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„The Transmission of ECB Monetary Policy Spillovers to CESEE and LATAM"

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Abstract

This thesis studies the transmission channels of ECB monetary policy spillovers to Central, Eastern and Southeastern Europe (CESEE) and Latin America (LATAM). ECB monetary policy tightening results in a significant decline in output in CESEE and LATAM. This can be explained by a relatively strong aggregate demand channel, with falling euro area (EA) output leading to a reduction of EA import demand. However, in the case of US dollar-invoiced EA imports from LATAM, the expenditure-switching channel partly offsets the impact of the aggregate demand channel due to the appreciation of the euro and subsequently lower import prices. Further, ECB monetary policy tightening is associated with a significant increase in global risk aversion resulting in a retrenchment of EA banking flows to CESEE and LATAM via the risk-taking channel. For LATAM, there is also an observed decline in total banking inflows, excluding the EA from the source countries. This in turn, has also negative effects on LATAM trade flows, and helps to understand the overall similar output spillovers to CESEE and LATAM.

Zusammenfassung

Diese Masterarbeit untersucht den internationalen Transmissionsmechanismus der geldpolitischen Auswirkungen der Europäischen Zentralbank (EZB) auf Zentral-, Ost- und Südosteuropa (CESEE) und Lateinamerika (LATAM). Eine geldpolitische Straffung der EZB führt zu einem signifikanten Rückgang der Produktion in CESEE und LATAM. Eine Erklärung hierfür liegt zum einen in der verringerten Importnachfrage des Euroraums aufgrund der kontraktiven Geldpolitik und dem damit einhergehenden Produktionsrückgang im Euroraum. Bei Euroraum-Importen aus LATAM, die in US-Dollar fakturiert werden, mildern Wechselkurseffekte die negativen Auswirkungen ab, da eine Aufwertung des Euro zu niedrigeren Importpreisen führt. Darüber hinaus resultiert die geldpolitische Straffung der EZB in einem signifikanten Anstieg der globalen Risikoaversion, was zu einer Reduktion der Bankflüsse aus dem Euroraum nach CESEE und LATAM führt. In LATAM ist auch ein Rückgang der Bankzuflüsse aus Ursprungsländern außerhalb des Euroraums zu beobachten. Dies hat wiederum negative Auswirkungen auf den Handel in LATAM und trägt dazu bei, die insgesamt ähnlichen Auswirkungen auf die Produktion in CESEE und LATAM zu erklären.

Contents

1 Introduction

In a globalized world, monetary policy measures of major economies can have substantial international spillovers, particularly through trade and capital flows. Focusing on Central, Eastern and Southeastern Europe (CESEE) and Latin America (LATAM), two regions with a different degree of economic integration with the euro area (EA), this thesis studies the international transmission channels of ECB conventional monetary policy spillovers. There is an extensive body of literature finding significant ECB monetary policy spillovers to CESEE. Feldkircher (2015), Hájek and Horváth (2016), Potjagailo (2017), Colabella (2021) and Feldkircher and Schuberth (2023) find output spillovers to CESEE of similar magnitudes to the domestic effects in the EA. Feldkircher and Schuberth (2023) examine the transmission channels of these spillovers, demonstrating that CESEE trade flows with the EA and banking inflows from the EA decline significantly in response to an ECB monetary tightening shock. The literature studying ECB monetary spillovers to LATAM is relatively scarce, as most papers analyze the effects on emerging markets as a whole rather than disaggregating the countries into regions, see Ca'Zorzi et al. (2020) and Walerych and Wesołowski (2021) who provide evidence that not only FED but also ECB monetary policy has global effects on emerging markets. However, in response to an expansionary ECB unconventional monetary policy shock, Ouerk (2023) finds a substantial increase in output in LATAM, comparable to the response observed in European emerging markets. Ouerk (2023) also shows that exchange rates, banking inflows, and overall financial conditions respond significantly, underscoring the importance of financial channels in spillovers to LATAM.

This thesis builds upon the research conducted by Feldkircher and Schuberth (2023) in the context of CESEE and extends it to include the analysis of the transmission of ECB monetary policy spillovers to LATAM. In addition to examining direct trade and banking flows between the EA and these two regions, this thesis further investigates the trade and banking flows with non-EA countries. This broader perspective is particularly valuable for understanding the transmission mechanism of spillovers to LATAM, where economic ties with the EA are notably less extensive than CESEE's ties with the EA.

The econometric framework relies on local projections by Jordà (2005) and the exogenous monetary policy shocks by Altavilla et al. (2019). Finding significant and closely resembling declines in output in CESEE and LATAM in response to a conventional ECB monetary policy tightening shock, the thesis moves on to study

the transmission mechanism responsible for these spillovers.

In a first step, the thesis examines direct trade and banking flows between the EA and the two regions, CESEE and LATAM. The main results found here are a decline in banking inflows from the EA and a decline in trade flows between the EA and both CESEE and LATAM, with reductions of LATAM exports to the EA being less pronounced than CESEE exports to the EA. The decline in banking flows can be explained by the increase in EA banks' risk aversion leading to a reduction in holdings of risky assets – the *risk taking channel*, see Bruno and Shin (2015a). The decline in EA imports can be attributed to a strong influence of the *aggregate demand channel*, with falling EA output leading to reduced import demand. Further, Gopinath (2015) shows that the traditional Mundell-Fleming framework, where trade prices are sticky in the producer's currency, might be inadequate to study the *expenditure switching channel* – the effect of exchange rate changes on the relative price between domestic and foreign goods. Invoicing currency data by Boz et al. (2022) indicates that CESEE exports to the EA are mainly invoiced in euros. Thus, an exchange rate depreciation against the euro in CESEE will have no effects on import prices for the EA and consequently the expenditure-switching channel is muted. However, for LATAM, where exports to the EA are predominantly invoiced in US dollars, the appreciation of the euro against the US dollar partially offsets the effects of the aggregate demand channel. Given the smaller responses of exports to the EA in LATAM and generally the fact that LATAM is less integrated with the EA, it remains puzzling why output spillovers to LATAM and CESEE are so similar.

Thus, as a second step, the thesis explores responses of trade and banking flows of CESEE and LATAM with the rest of the world, excluding the EA. This is motivated by the results of Miranda-Agrippino and Nenova (2022), highlighting the amplification of the risk-taking channel by the "global financial cycle", the co-movement of global asset prices, credit growth and capital flows, see Rey (2015). Despite its depreciation against the euro, Miranda-Agrippino and Nenova (2022) observe an appreciation of the US dollar against other currencies in response to an ECB unconventional monetary tightening shock and the associated rise in global risk aversion, underscoring the US dollar's role as a "safe haven". Consistent with these results, in response to a conventional monetary policy shock, the thesis finds a significant increase in global risk aversion and a depreciation of domestic currencies against the US dollar in LATAM, accompanied by a decline in banking inflows, excluding the EA from the source countries.

The depreciation of domestic currencies against the US dollar in LATAM and the predominant role of the US dollar as invoicing currency lead to decreasing total imports and exports (excluding the EA from the partner countries), with the fall in exports being less pronounced.[1] The findings of this second setting, where the EA is excluded from the partner countries, help to understand why the overall output spillovers are of similar size.

The thesis proceeds with section 2 summarizing the international transmission channels of monetary policy found in the literature. Section 3 describes the economic links between the EA and CESEE/LATAM. Section 4 presents the data in use and section 5 the econometric framework. Section 6 provides the empirical results and in section 7 some robustness checks are shown. Section 8 concludes the thesis.

2 Transmission channels of monetary policy

Domestic monetary policy transmission operates through its influence on financial conditions. The responses of consumption and investment to changes in these financial conditions subsequently lead to changes in consumer prices. In a globally integrated world via trade and capital flows, domestic monetary policies can potentially also generate spillover effects to other economies. The main transmission channels for these international spillovers are the aggregate demand channel, the expenditure-switching channel, and various financial channels (Ca'Zorzi et al., 2020).

The following elaborates on the functioning of the different transmission channels with a particular emphasis on the context of an ECB conventional monetary policy tightening, a scenario then studied in section 6.

2.1 Aggregate demand and expenditure-switching channel

The aggregate demand channel, also referred to as the "demand-augmenting effect", see Rey (2016) or Degasperi et al. (2020), works via imports. When monetary policy tightens, it reduces EA consumption and investment, which in turn lowers the demand for imports. This decrease in imports results in reduced output in other economies.

The aggregate demand channel can be mitigated or even reversed by the monetary policy effects on exchange rates – an influence captured by the expenditure-

[1] LATAM exports falling less than imports can be explained by the potentially even increased US import demand due to the US dollar appreciation.

switching channel. As monetary policy tightens, the euro tends to appreciate against other currencies due to a shift in the EA yield curves and higher demand for the euro. The effect of exchange rate changes on the relative price between goods produced in the EA and those from partner economies (exchange rate pass-through) hinges on the frequency of price adjustments (price stickiness) and the currency used for trade invoicing. Three distinct paradigms emerge, depending on the currency in which prices are sticky, the producer-currency pricing (PCP), local-currency pricing (LCP) and dominant-currency pricing (DCP), see Ca'Zorzi et al. (2020).

The expenditure-switching channel was traditionally studied under the paradigm of PCP, commonly known as the Mundell-Fleming model by Fleming (1962), Mundell (1963), Svensson and Wijnbergen (1989) and Obstfeld and Rogoff (1995). Under PCP trade prices are sticky in the producer's currency, thus EA exports are sticky in euros and EA imports are sticky in the currency of the trading partner. An appreciation of the euro leads to increased EA imports due to relatively lower import prices, consequently boosting output in partner economies. Hence, under the PCP paradigm, the expenditure-switching channel generates opposing spillover effects compared to the aggregate demand channel. However, for the EA, a stronger euro intensifies domestic impacts as EA exports decline due to higher export prices.

Under LCP trade prices are sticky in the importer's currency, i.e. EA imports are sticky in euros and EA exports are sticky in the currency of trading partners. Thus, under the LCP paradigm, the expenditure-switching channel is muted, and the aggregate demand channel emerges as the predominant force driving spillovers. LCP is also studied extensively in the literature, including works by Betts and Devereux (2000) and Devereux and Engel (2003) and reviewed by Corsetti et al. (2010).

Finally, under DCP, as studied in Goldberg and Tille (2008), Gopinath (2015) and Gopinath et al. (2020) all trade prices are sticky in one dominant currency, resulting in distinct exchange rate pass-through dynamics for the dominant currency issuer and other countries. Moreover, the effects depend on whether the issuer of the dominant currency coincides with the country where the monetary shock occurs.

Scenario 1 – US dollar as dominant currency: An exchange rate appreciation of the euro against the US dollar due to a monetary tightening shock results in increased imports due to relatively lower import prices. Consequently, this stimulates output in partner economies. However, the overall impact on EA imports is not clear, as the aggregate demand channel operates in the opposite direction as the expenditure-switching channel. Given that the exchange rates of the partner countries against

the US dollar stay unchanged and that EA exports are sticky in US dollars, the expenditure-switching channel is muted for EA exports.

Scenario 2 – Euro as dominant currency: An exchange rate appreciation of the euro following a monetary tightening shock has no effects on EA import prices as they are sticky in euros. Consequently, EA imports decline, driven by the aggregate demand channel. In the case of all other countries, the currency depreciation against the euro leads to reduced imports from EA, as well as from other countries, since all trade prices are sticky in euros. As a result, both EA imports and exports will fall in this scenario. Note that there can also be combinations or mixtures of different paradigms, as studied by Georgiadis and Mösle (2020) for the EA. Furthermore, it is possible that for EA imports a distinct paradigm is relevant as for EA exports, e.g. Ca'Zorzi et al. (2020) find evidence in line with the PCP paradigm for EA exports and DCP with the US dollar as dominant currency for EA imports.

To determine the currency in which trade prices are sticky, insights from Gopinath (2015) and Georgiadis and Schumann (2021) are highly informative. These studies provide evidence that prices are sticky in the invoicing currency. Consequently, having information on the invoicing currency is crucial for interpreting the empirical analysis of trade responses to monetary policy tightening in section 6. Section 3 provides data on trade invoicing, drawing from the research of Boz et al. (2022).

2.2 Financial channels

A broad range of financial channels is involved in the transmission of monetary policy. These channels cover various ways through which monetary policy influences foreign financial conditions and by that exchange rates and foreign aggregate demand. The surge in financial globalization since the 1990s has also contributed to a rise in the spillover effects of monetary policy through capital flows (Rey, 2015). Since financial channels can operate together simultaneously, identifying them can be challenging (Fratzscher et al., 2016). In general, monetary tightening leads to reduced capital inflows in partner countries, potentially resulting in lower output. Especially sudden stops or abrupt reversals in capital inflows can have negative effects on financial stability and output (Reinhart & Calvo, 2000). Degasperi et al. (2020) find that financial channels play a dominant role in internationally transmitting US monetary tightening to real variables such as output. Canova (2005) finds that US monetary policy produces large spillovers to LATAM particularly through financial channels. The following will provide an explanation of some of these finan-

cial transmission channels.

The credit channel, in the context of banks also referred to as bank-lending channel, see Bernanke and Gertler (1995), is based on the disparity between external and internal firm financing, known as the external finance premium, which hinges on both funding costs and firm collateral. Monetary policy tightening increases funding costs and, due to the decrease in asset prices, diminishing net worth of borrowers. The lower net worth leads to reduced collateral and subsequently the external finance premium increases. This, consequently, leads to a decrease in credit supply of banks.

This thesis focuses on the risk-taking channel introduced by Bernanke and Kuttner (2005), Borio and Zhu (2012), and Bruno and Shin (2015a), who emphasize the significance of this channel, particularly in the context of banking flows. The risk-taking channel is closely related to the credit channel (Morais et al., 2019). Through its impact on asset prices and funding costs monetary policy influences the balance sheet and leverage constraints of financial intermediaries and consequently affects their risk aversion. A tightening of monetary policy triggers higher funding costs and lower asset prices, subsequently imposing more stringent balance sheet and leverage constraints. This, in turn, leads to reduced leverage and holdings of risky assets. The global financial cycle, as described by Rey (2015), magnifies the risk-taking channel through global synchronization of financial variables, such as capital flows, asset prices and credit growth (Miranda-Agrippino & Nenova, 2022).

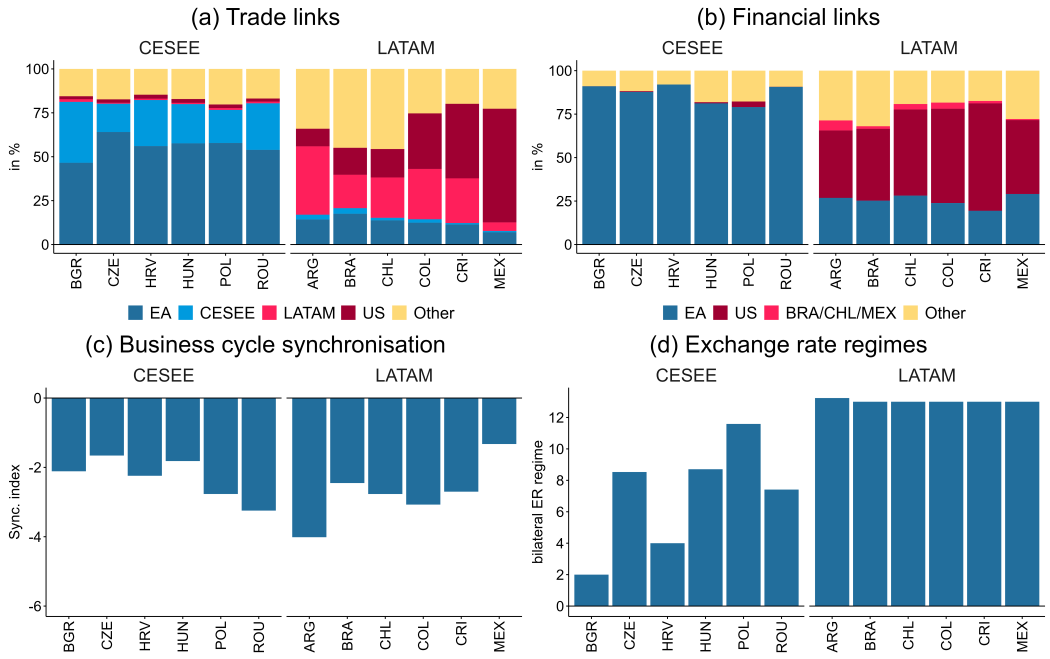
There is also a financial channel operating through the monetary policy effect on yield curves. As monetary policy tightens, the yield curve shifts up, especially increasing the demand for safe assets, and by that, also redirecting capital flows from other countries (Ca'Zorzi et al., 2020; Farhi & Maggiori, 2018).

