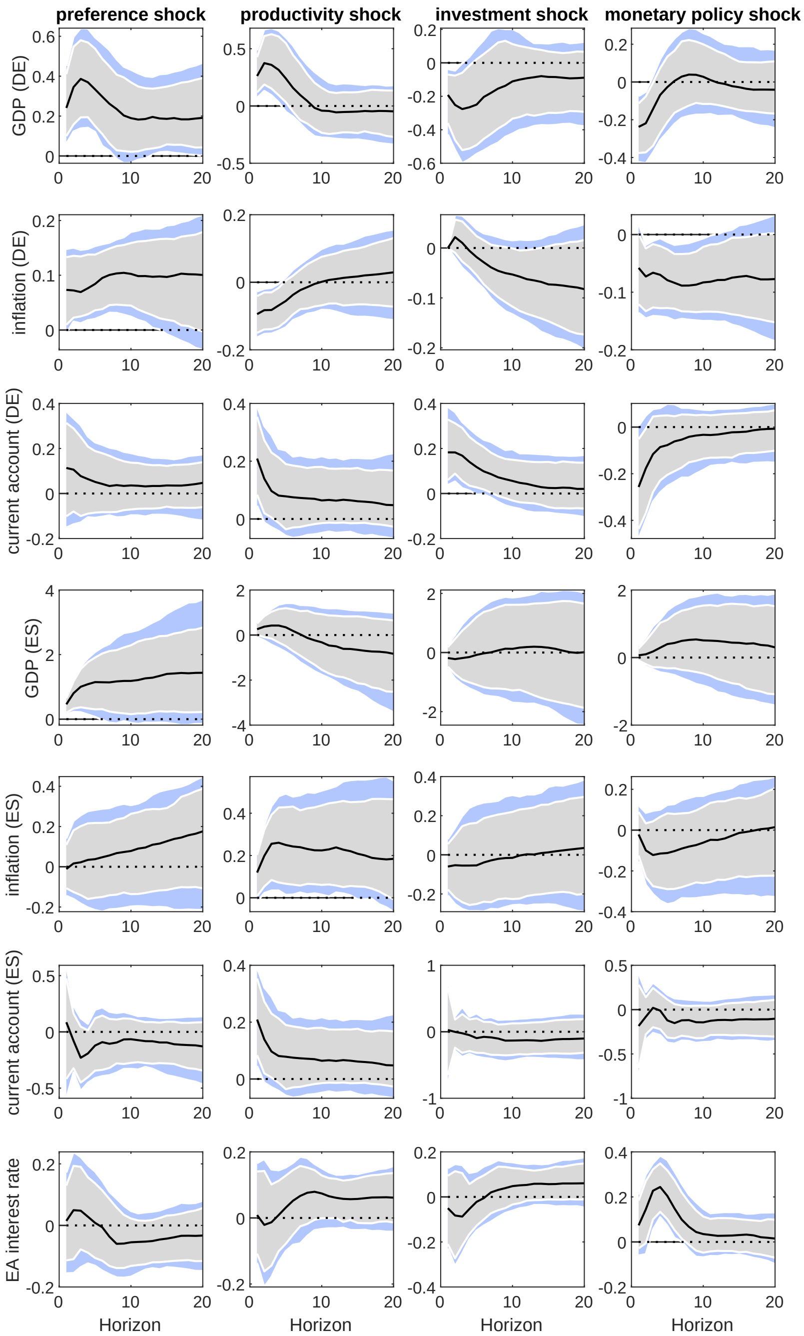
A preference shock in Germany in Figure A5 increases the Italian current account balance. A productivity shock in Germany has a positive effect on current account, but not significantly. A German investment shock lowers GDP and lowers inflation after the initial restrictions.

