sciendo

Zagreb International Review of Economics & Business, Vol. 25, No. 2, pp. 39-63, 2022

Faculty of Economics and Business, University of Zagreb and Sciendo. Printed in Croatia.
ISSN 1331-5609; UDC: 33+65
DOI: 10.2478/zireb-2022-0014

Modelling CESEE Countries Export Dynamics: Global Vector Autoregressive Approach

Saša Jakšić [*]

Abstract: *One of the main aspects of the transition process in Central, Eastern and Southeastern European (CESEE) countries was the trade liberalisation. As their financial systems are still underdeveloped and the trade channel is the dominant shock transmitter, this paper focuses on export dynamics for a selected set of CESEE countries. The employed methodology, Global Vector Autoregressive (GVAR) approach, allows modelling interactions and spillovers among countries. Furthermore, it enables joint modelling of exports and imports. This is of particular importance as the opening of new markets enabled astonishing export growth, but also opened the CESEE markets to foreign products. The empirical analysis reveals that a shock in German imports has a larger impact on CESEE countries' exports than a shock in German output. Moreover, the results indicate that the role of the real exchange rate is less pronounced in comparison to previous similar research.*

Keywords: Global VAR; International Trade; Export; CESEE; Trade Liberalisation

JEL Classification: F10, F17, C30

Introduction

In the process of transition of Central, Eastern and Southeastern European (CESEE) countries from centrally planned to market-oriented economies trade liberalisation was of particular importance (Damijan et al. 2006). Following the extensive restructuring of production (Damijan & Kostevc, 2011), trade liberalisation enabled CESEE countries to place their products in new markets and experienced more than a decade of continuous export growth. Trade liberalisation was further stimulated by numerous bilateral and multilateral free trade agreements and the accession process towards the European Union which became the most important export market for the CESEE countries (Cieslik & Hagemejer, 2011). In the literature, international trade and ex-

[*] Saša Jakšić is at Faculty of Economics and Business, University of Zagreb, Zagreb, Croatia.

port growth is of particular importance as it is considered one of the main drivers of economic growth (Frankel & Romer, 1999). Although the opening of new markets enabled astonishing export growth, trade liberalisation also meant opening CESEE markets to foreign products and an increase in imports. In some CESEE countries, the import growth rate was higher than the export growth rate, which raised the issue of economic growth financing and export competitiveness. Furthermore, trade liberalisation also made these countries more vulnerable to foreign shocks which became evident following the emergence of the global economic and financial crisis in 2008. As the CESEE countries have less developed financial markets and were not exposed to 'toxic' financial assets, the crisis effects manifested primarily through the real channel and particularly through international trade.

The empirical model used in this paper focuses on eleven CESEE countries that eventually became EU member states in one of the three enlargement waves: 2004 enlargement (Czech Republic, Hungary, Poland, Slovak Republic, Slovenia, Latvia, Estonia and Lithuania), 2007 enlargement (Bulgaria and Romania) and 2013 enlargement which involved only one country (Croatia). Additionally, Germany, as the largest EU economy and the main trading partner of most of the analysed countries is included in the model. All these countries experienced a decade of continuous export growth, which stopped in 2008 when the Great Trade Collapse led to a synchronous decrease in exports in all of the CESEE countries. However, the pattern that followed in the aftermath of the Great Trade Collapse, varied across countries. The central question is: why did some of the CESEE countries see an almost immediate recovery in the aftermath of the crisis while some countries still have not recovered their exports? Furthermore, what are the factors that could have led to a quicker recovery of some economies as opposed to other countries whose economies are still searching for a path towards recovery? Are foreign factors the main drivers of exports or perhaps domestic variables play an important role? This article tries to shed light on the issue and tries to address the key determinants of CESEE countries' exports that could explain the difference in the pattern of the response.