Financial conditions can also be affected by the impact of ECB monetary policy on exchange rates. When assets are denominated in euros and income in the local currency, an appreciation of the euro results in higher borrowing costs. Georgiadis and Zhu (2021) investigates the financial channel of exchange rates in relation to US dollar-denominated assets within the context of "fear of floating", see Calvo and Reinhart (2002). The study reveals that countries with larger foreign-currency exposures tend to raise policy rates in response to US monetary policy tightening. This suggests that the financial channel of exchange rates implies a trade-off between financial and macroeconomic stability and as Rey (2016) notes also amplifies the risk-taking and credit channel.

3 Economic links between the EA, CESEE and LATAM

This section provides a few insights into the economic links between the EA and the two regions, CESEE and LATAM. This helps to understand possible transmission channels of monetary spillovers to the distinct regions. The CESEE country sample consists of five emerging market economies (Bulgaria, Croatia, Hungary, Poland, Romania) and one advanced economy (Czechia). The LATAM country sample includes six emerging market economies (Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico).

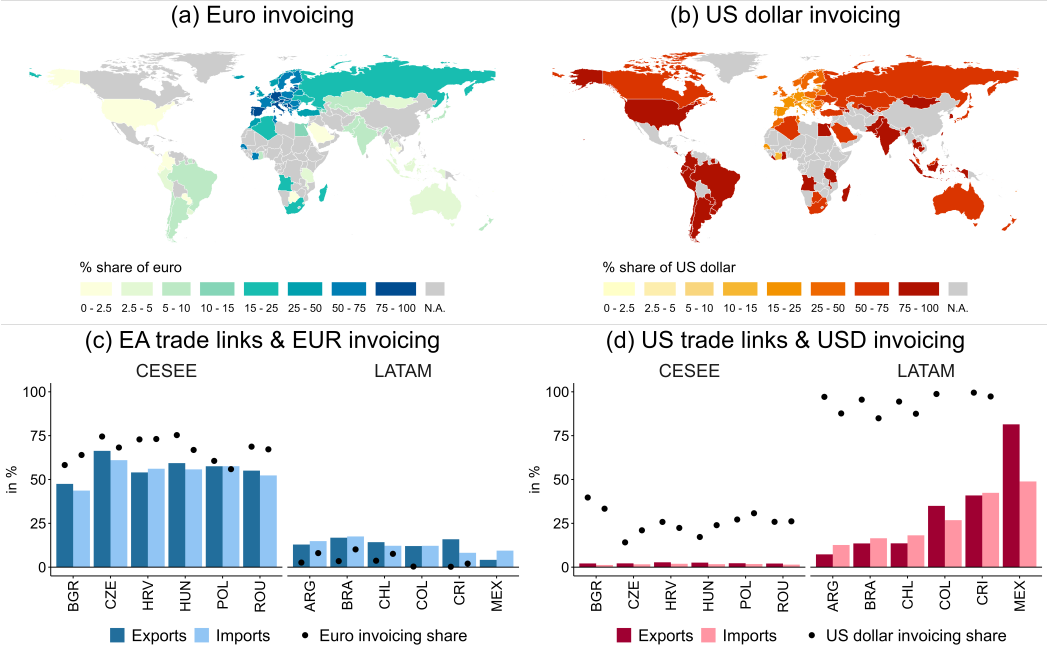
Figure 1: Economic links



Note: Panel (a) shows average export and import shares of trading partners. Note that the CESEE and LATAM group include also countries not in the sample. Panel (b) shows source country shares of total banking liabilities to all reporting countries. Panel (c) shows a measure for business cycle synchronisation with the EA, high value (closer to zero) means high synchronisation. Panel (d) shows bilateral de-facto exchange rate regimes against the euro, high values correspond to freely floating, low values to euro pegs. All panels show averages over the sample period.

Figure 1 (a) shows sample period (2003-01 - 2022-10) average export and import shares of the countries with either the EA, CESEE, LATAM, the US or others. Across all CESEE countries the trade shares with the EA are very high, followed by trade with other CESEE countries. In LATAM countries the overall trade shares

Figure 2: Trade invoicing



Note: Panel (a) & (b) show the euro (US dollar) invoicing shares averaged over exports and imports. Panel (c) & (d) show the EA (US) share in total exports and imports and the euro (US dollar) invoicing shares. All panels show averages over 2003-2019, if data is available. For Mexico no invoicing data and for Colombia no export invoicing data is available for any year.

with the EA are rather small, with trade with other LATAM countries and the US playing the most important role. This suggests that spillovers through direct trade flows between the EA and LATAM are relatively small, while for CESEE the trade flows with the EA should be a key driver of monetary policy transmission. Figure 1 (b) depicts the share of derived total outstanding liabilities (stocks) of the sample countries to the EA, the US, Mexico/Chile/Brazil and others. Note that the liabilities are derived from the reported claims of the partner countries against the respective sample country. Almost all banking claims against CESEE are held by EA banks. However, EA banks also play an important role in LATAM. Figure A.3 depicts individual bank data provided by Duijm and Schoenmaker (2020), showing that especially the two largest Spanish banks (BBVA and Banco Santander) have a notable exposure in LATAM. This indicates that banking flows could play a more significant role than trade flows in transmitting ECB monetary policy to LATAM.

Figure A.2 illustrates the trade and banking flows of CESEE and LATAM with the EA and the rest of the world in USD billions, presenting a reversed pattern

for CESEE and LATAM. The fraction of CESEE's links to the EA approximately corresponds to LATAM's links with the rest of the world. This emphasizes the importance of studying both direct links with the EA and those with the rest of the world.

Figure 1 (c) shows a simple indicator for business cycle synchronization, calculated following Giannone et al. (2010) as the real GDP growth rate difference between two economies multiplied by -1. Thus, the higher the value (e.g., the closer to zero), the higher the degree of synchronization. Surprisingly, business cycle synchronization with the EA seems to be relatively similar for CESEE and LATAM. To examine whether this observation is driven by overall synchronization with the US, Figure A.1 (a) shows that in fact the business cycle synchronization between the EA and the US is very high and the synchronization of the US with CEESE and LATAM countries very similar to the synchronization of the EA with these regions. This observation suggests that it might be useful to incorporate US output as a control variable in the econometric analysis. Finally, Figure 1 (d) depicts bilateral de-facto exchange rate regimes provided by Harms and Knaze (2021), showing that all LATAM countries have a flexible exchange rate against the euro, while CEESE currencies are tied closer to the euro and Bulgaria and Croatia having close pegs. In comparison, A.1 (b) shows that with the exception of Costa Rica, all countries have a rather flexible de-facto exchange rate against the US dollar.

Figure 2 (a) and (b) depict global euro and US dollar invoicing shares across countries based on data provided by Boz et al. (2022), averaged over the period 2003 - 2019.[2] Figure 2 (b) demonstrates the predominant role of the US dollar as global invoicing currency of trade. The role of the euro is less important globally, but in Europe the euro acts as a regional dominant currency. Unfortunately, bilateral data on trade invoicing, which would offer precise information about invoicing on trade flows between CESEE/LATAM countries and the EA, is not available. However, the aggregate data offers highly informative insights. Figure 2 (c) shows average export and import shares with the EA together with overall euro invoicing shares. In CESEE the euro invoicing shares are even higher than the trade shares with the EA. This indicates, that not only trade between the EA and CESEE is invoiced mainly in euros, but further that also a substantial part of CESEE trade flows with non-EA countries is invoiced in euros. Thus, the euro can be seen as regional

[2]Note that data for many countries is only available for a few years, so averages over the available period are computed. According to Boz et al. (2022), the invoicing currency shares of a country tend to be relatively stable.

dominant currency for the EA and CESEE. For LATAM a different situation arises, where for all countries the euro invoicing share is lower than the trade shares with the EA. However, in the case of Argentina, Brazil and Chile it seems that a substantial part of imports from the EA are invoiced in euros. Given the overall high shares of US dollar invoicing for LATAM imports, as the depicted in Figure 2 (d), the data indicates that the remaining fraction of imports from the EA is invoiced in US dollars.

The high shares of US dollar invoicing together with the low shares of euro invoicing for LATAM exports suggest that LATAM exports to the EA are invoiced predominantly in US dollars. As described above, trade invoicing plays an important role in the transmission mechanism of the expenditure-switching channel. In Section 6, the empirical results regarding the responses of trade flows to monetary policy shocks are interpreted, with a particular emphasis on the available invoicing data.

4 Data

The final data set covers the period from January 2003 to October 2022 on a monthly basis.[3] The analysis relies on exogenous ECB monetary policy shocks based on high-frequency data of changes in the yield curve during the window of ECB monetary policy announcements provided in the Euro Area Monetary Policy Event-Study Database (EA-MPD) by Altavilla et al. (2019). The monetary policy shocks are computed with the R package hfdshocks by Baumgärtner (2023). More specifically, I take the target factor of Altavilla et al. (2019), which loads most on short-term yields and serves as measure for conventional monetary policy. Given the monthly nature of the other variables, the daily surprises are converted into a monthly series. The literature broadly employs the method put forth by Gertler and Karadi (2015), who cumulate the entire daily series, then compute monthly averages, and subsequently take first differences. However, Ramey (2016) highlights that this approach potentially produces serially correlated shocks in the resulting monthly series. To address this issue, I adopt a more straightforward approach, following Rey (2016), Eberly et al. (2019), and Godinho (2021), who simply sum up the surprises for each month and set the monthly series to zero if there has not been any surprise in the corresponding month.

Data for trade flows is sourced from the Direction of Trade Statistics (DOTS)

[3]Only industrial production data for Argentina is missing before 2005.

provided by the IMF. The DOTS includes bilateral monthly imports and exports of goods. The trade flows are seasonally adjusted in the econometric analysis. Data for cross border banking claims against CESEE and LATAM is taken from the Locational Banking Statistics (LBS) provided by the Bank for International Settlements (BIS). It contains quarterly bilateral banking flows, mostly consisting of loans and deposits and debt securities. Since not all EA countries report, I add the claims of reporting countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain). Following Miranda-Agrippino and Rey (2020) and Feldkircher and Schuberth (2023), who also use the quarterly LBS data in a monthly framework, the banking claims are spline interpolated to obtain a monthly series. Additionally, following Feldkircher and Schuberth (2023), the banking claims are mean standardized to make the responses comparable between countries. As robustness check, the local projections are also estimated with quarterly banking claims.

Following the literature I take the VIX (US) and the VSTOXX (european), stock market volatility indices, as measure for global uncertainty and risk aversion, see among others Miranda-Agrippino and Nenova (2022), Forbes and Warnock (2012) and Bruno and Shin (2015a, 2015b).

Data sources and descriptions for further variables, including output (industrial production)[4], nominal exchange rates, etc., are presented in Table A.1. For the local projection analysis the data for output, exchange rates, exports and imports, EA consumer prices (CPI), EA commodity prices, EA equity prices, VIX and VSTOXX are taken in logarithmic transform and multiplied by 100.

5 Econometric framework

The econometric analysis follows Feldkircher and Schuberth (2023) and is based on local projections by Jordà (2005), which provide a robust methodology to compute impulse responses for both stationary and non-stationary data (Montiel Olea & Plagborg-Møller, 2021). Responses of various variables to an ECB monetary policy tightening shock are estimated both in a panel and in an individual country framework.

The main analysis consists of two different settings. First, panel responses of links between CESEE/LATAM and the EA to an ECB monetary policy tightening

[4]GDP is only available on quarterly basis.

shock are computed. For this purpose, for country i and period t, the $m_{y1} \times 1$ vector $Y_{1,it}$ = (output, EUR exchange rate, imports from the EA, exports to the EA, banking inflows from the EA)$'$ is established. In the second setting, panel responses of the links between CESEE/LATAM and the rest of the world, excluding the EA, are computed. In this case, the $m_{y2} \times 1$ vector $Y_{2,it}$ = (output, USD exchange rate, total imports (excl. EA), total exports (excl. EA), total banking inflows (excl. EA))$'$ is established. In both cases additional control variables are included in the $m_z \times 1$ vector Z_t = (EA output, EA CPI, EA commodity prices, US output)$'$. Furthermore, the model contains the exogenous ECB monetary policy shocks, denoted by mp.[5] The model for $Y = Y_1, Y_2$ with including $p = 4$ lags and $h = 0, 1, ..., 12$ impulse response horizons is defined as

$$Y_{i,t+h} = \alpha_{i,h} + mp_t \cdot \beta_h + \sum_{j=1}^{p} Y'_{i,t-j}\theta_{h,t-j} + \sum_{j=1}^{p} Z'_{t-j}\phi_{h,t-j} + \varepsilon_{i,t+h}. \tag{1}$$

In the panel framework, the model is estimated separately for the CESEE and LATAM country sample. Note that when applying the model to panel data $\alpha_{i,h}$ correspond to country fixed effects. In the individual country setting, equation (1) is estimated for each country separately. Thus, β_h is replaced by country specific $\beta_{i,h}$ and $\alpha_{i,h}$ denotes simple regression constants. Robust Newey and West (1987) standard errors $\varepsilon_{i,t}$ are used in the panel and in the individual country setting.

The model is also used to study the responses of global risk aversion indicators to an ECB monetary policy tightening shock. Here, equation (1) is estimated with $Y = Y_3$, where the $m_{y3} \times 1$ vector $Y_{3,t}$ = (VSTOXX, VIX)$'$ is used.[6]

As a first step, local projections are used to obtain domestic EA responses. This can be seen as plausibility check of the monetary policy shock variable. The responses are obtained by the following model,

$$Y_{t+h} = \alpha_h + mp_t \cdot \beta_h + \sum_{j=1}^{p} Y'_{t-j}\theta_{h,t-j} + \varepsilon_{t+h}, \tag{2}$$

where EA variables are collected in the $m_y \times 1$ vector Y_t = (EA output, 2- and 10-year government bond yields, EA equity prices, EA CPI, EA commodity prices)$'$.

[5]Note that the inclusion of control variables has limited impact on the empirical results, as the monetary policy shocks are exogenous.

[6]Here the model is defined without any country subscripts.