C.3 Shock spillovers to Spain

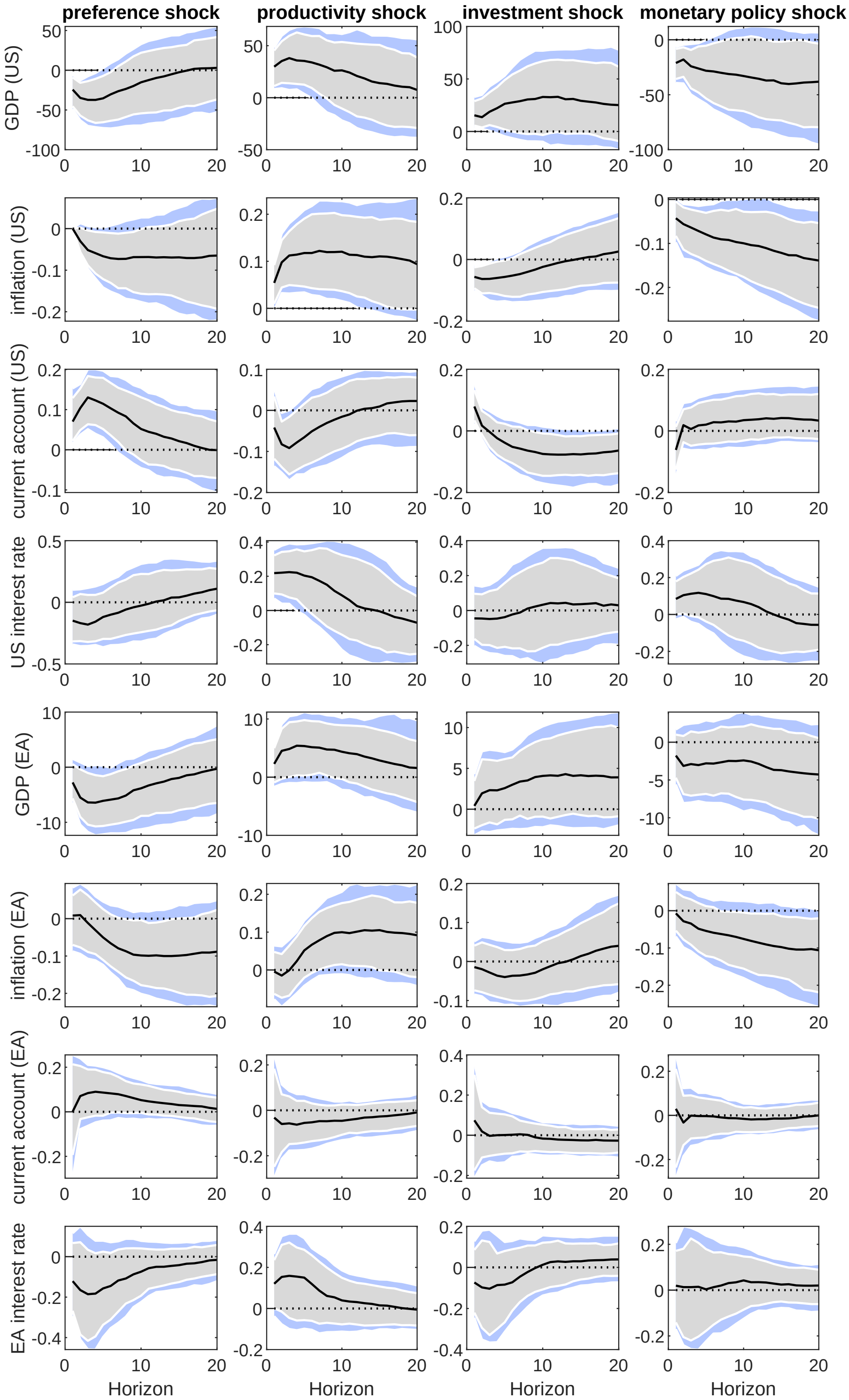
A preference shock originating in Germany brings no significant improvement in the current; see Figure A6. A positive productivity shock, by contrast, is benign for the current account. An investment shock in Germany has no significant impact on the current account in Spain.



Notes: IRF from the estimated VAR. The solid line represents the median IRF model. The shaded area represents the 16% and 84% (grey) or 10% and 90% (blue) quantiles of the posterior distribution.



Notes: IRF from the estimated VAR. The solid line represents the median IRF model. The shaded area represents the 16% and 84% (grey) or 10% and 90% (blue) quantiles of the posterior distribution.



Notes: IRF from the estimated VAR. The solid line represents the median IRF model. The shaded area represents the 16% and 84% (grey) or 10% and 90% (blue) quantiles of the posterior distribution.