To assess the export dynamics appropriately and answer these questions, the empirical model should include various macroeconomic variables. Trade liberalisation, besides growth in exports, also caused growth in the volume of imports. In some countries, imports grew much faster than exports creating substantial trade deficits. Furthermore, imports could be a part of export long-run relation as part of imports could be input for export production. Likewise, exports could also take place in import cointegrating relations due to the possible outsourcing of parts of export production abroad (Bussière *et al*. 2012). Therefore, any model intending to capture export dynamics should model import patterns as well. Although the theory states that exports are a function of foreign demand and imports are a function of domestic demand, Berman et al. (2015) found that exports also affect domestic demand. Therefore, the model should also include both domestic and foreign demand. Furthermore,

a relative price (price competitiveness) indicator should also be included in the model. Additionally, as all countries are part of global value chains (GVCs), a proxy for political impacts should also be included.

Another important part of the model definition stage is the choice of the data frequency. The modern economic environment brings many challenges. One of the greatest challenges is the speed of shock transmission and the necessity of economies to adapt quickly to new and rapidly changing conditions. Therefore, the empirical model includes monthly data. The choice of higher frequency data hindered the inclusion of two groups of variables. In the first group are the variables that are available only on yearly basis, such as Foreign Direct Investments (FDI). The second group consists of the variables that are available quarterly and can be interpolated or disaggregated but do not have much variability on monthly basis and as such do not contribute much to explaining export dynamics. For that reason, variables such as productivity and unit labour cost were not included in the final model specification.

Therefore, this paper analyses the effects of various macroeconomic indicators on the export dynamics of selected CESEE countries for the period from January 2000 to November 2020. To capture the multilateral nature of international trade flows, the study should employ a methodology that would enable joint modelling of all CESEE countries in a single model, accounting for possible spillovers among their economies. Otherwise, separate modelling of individual economies would neglect potential spillovers and lead to misleading conclusions. Furthermore, considering increasing globalisation as well as economic and financial integration of the economies under study, allowing for spillovers and international linkages offers possible better insight into the key determinants of export dynamics. Therefore, as an appropriate modelling framework, a GVAR approach (Pesaran *et al*., 2004) is applied because it enables the modelling of the international linkages unlike the usual unrestricted VAR models that model each economy separately (thus neglecting possible interactions between economies) or panel models, where countries are often treated as independent units which could lead to neglecting of important spillovers among countries. Furthermore, the flexible framework of a GVAR model is more convenient as it enables modelling economies of different sizes and relative importance. Feldkircher (2015), Backe *et al*. (2013) and Sun *et al*. (2013) applied a GVAR model to study how real and financial shocks transmit across CESEE countries. Moreover, these authors proved the importance of modelling spillovers in a global framework. Additionally, the GVAR approach enables joint modelling of exports and imports which could be of particular importance considering that following the trade liberalisation the export growth was accompanied by import growth.

Making the most of the employed methodology and using dynamic analysis the article assesses the impact of various shocks, such as shocks to German imports and German economic activity. The GVAR approach enables assessment of the analysed shock taking into account interlinkages among analysed economies, as previous re-

search (Feldkircher, 2015; Backe *et al*. 2013; Sun *et al*. 2013) showed significant spillovers from Western Europe (especially Germany) to CESEE countries. Moreover, the paper analyses the importance of domestic and foreign variables, real effective exchange rate and oil prices. As all countries are part of GVCs, the relationship between exports and imports will also be analysed. Furthermore, previous research (Slacik *et al*. 2014) argued on differences between CEE (Central and Eastern Europe) and SEE countries (Southeast Europe). In the context of this paper Czech Republic, Hungary, Poland, Slovak Republic, Slovenia and the Baltic countries represent CEE countries while Romania, Bulgaria and Croatia represent SEE countries. Therefore, another interesting question assessed in the paper is the one on differences among country groupings.

The rest of the paper is organized as follows: following the literature review (Section 2) and a few illustrations of the background of the analysed topic (section 3), the GVAR methodology applied in this paper and a short overview of the employed data set and the sources from which the data were obtained is briefly described in Section 4. The main empirical results are analysed in section 5 while section 6 concludes with a summary of the main results and suggestions for further steps in research.