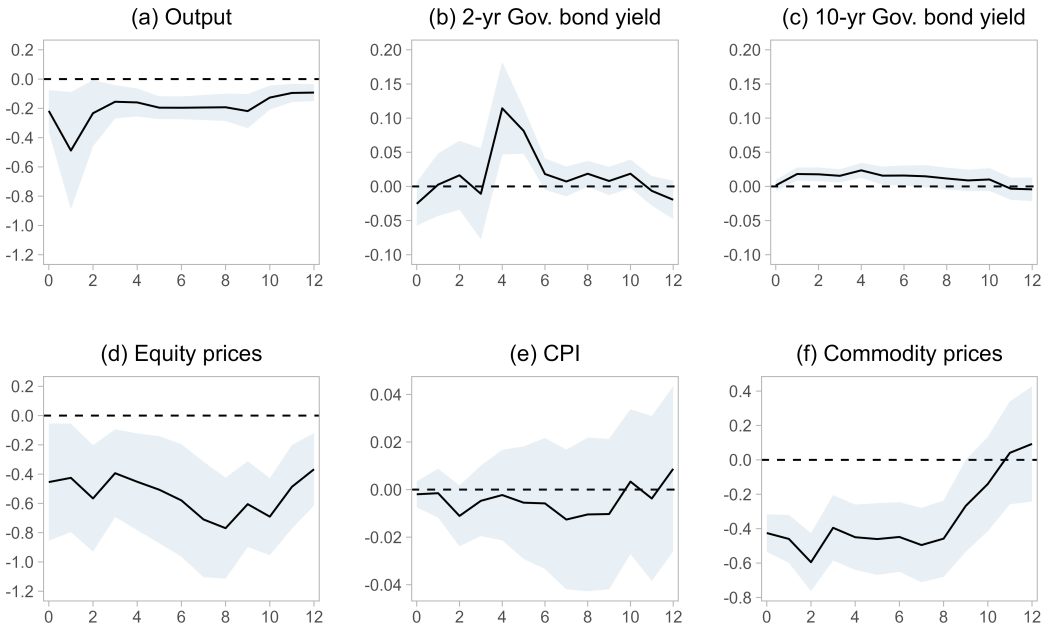
6 Empirical results

To validate the monetary policy shock series, this section first presents the responses of several EA variables to monetary policy tightening. Moving on to the analysis of the transmission channels of monetary policy, the section proceeds to show the responses of exchange rates, trade, and banking flows. These responses are explored both in terms of links between the two regions, CEESE and LATAM, and the EA, as well as links between the two regions and the rest of the world (excluding the EA).

6.1 Domestic EA effects

Figure 3 depicts the mean responses of macroeconomic EA variables to a one standard deviation ECB monetary policy tightening shock, together with 68% confidence bounds.[7]

Figure 3: EA responses



Note: This figure shows EA responses to an ECB monetary policy tightening shock of one standard deviation. Industrial production, equity prices, CPI and commodity prices are in logs x 100 and bond yields in % p.a. Mean responses and 68% confidence bounds are shown.

[7] 68% confidence bounds are commonly used in the literature both in local projections and vector autoregression (VAR) analysis, e.g. in Anaya et al. (2017), Ca'Zorzi et al. (2020) and Feldkircher and Schuberth (2023).

There is a persistent and significant decline observed in both output and equity prices. It is crucial that equity prices react negatively to monetary policy tightening, otherwise, it would suggest that the monetary policy shock series is driven by an information effect, see Jarociński and Karadi (2020) and Nakamura and Steinsson (2018), meaning that a monetary policy tightening shock is signalling a more optimistic economic outlook by the central bank. Furthermore, both short-term and long-term government bond yields increase, with short-term yields showing notably larger responses. This is consistent with the construction of the target factor of Altavilla et al. (2019), which should reflect conventional monetary policy and therefore short-term interest rates. Finally, the responses of consumer prices (CPI) and commodity prices are both negative, however the response of CPI is less pronounced and not significant.

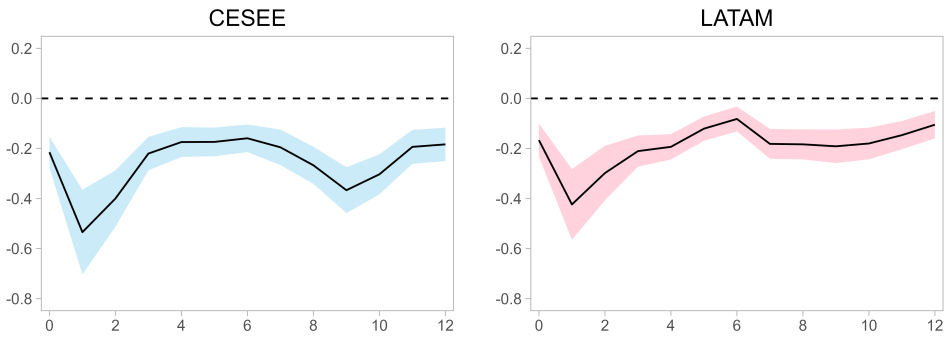
More specifically, the peak responses are a 0.49% decrease in output after 1 month, a 11 basis points increase in 2-year government bond yields after 4 months, a 0.77% decrease in equity prices after 8 months and a 0.6% decrease in commodity prices after 2 months. The responses of EA variables are broadly in line with expected patterns and correspond with existing literature (Feldkircher & Schuberth, 2023).

6.2 Effects on CESEE and LATAM

Moving on to the analysis of spillovers from ECB monetary policy tightening and their transmission channels to CESEE and LATAM, Figure 4 illustrates the output spillovers, showing substantial declines in output for both CESEE and LATAM in response to a monetary policy tightening shock. The similarity in magnitudes of the responses for CESEE (-0.53% after 1 month) and LATAM (-0.42% after 1 month), with CESEE responses showing only slightly more persistence, is somewhat surprising. However, these results are in line with the findings of Ouerk (2023), who identified similar GDP responses in LATAM and emerging Europe following an ECB unconventional monetary policy loosening.

To investigate possible explanations behind these output spillovers, i.e. the transmission channels, the first step is to examine the responses of bilateral links between CESEE/LATAM and the EA. Figure 5 (a) shows that both CESEE and LATAM exchange rates against the euro decline, but the effect is more pronounced in LATAM. This can be explained by the different exchange rate regimes of the countries, depicted in Figure 1, with LATAM countries uniformly having a higher degree of free

Figure 4: Panel responses of output



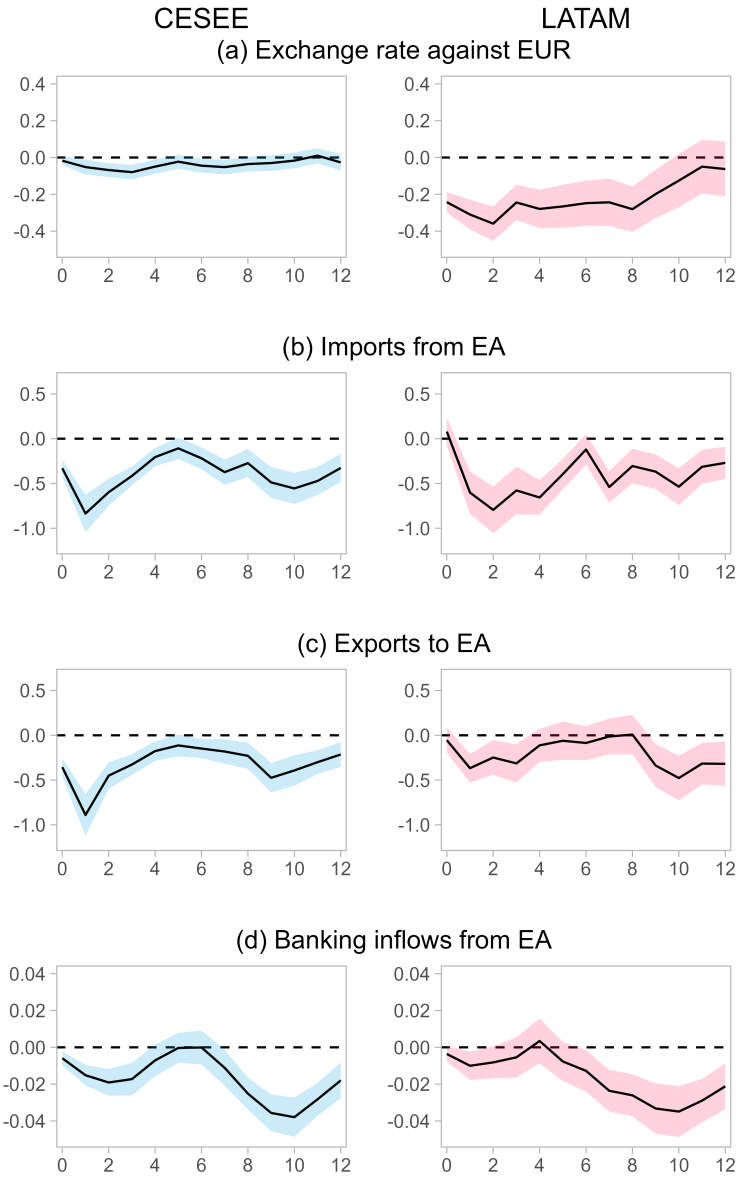
Note: This figure shows panel responses of CESEE and LATAM industrial production (in logs x 100) to an ECB monetary policy tightening shock of one standard deviation. Mean panel responses and 68% confidence bounds are shown.

floating against the euro than CESEE countries. When comparing the responses of exchange rates with the output spillovers for each individual country, see Figure A.7 and A.8, it becomes apparent that even within the CESEE group, countries with flexible exchange rates encounter spillover effects of similar magnitude as countries that have their currencies closely pegged to the euro (Croatia and Bulgaria). This is consistent with the evidence provided by Corsetti et al. (2021), who examine ECB monetary policy spillovers in relation to different exchange rate systems in more detail. In the traditional text-book Mundell-Fleming framework, the PCP paradigm, where trade prices are sticky in the producer's currency, the observed decline in exchange rates against the euro, i.e. an appreciation of the euro, should lead to declining imports from the EA and to increasing exports to the EA. However, the invoicing currency data of Boz et al. (2022) presented in Figure 2 suggests that the PCP paradigm alone might be insufficient to study the expenditure-switching channel.

For CESEE the high euro invoicing shares indicate that the euro can be seen as the regional dominant currency. Consequently, consistent with DCP, where trade prices are sticky in the dominant currency, the appreciation of the euro leads to declining imports from the EA, as shown in Figure 5 (b) with a peak decline of 0.84% after 1 month.[8] Moreover, for CESEE exports to the EA, the expenditure-switching channel is muted and the responses of exports to the EA are driven by the aggregate demand channel. Therefore, the decrease in EA output due to monetary policy tightening results in declining CESEE exports to the EA with a peak of -

[8]Note that this situation coincides with PCP, where prices are sticky in the producer's currency.

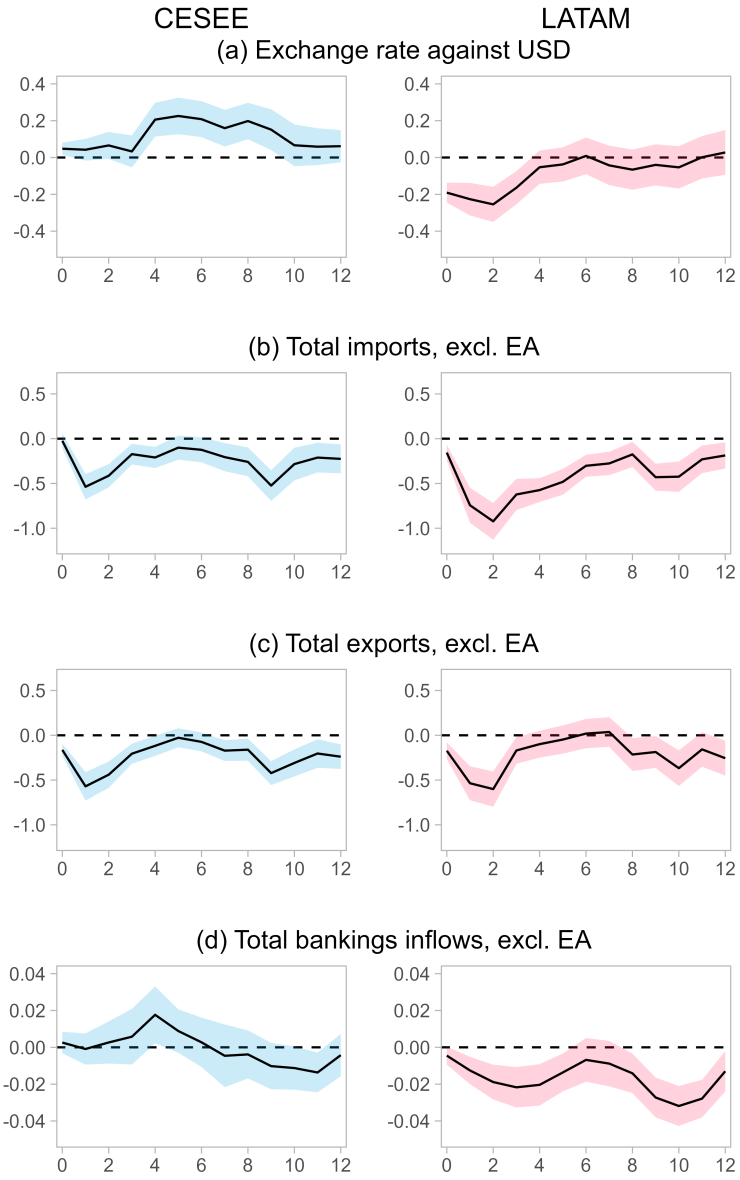
Figure 5: Panel responses of CESEE/LATAM - EA links



Note: This figure shows panel responses for CESEE and LATAM to an ECB monetary policy tightening shock of one standard deviation. Banking inflows are mean-standardized, all other variables are in logs x 100. Mean responses and 68% confidence bounds are shown.

0.89% after 1 month. With respect to trade flows between the EA and LATAM, the invoicing data suggests that a high share of LATAM imports from the EA is invoiced in euros and that the remaining fraction of imports from the EA is invoiced in US dollars. Figure 7 (b) shows that ECB monetary policy tightening

Figure 6: Panel responses of CESEE/LATAM - World (excl. EA) links



Note: This figure shows panel responses for CESEE and LATAM to an ECB monetary policy tightening shock of one standard deviation. Banking inflows are mean-standardized, all other variables are in logs x 100. Mean responses and 68% confidence bounds are shown.

leads to an appreciation of the euro against the US dollar. However, Miranda-Agrippino and Nenova (2022) provide evidence that ECB unconventional monetary policy tightening results in an increase of the effective US dollar exchange rate (excluding the euro exchange rate) and explain this finding by the influence of ECB

monetary policy on global risk aversion and the US dollar serving as a "safe haven". Figure 6 (a) corroborates this finding for LATAM countries, where a significant decline in the exchange rates against the US dollar is observed. Taken together, in LATAM countries the exchange rates against the euro and the US dollar decline in response to an ECB monetary policy tightening shock. This explains why imports from the EA decrease in a comparable magnitude as CESEE imports from the EA with a peak decline of 0.8% after 2 months.[9]

The low shares of euro invoicing together with the high shares of US dollar invoicing for total LATAM exports suggest that the responses of LATAM exports to the EA have to be analyzed under the DCP paradigm with the US dollar as dominant currency. The appreciation of the euro against the US dollar should result in boosting LATAM exports to the EA. However, since the aggregate demand channel operates in the opposite direction as the expenditure-switching channel, the final outcome is not clear. As depicted in Figure 5 (c) LATAM exports to the EA fall with a peak of 0.48% after 10 months, which is less pronounced than CESEE exports to the EA, where the expenditure-switching channel is muted. This indicates that the overall response is driven by the aggregate demand channel, but the effects are partly offset by the expenditure-switching channel.

Finally, Figure 5 (d) depicts responses of banking inflows from the EA, showing significant declines both in CESEE and LATAM. Banking inflows are mean-standardized to be comparable across countries.[10] Table A.2 includes the mean and standard deviation of banking inflows to CESEE and LATAM. The peak decline of about 0.04 standard deviations for both CESEE and LATAM corresponds to 5.28% (CESEE) and 5.12% (LATAM) of average banking inflows from the EA in absolute values.[11] The responses of banking inflows from the EA are shown for the individual countries with mean-standardized flows in Figure A.14, and with flows in USD

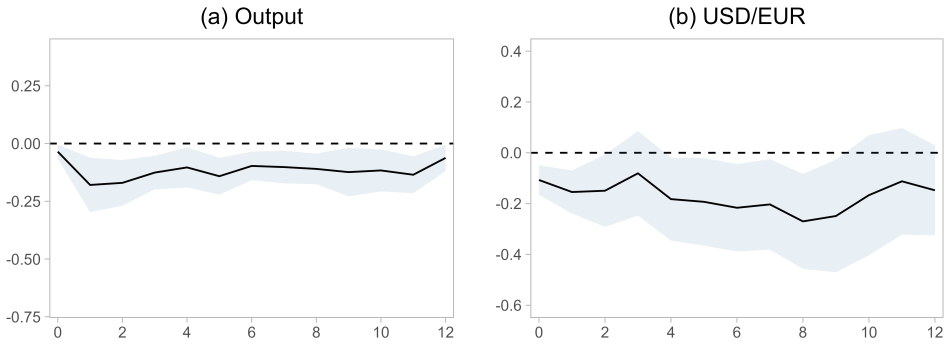
[9]Given the euro and US dollar invoicing shares of LATAM imports from the EA, the corresponding paradigm would be a mixture of PCP and DCP with the US dollar as dominant currency. However, since the LATAM exchange rates against the US dollar decline, the expenditure-switching channel is also not muted for the fraction of trade invoiced in US dollars. Thus, overall, the expected and observed responses correspond to the PCP paradigm.