D FEVD

Table D7: Forecast error variance decomposition for Italy

	Horizon	GDP	Inflation	CA/GDP	Interest Rate
Preference shock	Impact	15.48	2.11	14.12	42.60
		(2.68, 45.79)	(0.13, 15.41)	(1.53, 44.42)	(3.50, 79.61)
	1 Year	13.38	5.82	16.55	30.81
		(2.15, 43.43)	(1.38, 22.49)	(2.39, 46.03)	(3.01, 72.74)
	4 Years	21.63	15.23	9.75	26.75
		(7.44, 38.62)	(2.27, 37.72)	(5.71, 39.55)	(3.67, 60.61)
Productivity shock	Impact	43.28	52.87	2.19	4.51
		(22.92, 70.18)	(24.38, 76.18)	(0.18, 10.40)	(0.62, 17.53)
	1 Year	43.02	40.08	2.90	12.69
		(21.86, 71.64)	(15.00, 66.73)	(1.19, 6.54)	(2.59, 33.64)
	4 Years	36.57	22.42	8.07	23.17
		(20.86, 55.14)	(6.33, 48.52)	(2.49, 17.15)	(10.29, 42.82)
World demand shock	Impact	3.22	36.35	46.35	3.54
		(0.31, 16.16)	(18.24, 66.93)	(21.68, 69.77)	(0.34, 16.52)
	1 Year	7.27	43.52	43.18	10.83
		(1.40, 23.78)	(17.59, 71.56)	(19.51, 65.09)	(2.67, 26.11)
	4 Years	9.91	40.81	39.65	14.19
		(3.24, 21.99)	(15.39, 67.05)	(18.30, 60.23)	(4.31, 25.76)
Investment Shock	Impact	18.63	13.74	22.09	40.20
		(2.87, 49.10)	(0.00, 0.00)	(3.78, 51.27)	(4.05, 82.18)
	1 Year	14.81	1.62	24.61	23.43
		(2.16, 44.92)	(0.20, 5.74)	(6.17, 55.10)	(2.81, 70.05)
	4 Years	26.07	6.49	26.79	20.86
		(11.85, 41.43)	(0.69, 25.13)	(11.16, 46.95)	(4.68, 55.97)

Notes: Results are in percentage and we report the 16% and 68% quantiles in brackets.

Table D8: Forecast error variance decomposition for Spain

	Horizon	GDP	Inflation	CA/GDP	Interest Rate
Preference shock	Impact	17.31	13.52	9.62	35.95
		(2.48, 52.84)	(0.74, 42.68)	(0.98, 35.29)	(10.03, 69.21)
	1 Year	16.11	17.28	21.08	34.47
		(2.38, 50.02)	(1.71, 51.87)	(6.98, 41.29)	(6.43, 69.52)
	4 Year	18.12	26.31	20.48	31.21
		(5.86, 49.73)	(4.72, 58.72)	(8.32, 36.97)	(6.71, 66.28)
Productivity shock	Impact	19.23	35.72	10.41	5.96
		(3.10, 48.85)	(9.22, 70.62)	(1.39, 38.90)	(0.50, 24.76)
	1 Year	23.83	38.98	10.2	6.97
		(6.02, 52.51)	(9.89, 67.93)	(3.09, 28.98)	(1.66, 27.96)
	4 Year	27.41	25.78	22.7	11.62
		(6.26, 61.82)	(6.88, 54.31)	(12.89, 35.24)	(4.44, 29.44)
World demand shock	Impact	12.2	33.32	30.23	8.54
		(3.27, 37.52)	(9.74, 70.12)	(6.16, 59.30)	(0.38, 28.84)
	1 Year	4.9	29.35	20.93	7.06
		(1.18, 26.02)	(6.85, 62.24)	(6.72, 43.12)	(1.30, 31.63)
	4 Year	6.9	26.39	16.46	7.95
		(1.68, 21.89)	(7.42, 56.63)	(8.00, 30.01)	(2.25, 27.50)
Investment shock	Impact	25.86	0	22.57	29.88
		(3.27, 64.19)	(0.00, 0.00)	(3.21, 64.30)	(4.99, 68.08)
	1 Year	31.54	0.92	33.57	28.53
		(5.68, 67.75)	(0.10, 3.52)	(11.17, 59.80)	(4.60, 65.11)
	4 Year	19.7	4.43	33.96	30.78
		(5.66, 65.79)	(1.00, 15.28)	(18.97, 49.88)	(6.21, 64.40)

Note: Results are in percentage and we report the 16% and 68% quantiles in brackets.

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Tobias Schuler
European Central Bank, Frankfurt am Main, Germany; email: tobias.schuler@ecb.europa.eu

Yiqiao Sun
European Central Bank, Frankfurt am Main, Germany; email: yiqiao.sun@ecb.europa.eu

Postal address 60640 Frankfurt am Main, Germany
Telephone +49 69 1344 0
Website www.ecb.europa.eu

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