Literature review

The literature on export performance in CESEE economies mostly employs gravity models (Collins & Rodrik, 1991; Havrylyshyn & Pritchett, 1991; Rosati, 1992; Hamilton & Winters, 1992; Baldwin, 1994; Kaminski *et al*. 1996a; Jakab *et al*. 2001; Havrylyshyn & Al-Atrash, 1998; Egger, 2003; Fidrmuc & Fidrmuc, 2003; Bussière *et al*. 2005) as well as upgraded versions of the gravity models that distinguish between market access and supply capacity factors (Redding & Venables, 2004, 2004a; Fugazza, 2004; Damijan *et al*. 2011; Damijan *et al*. 2013). Gravity models suggest that export growth was a consequence of removing restrictions on foreign trade and geographical proximity to advanced economies (in particular EU countries).

In studying export dynamics, the authors also apply shift-share analysis (Havlik *et al*. 2001; Havlik, 2000) and analyse export competitiveness (Kaminski *et al*. 1996b; Zinnes *et al*. 2001) as well as descriptive statistical analysis of factors explaining export growth. A more detailed overview of the literature can be found in Damijan *et al*. (2013).

Gravity models and variables such as geographical proximity (which is constant over time) and the size of the economy (which is not subject to significant changes over a shorter period) served as a reasonable explanation for the beginning and subsequent stages of transition. More than two decades after the beginning of the transition process, export growth stimulated by the mere opening of new markets is far behind.

This paper investigates export performance from a different perspective and considers various macroeconomic indicators (i.e. taking into account factors that change over time) that can to a certain extent be influenced by policy measures (structural reforms, fiscal and monetary policy) and analyses the impact of foreign variables that could indicate potential sources of export vulnerability.

Many papers found significant trade spillovers in the CESEE countries. These papers mostly applied GVAR methodology (Feldkircher & Korhonen, 2014; Backe *et al*. 2013; Colabella, 2021; El-Shagi & Tochkov, 2022). However, other modelling approaches, such as near-VAR methodology (Nguyen & Rondeau, 2016) and SVAR (Cuaresma *et al*. 2011) also reached the same conclusion.

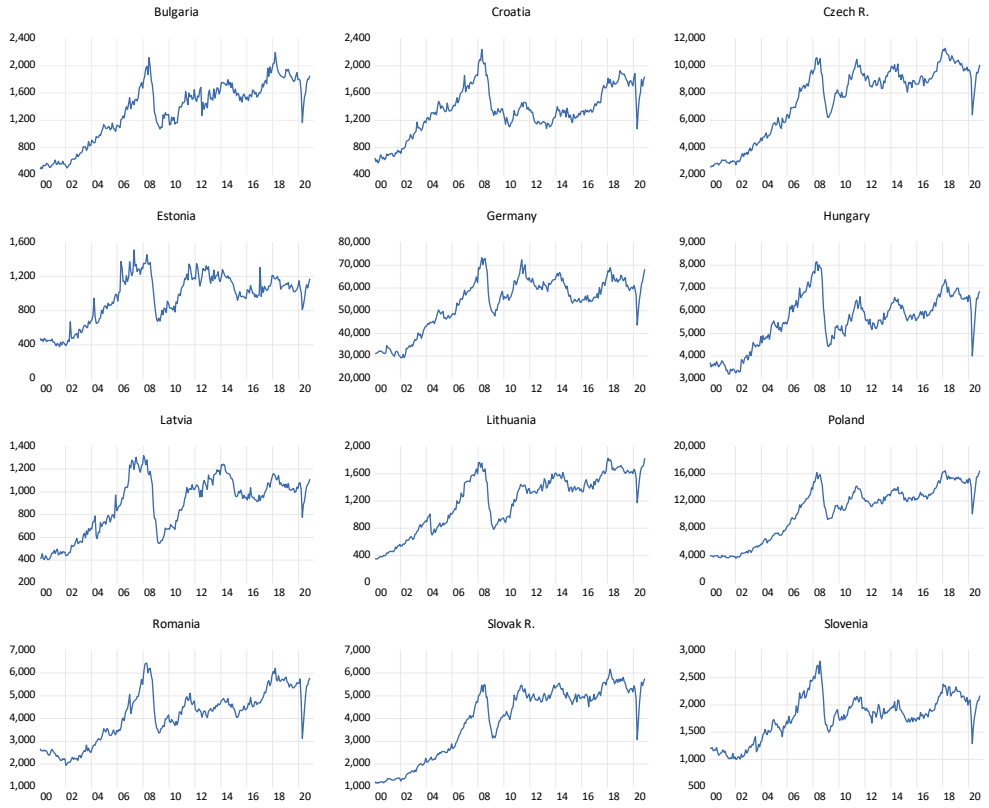
GVAR methodology turned out to be a particularly convenient methodology for modelling trade flows in a globalised setting. Following Bussière *et al*. (2012) it was applied to study CESEE countries' trade flows in several papers (Jakšić & **Žmuk**, 2014, Khan, 2020a; Khan, 2020b; Juráček, 2021). Building upon conclusions from the first application of the GVAR methodology to CESEE countries' exports (Jakšić & **Žmuk**, 2014), this article enriches the dataset with three more countries (the Baltic countries) and extends the analysed period by another eight years to get a complete picture on the consequences of the 2008 global economic and financial crisis and adjustments that followed.