[10]Logarithmic transformation as for exchange rates and trade flows is not possible since banking flows can be negative.

[11]More precisely, information from Table A.2 is used to calculate for CESEE and LATAM $\frac{\text{ea\_claims\_m\_sd} * x_i}{\text{ea\_claims\_m\_abs}}$, where ea_claims_m_sd is the standard deviation of monthly banking inflows, ea_claims_m_abs is the sample period mean of banking inflows in absolute values and x_i is the peak decline for CESEE (0.038) and LATAM (0.035) depicted in Figure 5 (d). Note that banking inflows are taken in absolute values to relate the effects to the general level of flows. Because of the large amount of negative flows after the financial crisis as depicted in Figure A.2 the "real" average denoted as "ea_claims_m" in Table A.2 is very low.

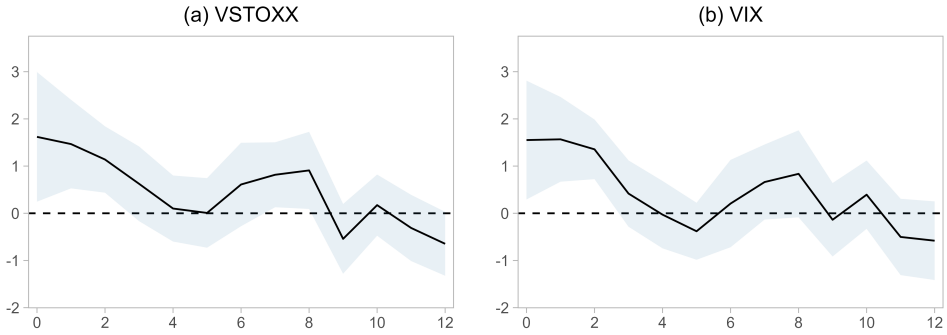
millions in Figure A.16. Note that with the exception of Romania and Costa Rica, in all countries banking inflows from the EA decline significantly, with the response of Czechia, an observed fall in banking inflows of around 75 USD millions after 10 months, being the most pronounced in absolute terms. Overall, the responses of the banking inflows indicate that ECB monetary policy tightening spillovers also transmit to CESEE and LATAM through financial channels. However, given the similar responses of banking inflows together with the less pronounced decline in LATAM exports to the EA and generally the fact that LATAM is less integrated with the EA, it remains puzzling why output spillovers to LATAM and CESEE are so similar.

Figure 7: US responses



Note: This figure shows US responses of output (industrial production) and the euro exchange rate, both in logs x 100, to an ECB monetary policy tightening shock of one standard deviation. Mean responses and 68% confidence bounds are shown.

Figure 8: Responses of VSTOXX and VIX



Note: This figure shows responses of VSTOXX and VIX, both in logs x 100, to an ECB monetary policy tightening shock of one standard deviation. Mean responses and 68% confidence bounds are shown.

A possible explanation is the risk-taking channel and its amplification through the "global financial cycle" – the international co-movement of asset prices, credit growth and capital flows (Miranda-Agrippino & Nenova, 2022; Rey, 2015). The tightening of monetary policy triggers higher funding costs and lower asset prices, subsequently imposing more stringent balance sheet and leverage constraints on banks, leading to increased risk aversion and less holdings of risky assets. While the risk-taking channel explains the observed decline in EA banking flows to LATAM and CESEE, it could potentially be amplified by an overall increase in global risk aversion, resulting in a retrenchment of global banking flows. In line with the results of Miranda-Agrippino and Rey (2022) and Ouerk (2023) for ECB unconventional monetary policy, Figure 8 shows that the VSTOXX and VIX increase significantly and instantly by around 1.5% to an ECB conventional monetary policy tightening shock. VSTOXX (european) and VIX (US) are stock market volatility indices commonly used as measures for global uncertainty and risk aversion and they are negatively correlated with global capital flows and domestic credit growth, see Forbes and Warnock (2012) and Rey (2015, 2016).

The observed impact of ECB monetary policy tightening on global risk aversion potentially also influences exchange rates, trade, and financial flows between CESEE/LATAM and the rest of the world, excluding the EA. Figure 6 (a) illustrates the exchange rate responses against the US dollar for CESEE and LATAM. In the case of CESEE, domestic currencies strengthen against the US dollar, while LATAM experiences a significant currency depreciation, peaking at -0.25% after 2 months against the US dollar. In the case of CESEE, this finding can be attributed to Croatia's and Bulgaria's currency pegs to the euro, along with the remaining countries in the region maintaining some degree of currency ties to the euro. Furthermore, as shown in Figure 6 (d), there is also no decline in banking inflows from non-EA source countries, which would contribute to a currency depreciation. On the other hand, LATAM's currency depreciation against the US dollar can be explained by the increase in global risk aversion and the US dollar serving as a "safe haven" (Miranda-Agrippino & Nenova, 2022). The responses of banking inflows align with this explanation, as there is a notable decline in banking inflows to LATAM, with a peak decline of 0.032 standard deviations after 10 months, corresponding to 4% of average banking inflows (excluding the EA from the source countries) in absolute values.[12] As most trade flows of LATAM are invoiced in US dollars, the depreciation

[12]The responses of total banking inflows, excluding the EA from the source countries, are shown for the individual countries with mean-standardized flows in Figure A.15, and with flows in USD

against the US dollar in LATAM results in declining total imports and exports (excluding the EA from the partner countries). The less pronounced decline in exports can be explained by the potentially even rising import demand from the US. The invoicing data for CESEE indicates that CESEE trade with non-EA countries is partially invoiced in euros, but a substantial share is also invoiced in US dollars. Consequently, the depreciation against the euro and the appreciation against the US dollar are working in opposite directions. Overall, there are declining exports and imports, but the appreciation against the US dollar explains why the import responses (-0.54% after 1 month) are less pronounced than for LATAM (-0.92% after 2 months).

Given that trade and banking flows between non-EA countries and LATAM are considerably larger than between non-EA and CESEE, as depicted in A.2, the responses of total exports and banking inflows, excluding the EA from the partner countries, help to understand why overall output spillovers of an ECB monetary policy tightening in CESEE and LATAM are so similar.

7 Robustness checks

To ensure the robustness of the results obtained for the interpolated monthly banking flows, the panel local projections are also estimated using the original quarterly series. More specifically, equation (1) is estimated using quarterly data with including $p = 4$ lags and $h = 0, 1, ..., 8$ horizons.[13]

Figure 9 depicts the responses of quarterly banking inflows from the EA. The responses during the first 4 quarters closely resemble those obtained with the monthly series in Figure 5 (d) for 12 months. CESEE banking inflows from the EA decline more pronounced in the first 2 quarters while banking inflows to LATAM begin to significantly decrease after 2 quarters. For CESEE the peak decline of 0.07 standard deviations after 4 quarters corresponds to an average decline of 146 USD millions across the sample and for LATAM the peak decline of 0.06 standard deviations after 4 quarters corresponds to an average decline of 61 USD millions.[14]

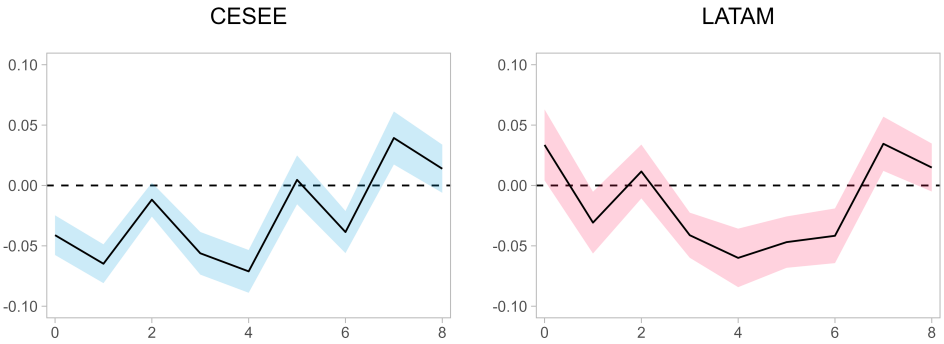
millions in Figure A.17. The response in USD millions is most pronounced for Brazil, where banking inflows decline by 63 millions after 2 months.

[13]Quarterly averages for industrial production, exchange rates, EA CPI and EA commodity prices; Quarterly sums for export and import flows. Daily monetary policy shocks are added for each quarter analogous to the computation of the monthly series.

[14]In % of flows in absolute values: 9.6% (CESEE) and 8.8% (LATAM). For the computation, information from Table A.2 is used to calculate for CESEE and LATAM $\frac{\text{ea\_claims\_q\_sd} * x_i}{\text{ea\_claims\_q\_abs}}$, where ea_claims_q_sd is the standard deviation of quarterly banking inflows, ea_claims_q_abs is the sample

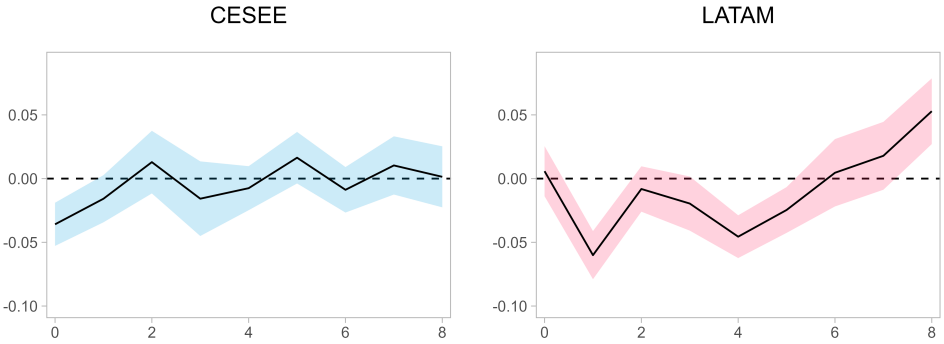
Figure 10 depicts the responses of quarterly total banking inflows, excluding the EA from the source countries. Again, the responses are quite similar to those obtained with the monthly series in Figure 6 (d). In CESEE the peak decline of 0.036 standard deviations in the same quarter as the shock corresponds to an average decline of 36 USD millions across the sample and in LATAM the peak decline of 0.06 standard deviations after 1 quarter corresponds to an average decline of 132 USD millions.[15]

Figure 9: Panel responses of quarterly banking inflows from EA



Note: This figure shows responses of quarterly banking inflows from the EA (mean-standardized). Mean panel responses and 68% confidence bounds are shown.

Figure 10: Panel responses of quarterly total banking inflows, excl. the EA



Note: This figure shows responses of quarterly total banking inflows, excluding the EA from the source countries (mean-standardized). Mean panel responses and 68% confidence bounds are shown.

Georgiadis (2017) recommends to include the output of partner countries in bilateral two-country models. Thus, additional to EA and US output, I include

period mean of banking inflows in absolute values and x_i is the peak decline for CESEE (0.07) and LATAM (0.06).

[15] In % of flows in absolute values: 4.9% (CESEE) and 7.7% (LATAM).

trade-weighted output of the countries of the respective region in equation (1).[16] Then Z_t equals Z_{it} = (EA output, EA CPI, EA commodity prices, US output, weighted output)$'$. However, the inclusion of the variable has no noticeable impact on the responses. As further robustness check, the sample period is restricted to the pre-Covid-19 era. Figure A.5 depicts the responses of output in CESEE and LATAM and Figure A.6 depicts the responses of exchange rates, trade and banking flows both with the EA and with the rest of the world (excluding the EA). The responses obtained for the pre-Covid-19 era are generally less pronounced but broadly exhibit the same sign as those for the baseline sample period. The only exception is that the response of LATAM exports to the EA is insignificant in the restricted sample. Further, it is notable that total LATAM exports (excluding the EA from the partner countries) only slightly decrease after 12 months. Overall, this once again underscores the importance of banking flows in transmitting ECB monetary policy spillovers to LATAM.

8 Conclusion

This thesis studies the transmission channels of ECB conventional monetary policy spillovers to Central, East and Southeastern Europe (CESEE) and Latin America (LATAM), two regions with a different degree of economic integration with the euro area (EA). Using local projections by Jordà (2005) and the exogenous monetary policy shocks by Altavilla et al. (2019), I find significant and similar declines in output in CESEE and LATAM in response to an ECB monetary policy tightening shock. Given this rather surprising result, the thesis proceeds to study the transmission mechanism responsible for these spillovers, with a focus on trade and banking flows, both directly with the EA and with the rest of the world.

The thesis finds a decline in banking inflows from the EA and a decline in trade flows between the EA and both CESEE and LATAM, with LATAM exports to the EA falling less pronounced than CESEE exports to the EA. The decline in banking flows can be attributed to the risk-taking channel, while the decrease in EA imports can be explained by the strong influence of the aggregate demand channel. Further, I investigate the expenditure-switching channel in light of the new trade invoicing data provided by Boz et al. (2022). The invoicing data indicates that CESEE exports to the EA are mainly invoiced in euros. Thus, an exchange rate

[16] For CESEE countries the output of all other CESEE countries is weighted according to their trade links. The same is done for LATAM countries.

depreciation against the euro in CESEE has no effects on import prices for the EA and consequently the expenditure-switching channel is muted. This implies that as long as trade is invoiced in euros, CESEE countries cannot protect themselves from negative output spillovers with flexible exchange rates. This finding is important not only for policymakers in CESEE but also for EA policymakers, who have to take the spillovers of monetary policy into account. However, in the case of LATAM, where exports to the EA are predominantly invoiced in US dollars, the appreciation of the euro against the US dollar partially offsets the effects of the aggregate demand channel. Given the smaller response of LATAM exports to the EA and generally the fact that LATAM is less integrated with the EA, it remains puzzling why output spillovers to LATAM and CESEE are so similar.

Thus, as a second step, the thesis explores responses of trade and banking flows of CESEE and LATAM with the rest of the world, excluding the EA. This is motivated by finding a significant increase in global risk aversion in response to an ECB monetary tightening shock. As Miranda-Agrippino and Nenova (2022) point out, a rise in global risk aversion amplifies the risk-taking channel by a retrenchment of global capital flows. In fact, the thesis finds a significant decline in total banking inflows to LATAM, excluding the EA from the source countries. In line with these results there also occurs a depreciation of domestic currencies against the US dollar in LATAM, highlighting the role of the US dollar as a "safe haven". The depreciation of domestic currencies against the US dollar in LATAM and the predominant role of the US dollar as invoicing currency lead to decreasing total trade flows with the rest of the world. The findings of this second setting, where the EA is excluded from the partner countries, help to understand why the overall output spillovers in CESEE and LATAM are of similar size. It also points to the importance of the risk-taking channel and banking flows in transmitting monetary policy spillovers to LATAM. As highlighted by Rey (2015), this suggests potential surges and retrenchments of capital inflows, leading to financial instability. Therefore, LATAM policymakers may find it beneficial to implement targeted capital controls and macro-prudential policies.