In comparison to previous GVAR contributions in studying CESEE countries' trade, this paper adds further insight by using monthly instead of quarterly data (Khan, 2020a; Khan, 2020b; Juráček, 2021). Hence, besides employing a larger data set, this paper employs monthly data, which are better suited for capturing the dynamics in a globalised environment in which shocks transmit rapidly. Furthermore, this paper includes all post-communist EU NMS as opposed to papers by Khan (2020a) and Khan (2020b) which did not include Lithuania. Moreover, in contrast to total trade (Khan, 2020a) or trade flows (Khan, 2020b), this paper employs exports as the central variable of the study.

CESEE countries' exports dynamics

To get familiar with the setting, a few snapshots and graphs depicting export and GDP growth dynamics will be presented in the following section. All CESEE countries experienced more than a decade of continuous export growth, which stopped in 2008 when the Great Trade Collapse led to a synchronous decrease in CESEE countries' exports (Figure 1).

Figure 1: Real exports in mil. US$ (at 2015 prices) for the selected CESEE countries and Germany (2000-2020)

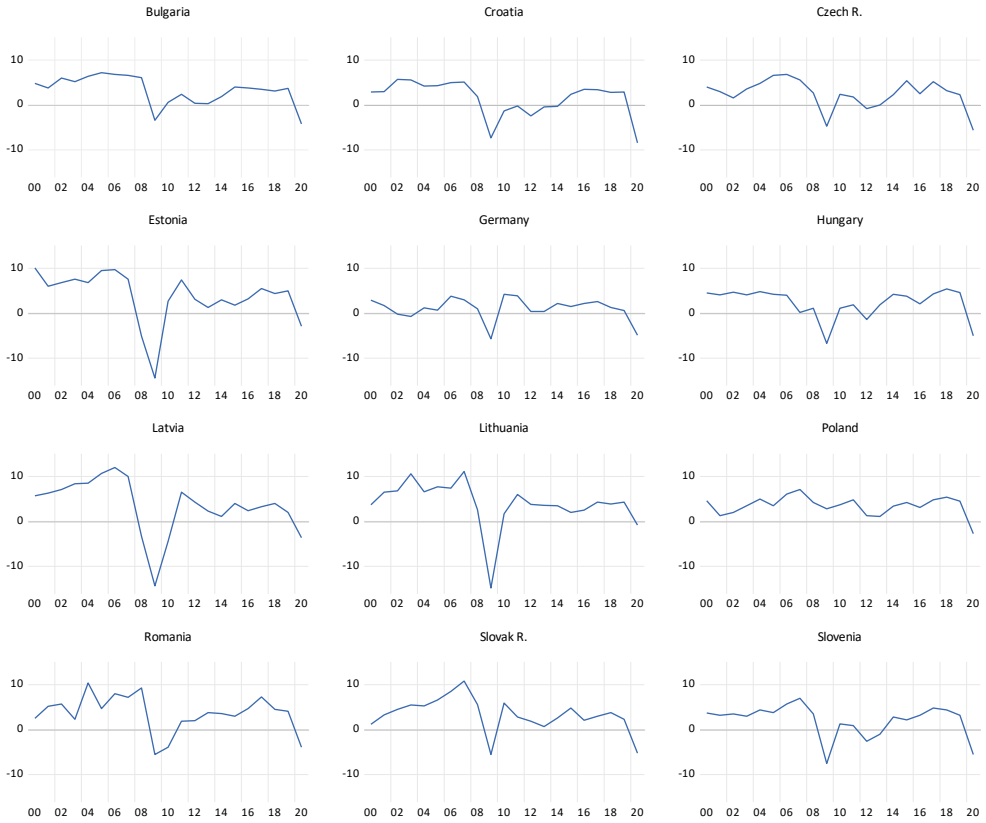


Source: International Monetary Fund (Direction of Trade Statistics)

Up until that point, the pattern was quite similar. However, the pattern that followed in the aftermath of the Great Trade Collapse, was very diverse and came in different shapes and sizes. The decrease lasted approximately one year when the trend shifted from downward to upward in most countries. While some countries recovered their exports quite quickly, some countries still have not managed to get back to the pre-crisis level (Croatia, Slovenia and Hungary). Some countries got close to recovering their exports to the pre-crisis level at the end of the observed period, only to see another decline due to COVID 19 crisis.