Appendix

Table A.1: Data sources

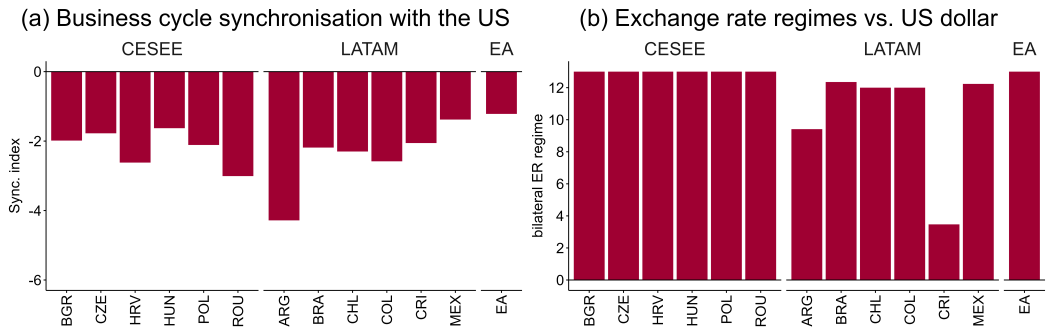
Variable	Source and description
Monetary policy shocks	Altavilla et al. (2019): EA-MPD, target factor as measure for conventional monetary policy.
Trade flows	Direction of Trade Statistics (DOTS), IMF. Monthly bilateral trade flows of goods.
Cross border banking claims	BIS locational banking statistics (LBS). Quarterly exchange rate- and break-adjusted series (flows) & amounts of outstanding claims (stocks).
Exchange rates	Monthly average nominal euro and US dollar exchange rates vs. domestic currency, International Financial Statistics (IFS), IMF.
Output	Argentina: UN monthly industrial production index starting 2005. EA, US, CESEE and LATAM countries (excl. Argentina): OECD, monthly total industrial production index.
EA CPI and commodity prices	Monthly harmonised index of consumer prices (HICP) and total non-energy commodity price index, ECB Statistical Data Warehouse (SDW).
EA equity prices	Monthly EA equity shares price index, OECD.
EA bond yields	EA 2- & 10-year Government Benchmark bond yield, ECB SDW.
Exchange rate regimes	De facto exchange rate regimes vs. euro and vs. US dollar by Harms and Knaze (2021).
Volatility indices	Chicago Board Options Exchange (CBOE) Volatility Index: VIX, FRED, Federal Reserve Bank of St. Louis; EURO STOXX 50 Volatility Index: VSTOXX, Qontigo.
Trade invoicing	Invoicing currency data by Boz et al. (2022), provides overall US dollar, euro and domestic currency invoicing shares of imports and exports by country.
Other data	Annual GDP growth rates, World Development Indicators (WDI), World Bank; Data on cross-border exposures of EA banks by Duijm and Schoenmaker (2020); Global capital flows by category: Balance of Payments (BoP), IMF.

Table A.2: Data summary

Variable	EA	CESEE	LATAM	BGR	CZE	HRV	HUN	POL	ROU	ARG	BRA	CHL	COL	CRI	MEX
mps	-0.02														
yield_2yr	1.51														
yield_10yr	2.62														
equ_pr	448.19														
hicp	456.50														
pcom	453.80														
ip	460.84	454.76	456.11	459.56	454.65	465.40	452.11	450.36	446.52	454.27	461.16	454.41	456.80	455.02	454.97
xdc/eur		-242.17	-463.12	-67.09	-329.04	-200.89	-567.99	-143.42	-144.59	-254.44	-122.59	-661.31	-804.29	-648.43	-287.68
xdc/usd		-187.55	-441.91	-45.96	-307.90	21.14	-546.85	-122.28	-123.46	-232.83	-101.45	-640.17	-783.16	-627.30	-266.54
ea_exp		804.24	645.36	693.25	878.48	701.26	838.05	915.27	799.15	650.09	778.68	634.46	596.29	437.37	775.30
row_exp		777.29	838.25	711.36	819.57	665.77	807.29	877.42	782.30	815.72	923.16	819.93	788.94	682.62	999.11
ea_imp		783.79	660.67	678.28	889.45	628.18	838.46	896.40	771.93	655.84	787.67	660.65	604.50	533.81	721.58
row_imp		759.49	862.50	686.88	823.65	608.46	811.83	863.39	762.69	849.35	955.13	842.79	792.74	713.60	1021.38
ea_claims_m		85.22	33.77	25.63	268.05	-38.98	13.50	229.41	13.73	1.84	111.14	31.75	38.15	1.69	18.06
ea_claims_m_sd		594.41	289.07	240.52	1024.34	256.82	682.40	814.41	547.96	136.26	879.80	206.32	114.68	13.88	383.46
row_claims_m		15.13	117.02	0.64	40.91	-4.40	15.48	33.78	4.38	0.83	381.25	102.72	46.31	4.45	166.55
row_claims_m_sd		287.98	646.90	54.67	418.05	80.44	220.18	846.09	108.45	340.71	2118.80	385.81	226.02	40.71	769.39
ea_claims_q		382.96	87.65	102.57	1051.67	54.20	130.41	687.02	271.87	-36.79	320.51	102.20	103.98	3.72	32.32
ea_claims_q_sd		2089.64	1018.83	806.22	3252.15	1290.70	2306.56	2769.65	2112.53	484.23	3129.64	681.60	405.55	46.76	1365.20
row_claims_q		47.53	325.87	2.16	144.18	-13.99	36.24	109.41	7.20	73.76	889.61	306.48	128.17	11.61	545.60
row_claims_q_sd		1000.77	2205.96	200.97	1341.30	315.10	793.84	2985.74	367.65	957.81	7186.69	1380.33	786.57	143.08	2781.31
ea_claims_m_abs		427.65	197.34	144.69	693.65	204.67	522.26	648.37	352.24	89.56	591.08	153.12	70.01	10.29	269.97
row_claims_m_abs		204.02	505.04	38.50	278.69	55.11	168.17	602.02	81.63	228.17	1661.32	300.63	176.83	29.30	633.97
ea_claims_q_abs		1516.58	696.83	511.11	2322.93	867.42	1809.02	2180.90	1408.12	324.49	2112.91	500.26	228.01	35.55	979.76
row_claims_q_abs		731.35	1717.80	141.72	933.04	216.32	613.48	2207.79	275.78	669.43	5621.12	1054.53	600.89	100.89	2259.97

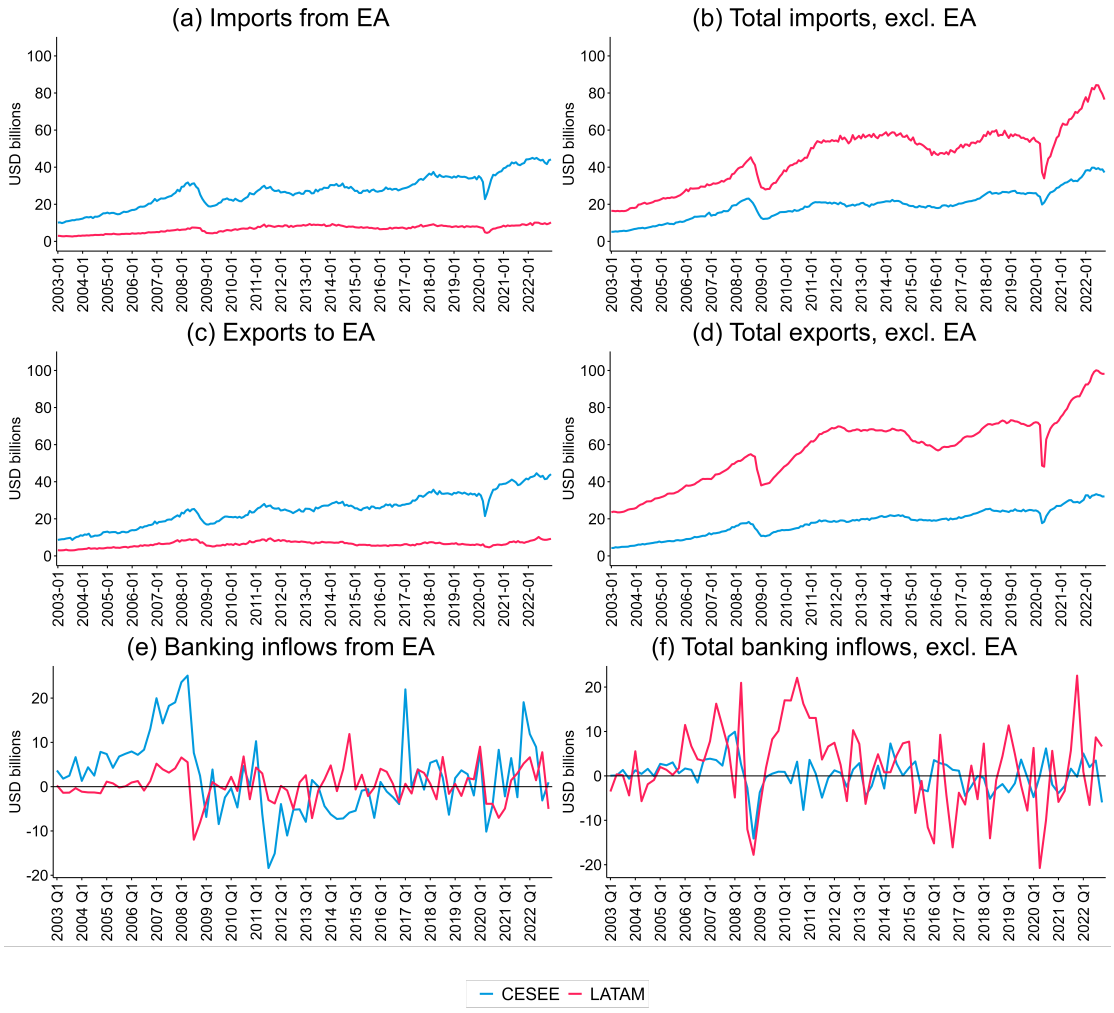
Note: mps = monetary policy shocks, yield_ = government bond yields (2- and 10-year), equ_pr = equity prices, hicp = consumer prices, pcom = commodity prices, ip = industrial production, xdc/eur = euro per domestic currency ER, xdc/usd = US dollar per domestic currency ER, ea_exp = EA exports (region's imports from EA), row_exp = Total imports (excl. EA from partner countries), ea_imp = EA imports (region's exports from EA), row_imp = Total exports (excl. EA from partner countries), ea_claims ... banking inflows from EA, row_claims ... total banking inflows (excl. EA), m ... monthly, q ... quarterly, sd ... standard deviation, abs ... in absolute values. Shows averages for monthly variables over period 2003-01 - 2022-10 and for quarterly claims from 2003-Q1 - 2022-Q2.

Figure A.1: Economic links with the US



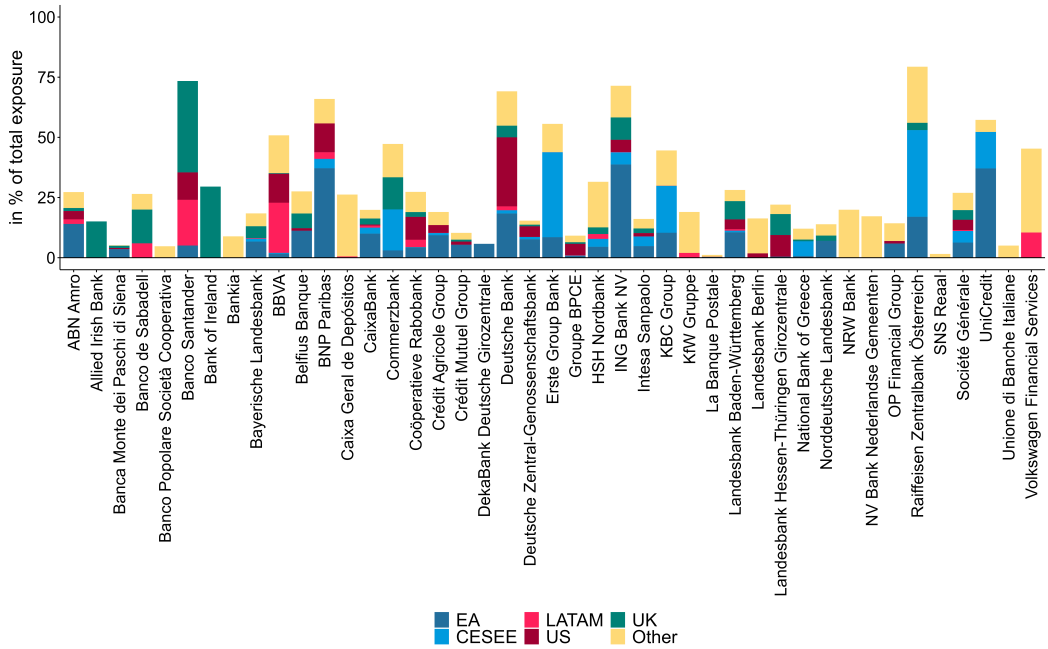
Note: Panel (a) shows a measure for business cycle synchronisation with the US, high value (closer to zero) means high synchronisation. Panel (b) shows de-facto bilateral exchange rate regimes against the US dollar, high values correspond to freely floating, low values to euro pegs. All panels show averages over the sample period.

Figure A.2: Trade and banking flows



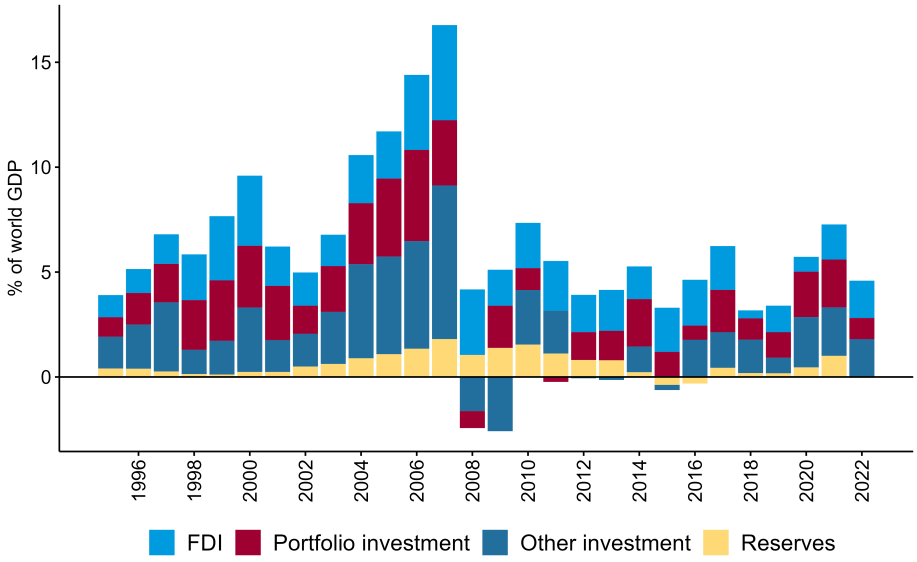
Note: Panel (a), (b), (c) & (d) show seasonally adjusted monthly CESEE and LATAM exports and imports to/from the EA and the rest of the world. Panel (e) & (f) show CESEE and LATAM quarterly banking inflows from the EA and the rest of the world.

Figure A.3: Foreign exposure of largest EA banks, 2017



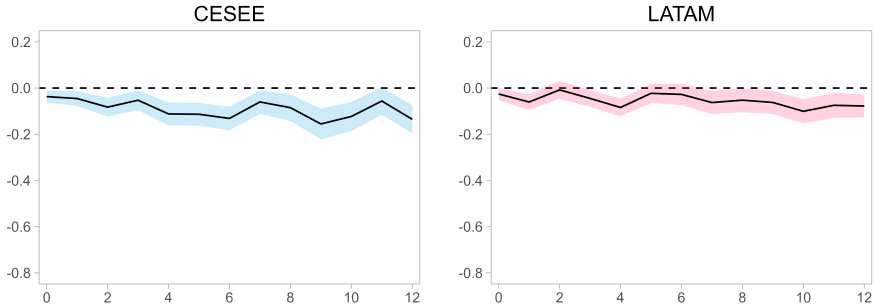
Note: The figure shows the foreign exposure by region in % of total exposure by the largest EA banks in 2017.