To put the export dynamics in the context and get a better picture of the severity of the crisis and the diversity of patterns that CESEE countries displayed, real GDP growth rate dynamics are presented in Figure 2.

Figure 2: Growth rate of the real GDP for the selected CESEE countries and Germany (2000-2020)

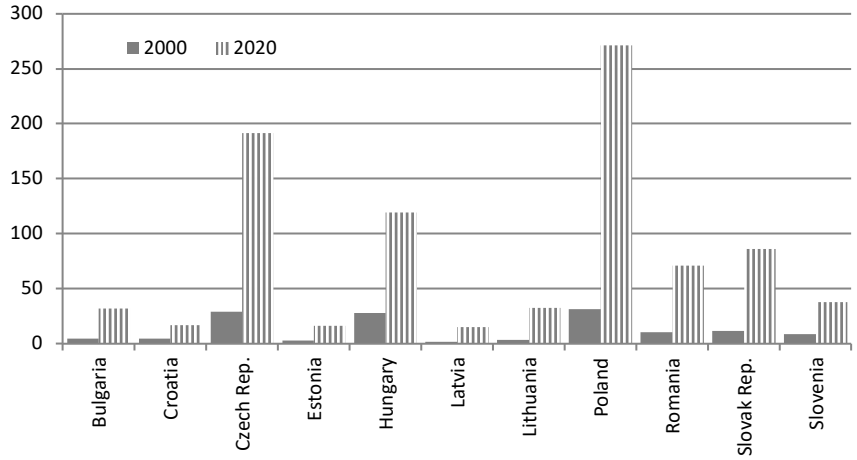


Source: Eurostat

One can notice a few shared features: a 'V'-shaped curve in all countries besides Poland; after getting back on track (achieving positive growth rates), in all countries growth slowed down and few countries faced 'double-dip' recessions (Czech Republic, Hungary and Slovenia); COVID 19 crisis has hit all economies, without an exception. However, Figure 2 also tells many different stories: a sharp drop and a quick recovery in the Baltic countries; Poland established as a highly resilient economy; Romania quickly recovered following the crisis and almost got back to the pre-crisis level; a less intense drop and a very, very slow recovery in Croatia. To be more precise, in Croatia recession lasted for six years (2009-2014). And despite the long-lasting recession, the recovery is still taking place at modest growth rates.

Additionally, to accompany Figure 1 a snapshot of yearly figures on exports at the beginning and the end of the analysed period are in Figure 3. Although experiencing almost a decade of continuous growth in the '90s, at the beginning of the millennium the values of CESEE countries' exports were still quite low (Figure 3). Only following the EU accession have their exports taken off. Again, their exports did not grow at the same pace.