Figure A.4: Global capital flows by category, 1995 - 2022



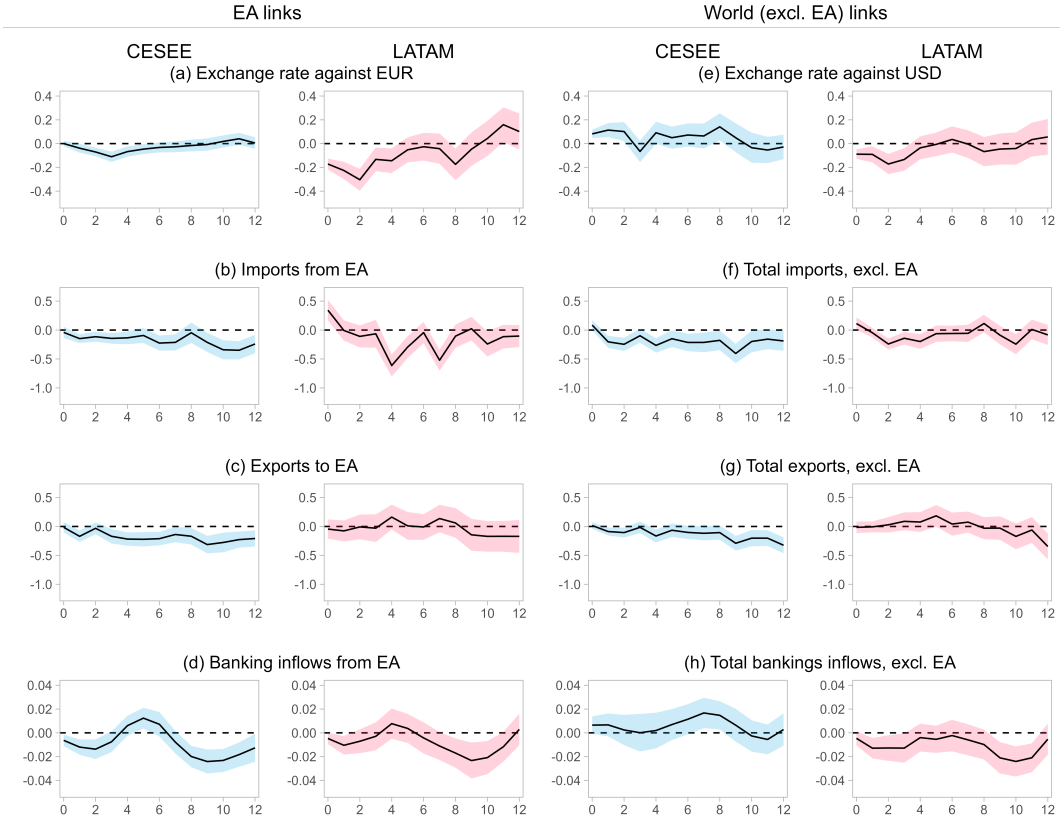
Note: Bank loans and deposits are included in other investment, whereas debt securities held by banks are included in portfolio investment. Portfolio investment and other investment are closely linked and negatively associated with the VIX (Rey, 2015).

Figure A.5: Panel responses of output, pre-Covid-19 era



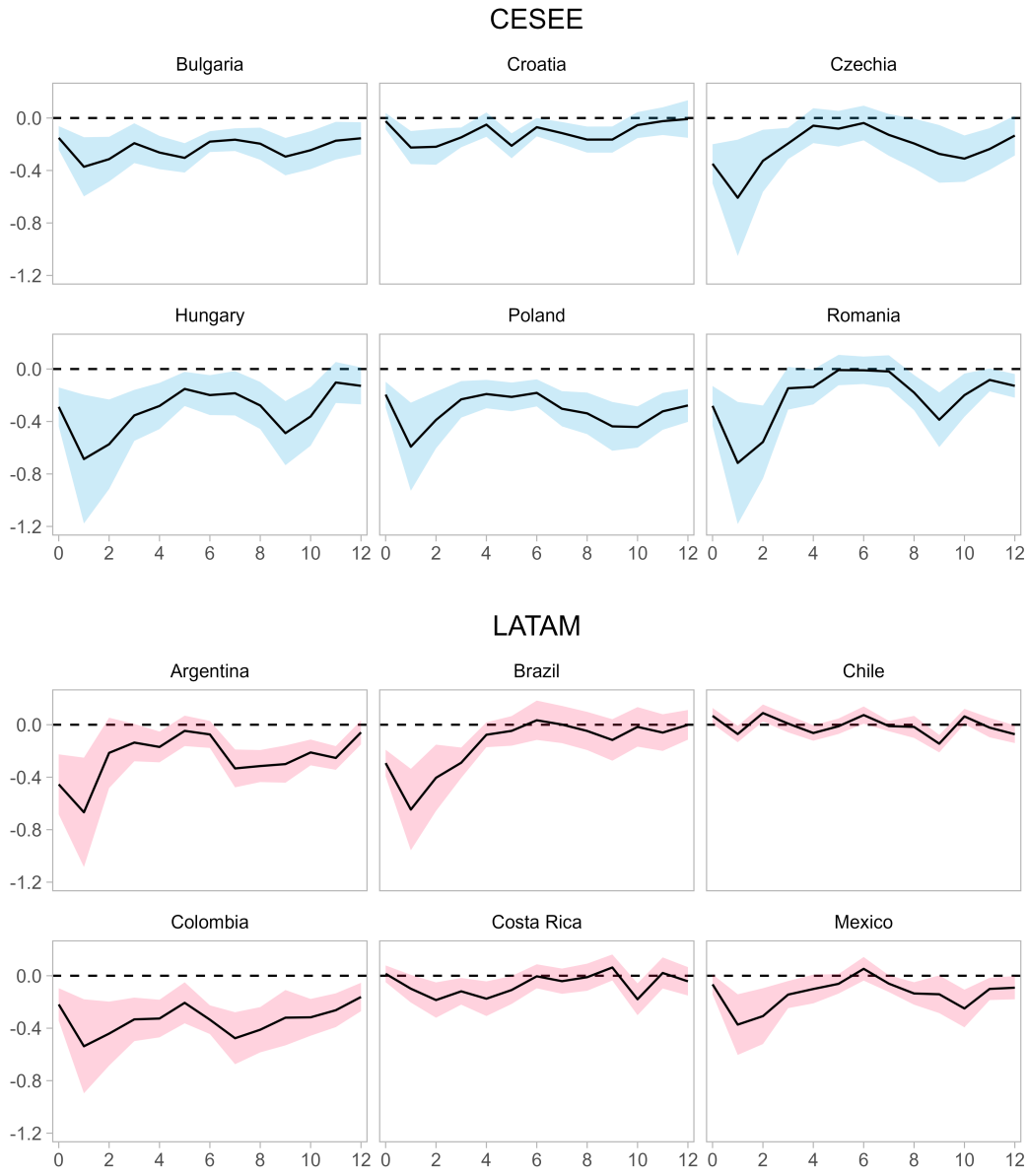
Note: This figure shows responses of CESEE and LATAM industrial production (in logs x 100) to an ECB monetary policy tightening shock of one standard deviation. Mean panel responses and 68% confidence bounds are shown. The sample period is 2003-01 to 2020-02.

Figure A.6: Panel responses of CESEE/LATAM, pre-Covid-19 era



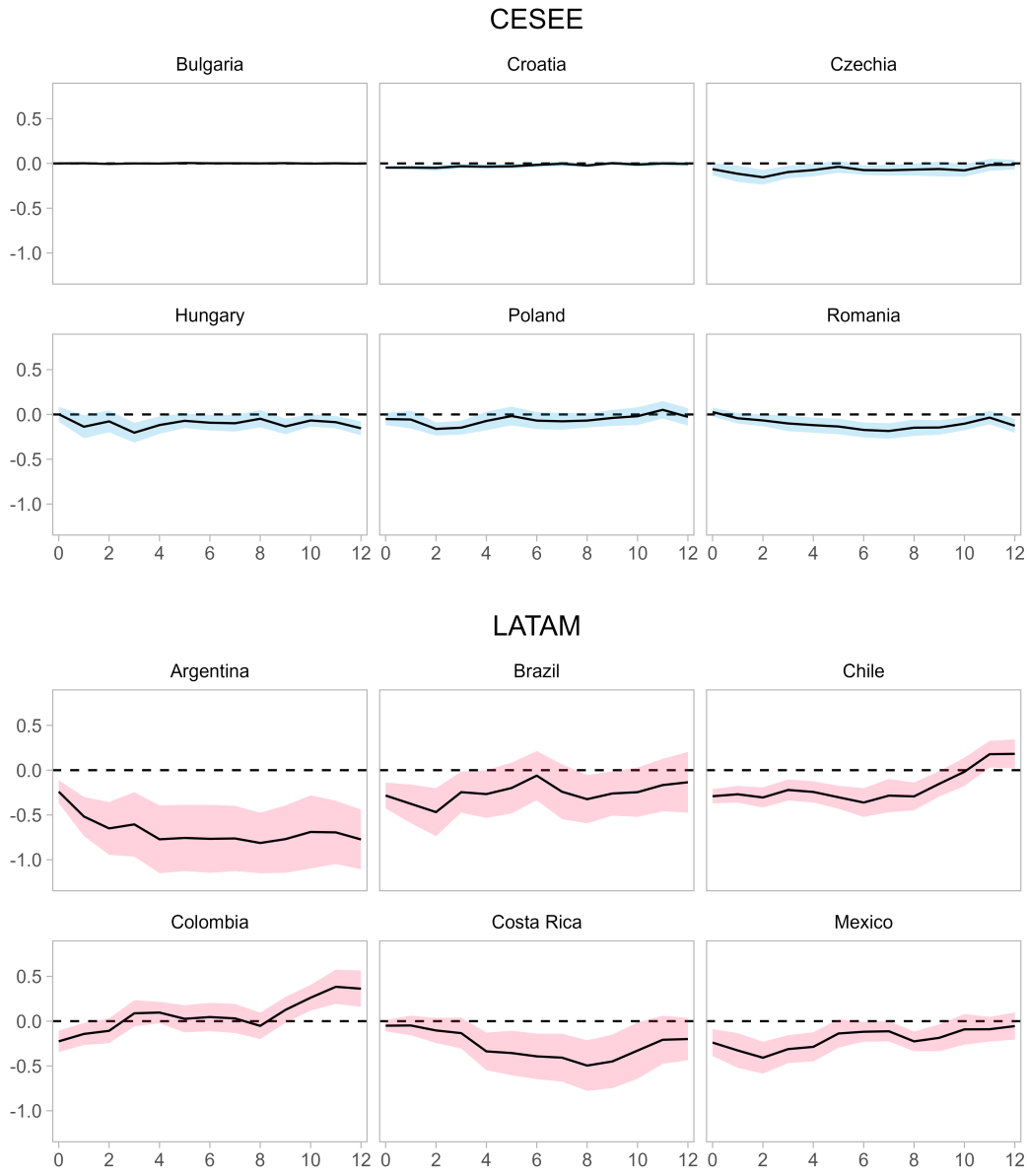
Note: This figure shows panel responses for CESEE and LATAM to an ECB monetary policy tightening shock of one standard deviation. Banking inflows are mean-standardized, all other variables are in logs x 100. Mean responses and 68% confidence bounds are shown. The sample period is 2003-01 to 2020-02.

Figure A.7: Responses of output



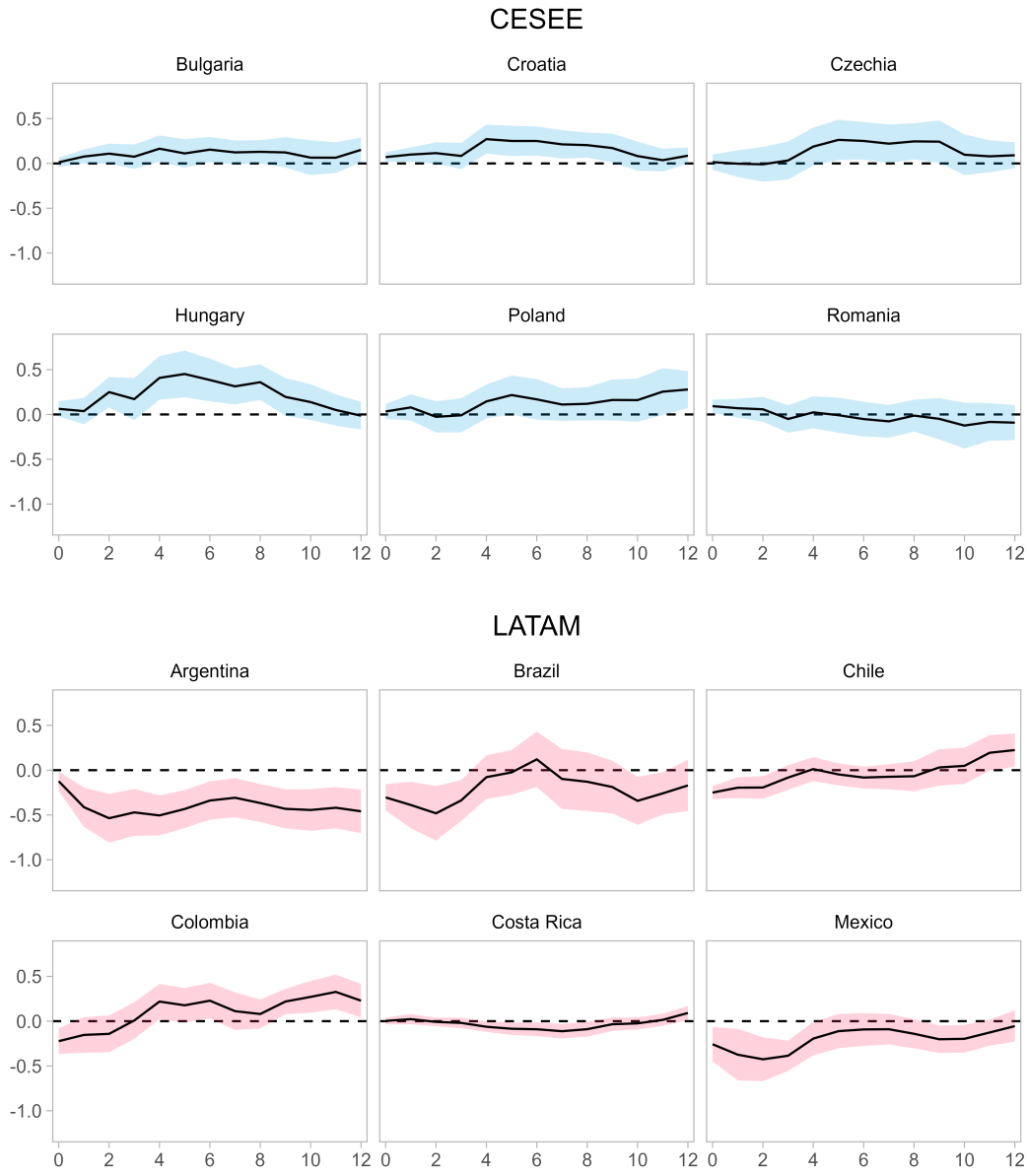
Note: This figure shows responses of industrial production (in logs x 100) to an ECB monetary policy tightening shock of one standard deviation. Mean responses and 68% confidence bounds are shown.

Figure A.8: Responses of EUR exchange rates



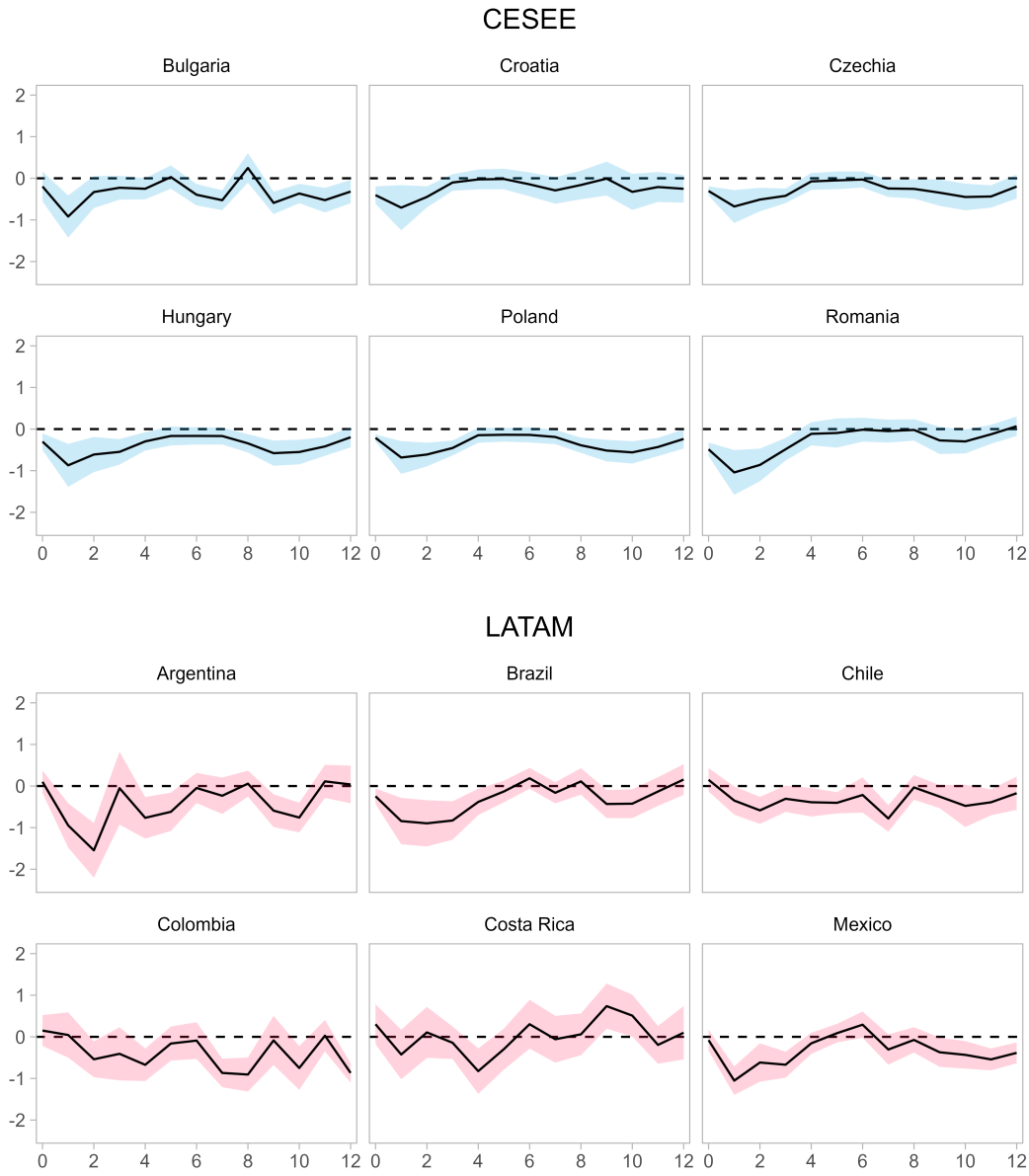
Note: This figure shows responses of the euro per domestic currency exchange rate (in logs x 100) to an ECB monetary policy tightening shock of one standard deviation. Mean responses and 68% confidence bounds are shown.

Figure A.9: Responses of USD exchange rates



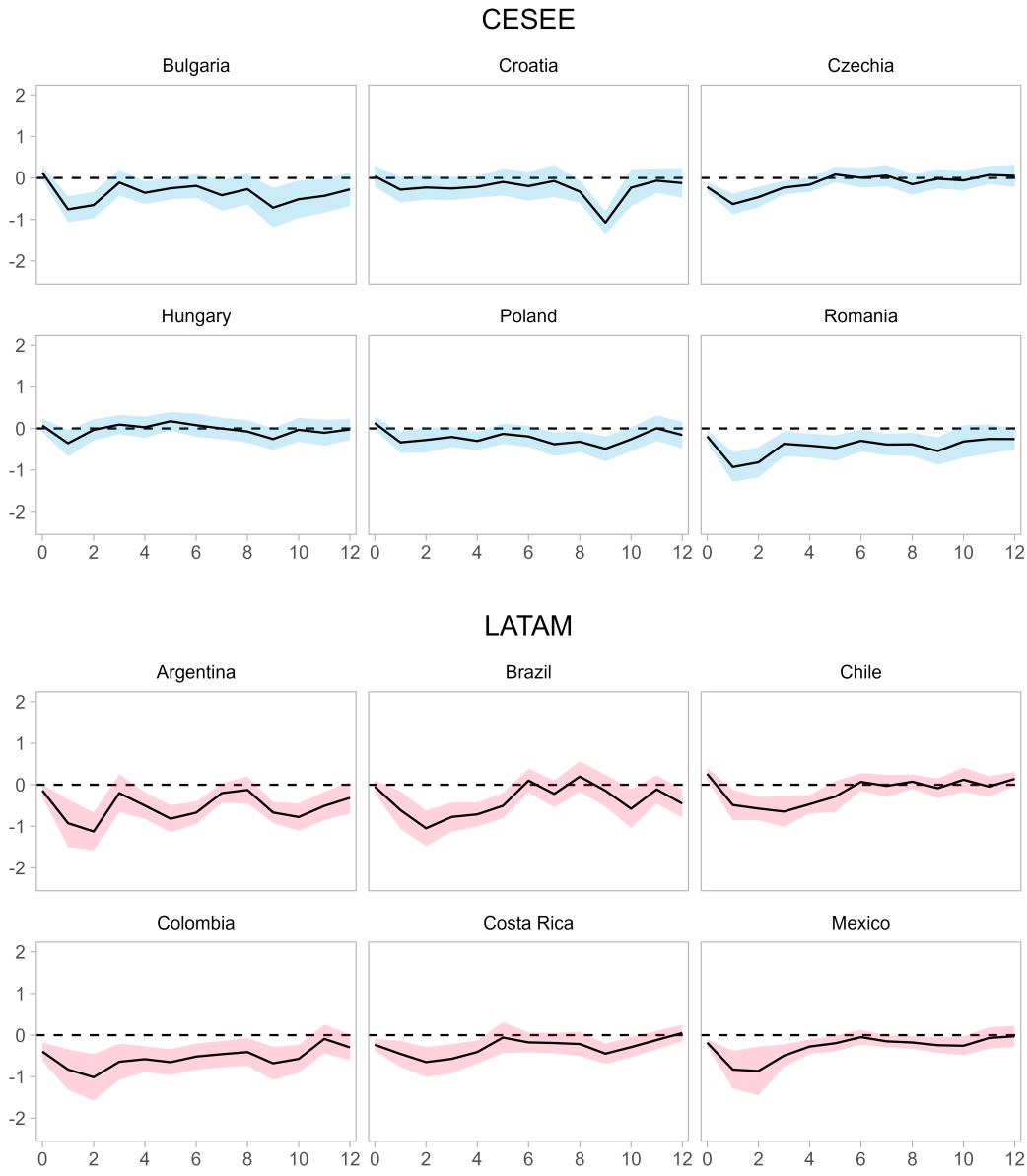
Note: This figure shows responses of the US dollar per domestic currency exchange rate (in logs x 100) to an ECB monetary policy tightening shock of one standard deviation. Mean responses and 68% confidence bounds are shown.

Figure A.10: Responses of imports from the EA



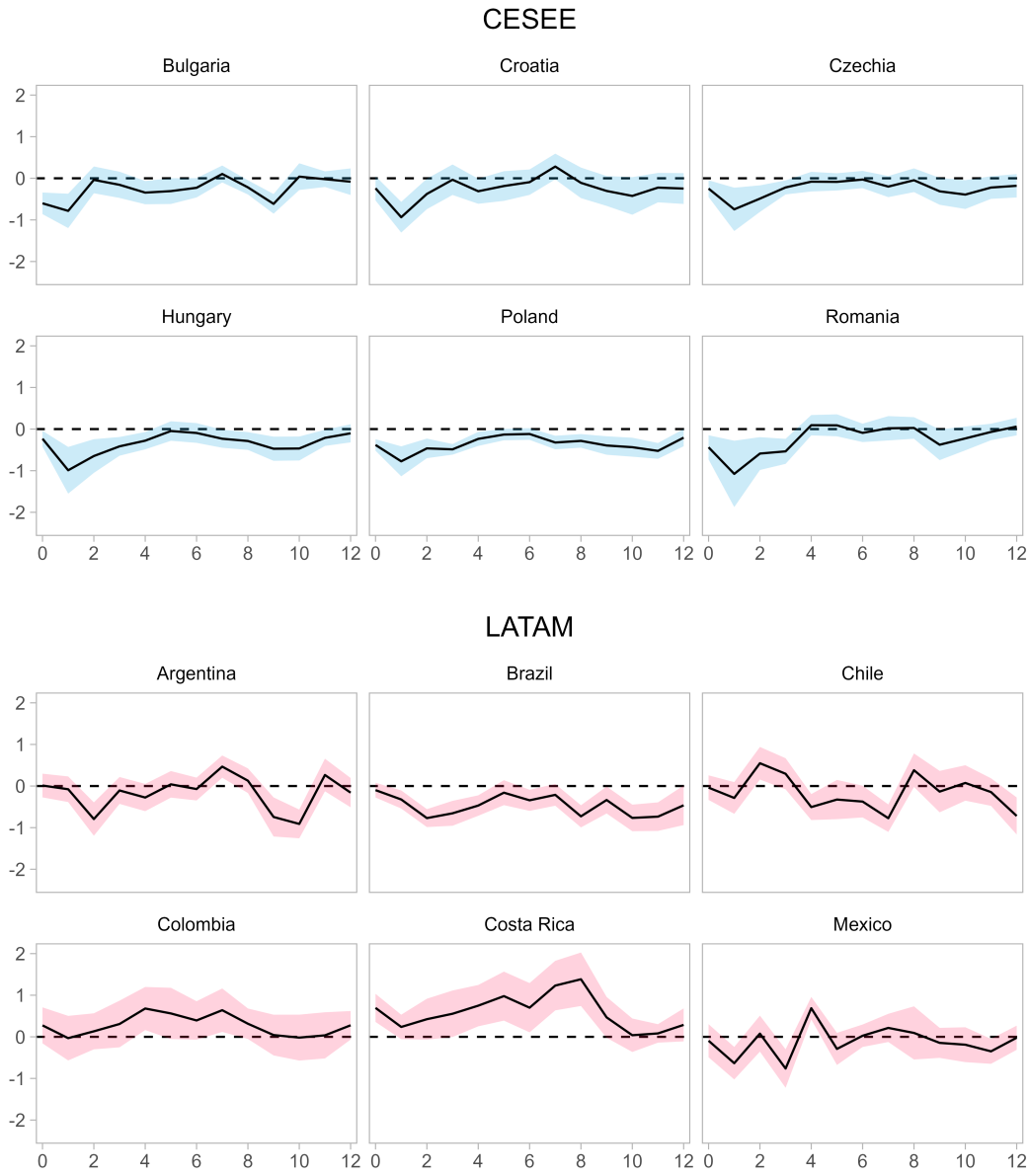
Note: This figure shows responses of imports from the EA (in logs x 100) to an ECB monetary policy tightening shock of one standard deviation. Mean responses and 68% confidence bounds are shown.

Figure A.11: Responses of total imports, excl. the EA



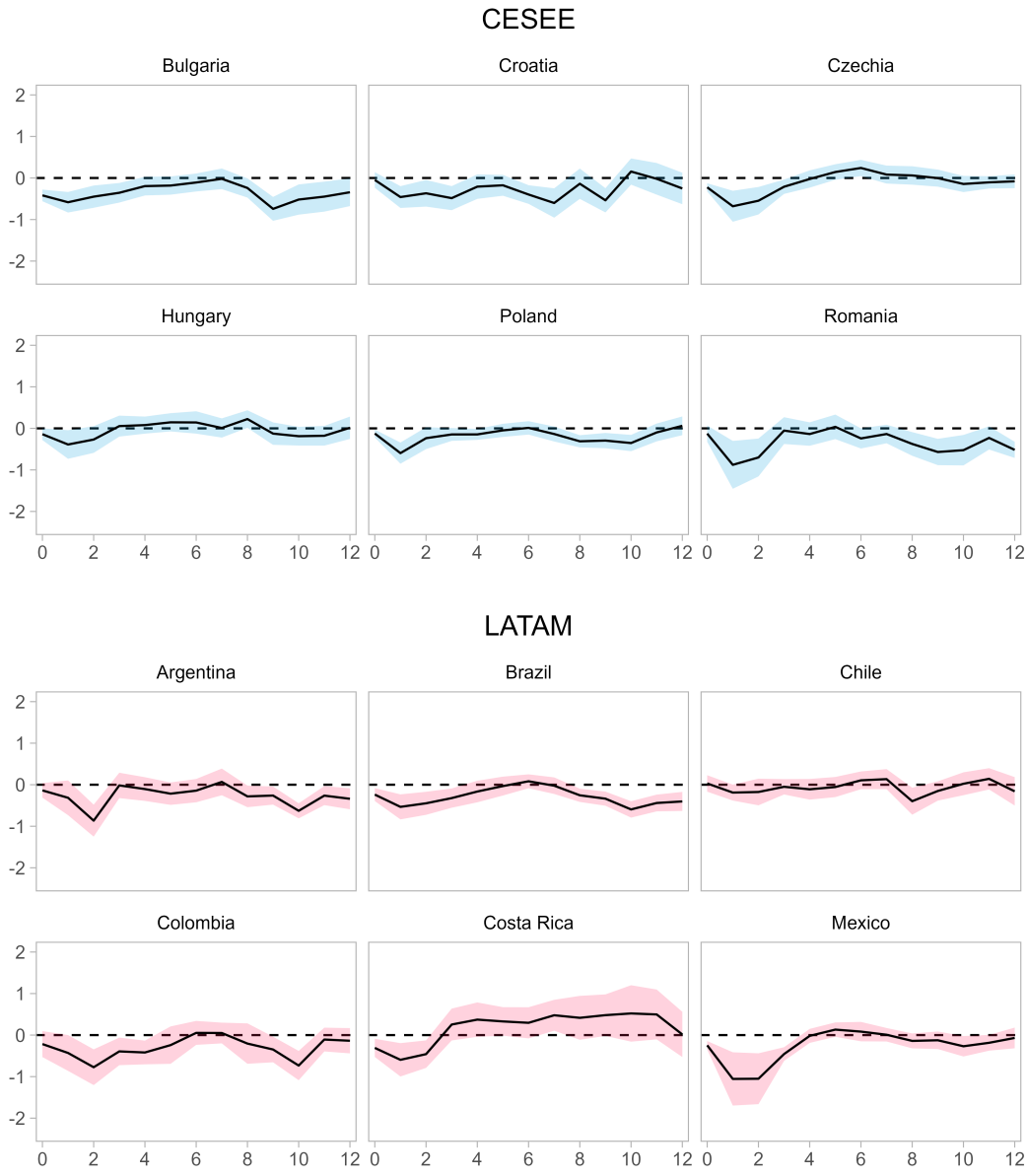
Note: This figure shows responses of total imports, excluding the EA from the partner countries (in logs x 100), to an ECB monetary policy tightening shock of one standard deviation. Mean responses and 68% confidence bounds are shown.

Figure A.12: Responses of exports to the EA



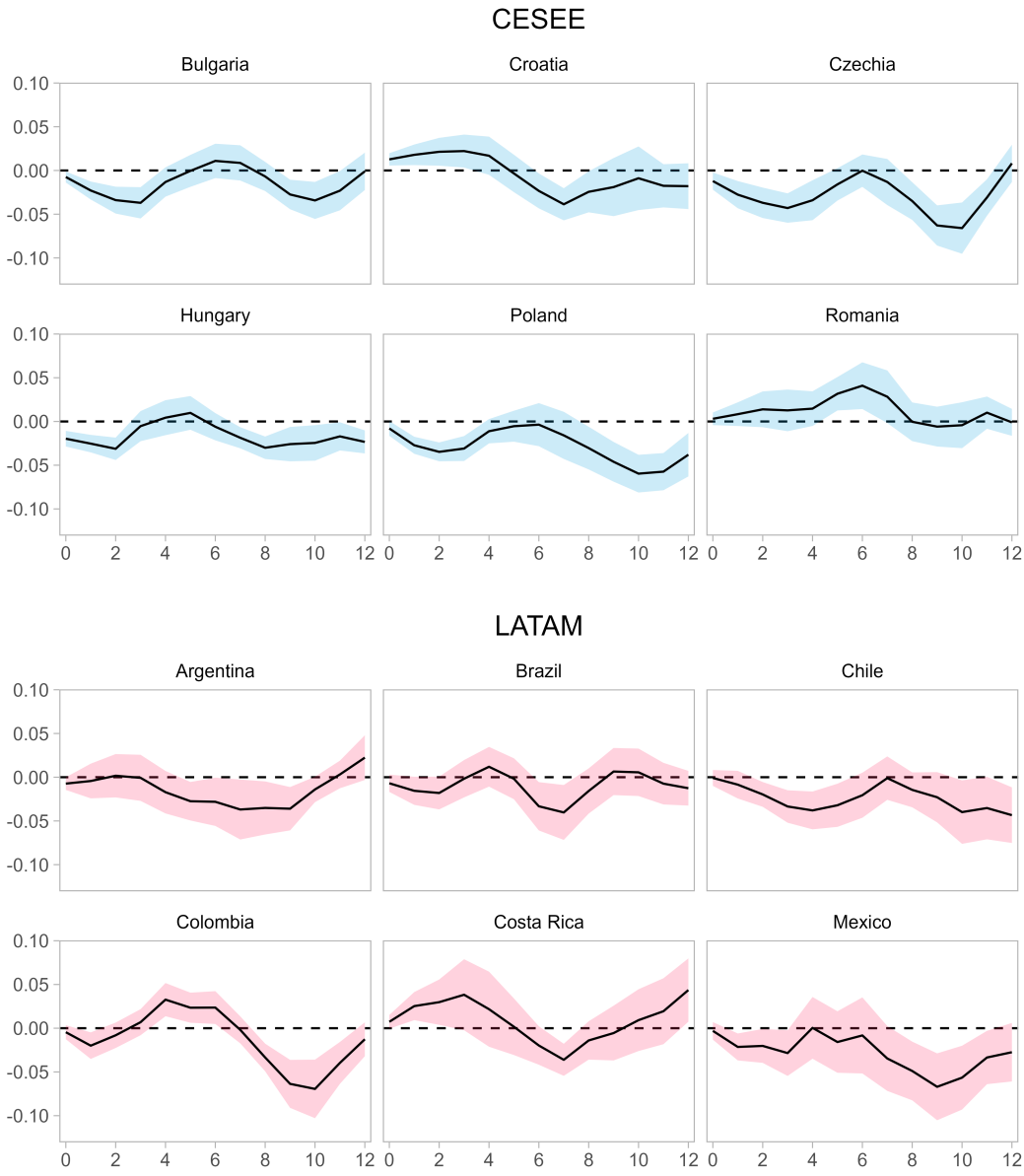
Note: This figure shows responses of exports to the EA (in logs x 100) to an ECB monetary policy tightening shock of one standard deviation. Mean responses and 68% confidence bounds are shown.

Figure A.13: Responses of total exports, excl. the EA



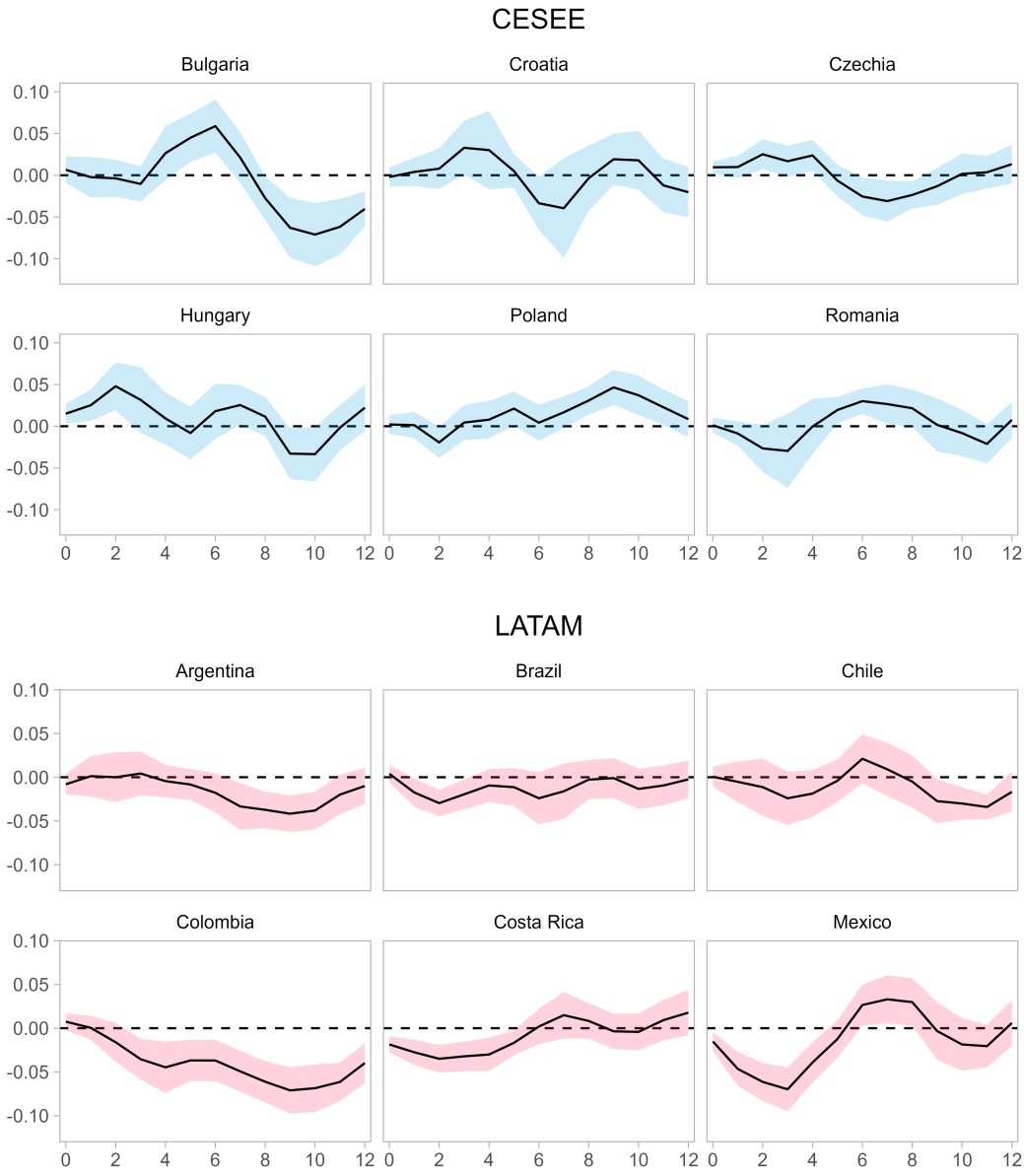
Note: This figure shows responses of total exports, excluding the EA from the partner countries (in logs x 100), to an ECB monetary policy tightening shock of one standard deviation. Mean responses and 68% confidence bounds are shown.

Figure A.14: Responses of banking inflows from the EA, mean standardized



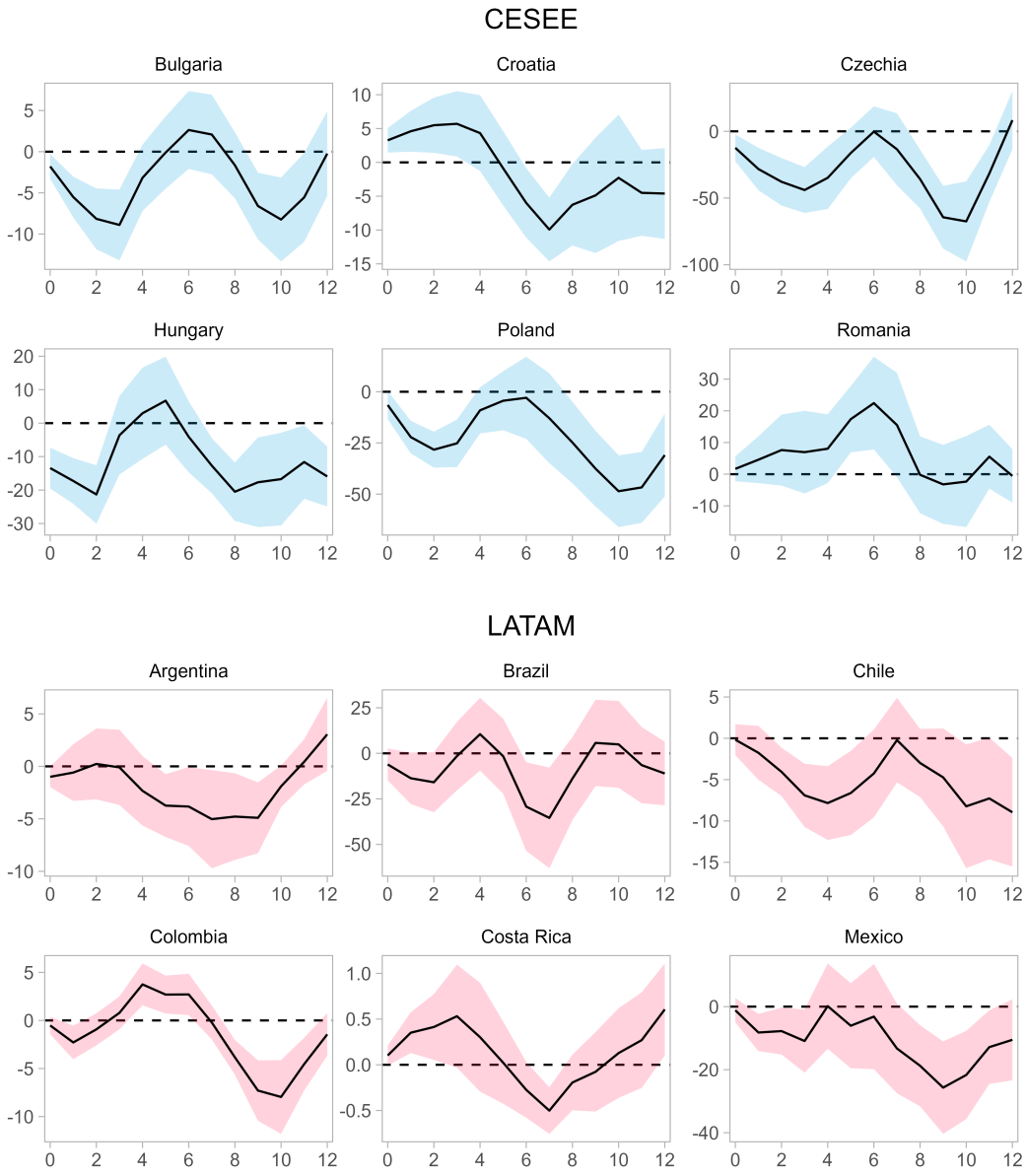
Note: This figure shows responses of banking inflows from the EA (mean-standardized) to an ECB monetary policy tightening shock of one standard deviation. Mean responses and 68% confidence bounds are shown.

Figure A.15: Responses of total banking inflows, excl. the EA, mean standardized



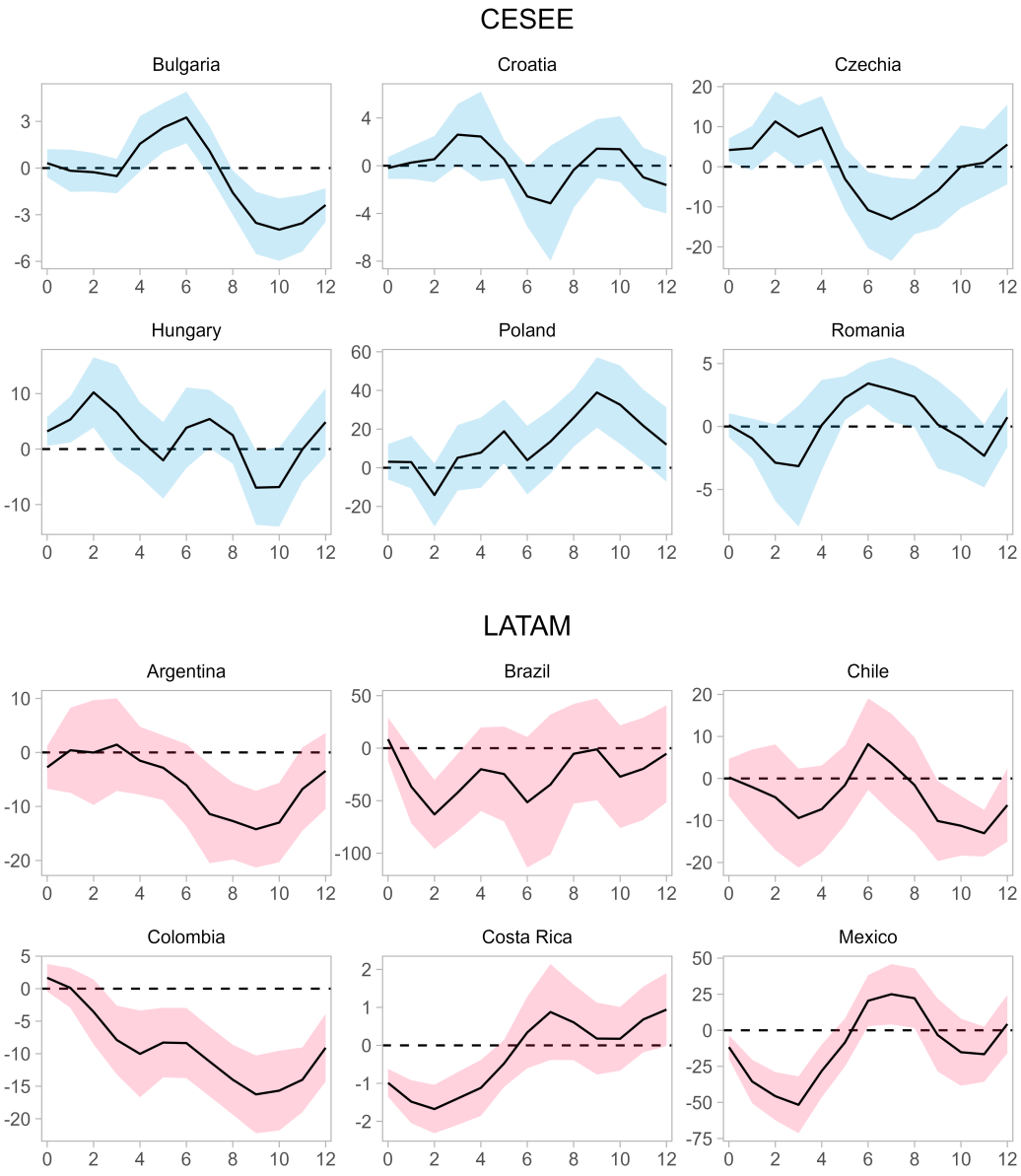
Note: This figure shows responses of total banking inflows, excluding the EA from the source countries (mean-standardized), to an ECB monetary policy tightening shock of one standard deviation. Mean responses and 68% confidence bounds are shown.

Figure A.16: Responses of banking inflows from the EA, in USD millions



Note: This figure shows responses of banking inflows from the EA (in USD millions) to an ECB monetary policy tightening shock of one standard deviation. Mean responses and 68% confidence bounds are shown.

Figure A.17: Responses of total banking inflows, excl. the EA, in USD millions



Note: This figure shows responses of total banking inflows, excluding the EA from the source countries (in USD millions), to an ECB monetary policy tightening shock of one standard deviation. Mean responses and 68% confidence bounds are shown.

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