Figure 3: Exports of selected CESEE countries in billions of US$



Source: International Monetary Fund (Direction of Trade Statistics)

The highest export growth in the analysed period was in Lithuania (824%), Poland (758%) and Latvia (708%). Although the growth looks impressive, one must bear in mind that the initial values were quite low at the outset in Lithuania and Latvia. This is why their export is still among the lowest in the CESEE. On the other hand, by far the smallest growth was in Croatia (285%). Although Hungary's exports are the third largest among the CESEE countries, Hungary (326%) and Slovenia (330%) also were not successful in comparison to other CESEE countries.

Hence, figures 1-3 show that the CESEE countries, on the one hand, share some features. On the other hand, there are some distinct differences in the pattern of the response of their exports and GDP growth to the crisis. Two questions arise: what could be possible factors that explain these differences? Which modelling framework could explain these differences?

Data and methodology

Analysing international trade inevitably brings in the multilateral aspect. That said, an appropriate methodology that accounts for potential interlinkages and spillovers will be applied in the paper. The GVAR approach (Pesaran *et al*. 2004; Pesaran *et al*. 2006; Pesaran *et al*. 2007; Dees *et al*. 2007) is applied to assess the importance of various factors in explaining the dynamics of CESEE countries' exports in a multi-country setting. The approach can be summarized as a two-step procedure. First, individual country models are estimated. In each country model (1) domestic macroeconomic variables ($y_{i,t}$) are related to its lagged values, deterministic variables ($D_{i,t}$)) i.e. trend and/or dummy variables, foreign-specific variables ($y^*_{i,t}$) and global variables ($d_{i,t}$):

$$y_{i,t} = a_{i,0} + a_{i,1}D_{i,t} + \sum_{j=1}^{p_i} a_{i,j}y_{i,t-j} + \sum_{j=0}^{q_i} \beta_{i,j}y^*_{i,t-j} + \sum_{j=0}^{p_i} \gamma_{i,j}d_{i,t-j} + u_{i,t} \quad (1)$$

for $t = 1,2, ...,$ and $i = 0,1,2, ..., N$, p_i and q_i are the lag orders for the endogenous variables and foreign-specific variables, while $u_{i,t}$ is the error term for country-specific models.

Model (1) is a VAR model augmented with foreign specific variables and is denoted as VARX*(p_i, q_i) model. Individual country VARX* models are estimated separately. Nevertheless, they are connected using foreign-specific variables defined as weighted averages of the corresponding domestic variables for the remaining countries.

$$y^*_{i,t} = \sum_{j=0}^{N} w_{ij}y_{j,t} \quad (2)$$

Foreign-specific variables act as a proxy for common unobserved factors and are modelled as weakly exogenous variables (long-run forcing), i.e. do not depend on the contemporaneous values of the domestic (endogenous) variables, but could depend on the lagged values of domestic variables (Garratt *et al*. 2006). The weak exogeneity assumption is a reasonable assumption considering that analysed CESEE countries are small open economies (SOE) and is a standard SOE literature assumption (Fleming, 1962; Mundell, 1963). In the second step, individual models are stacked together and solved in a global VAR model. The approach enables modelling interlinkages on various levels, both national and international and is based on a modified and generalised version of Johansen's (1988, 1991, 1995) maximum likelihood approach. Under the weak exogeneity assumption, coefficients of the country-specific models are estimated based on the reduced-rank approach developed by Johansen. Although

Johansen's approach is based on the assumption that all variables are endogenous and *I*(1), Harbo *et al*. (1998) and Pesaran *et al*. (2000) modified the methodology to allow for weakly exogenous *I*(1) variables.

As higher frequency data are more suitable for the analysis in a globalised setting where shocks tend to transmit at a faster pace across economies, monthly data for the period from January 2000 to November 2020 are employed in the study, i.e. 251 observations. The observation period leaves out data on export growth achieved in the first decade of the transition process as the growth achieved in the first phase of transition was mostly due to the opening of new export markets. Data employed in the analysis include the period of high export growth, the abrupt decline of export due to the global financial and economic crisis, the period of recovery and the beginning of the ongoing COVID 19 crisis. As drastic as these declines may seem, performed stability tests do not indicate severe structural breaks for the analysed variables (the results of the tests are available upon request). Structural stability tests performed for this purpose are Ploberger & Kramer's (1992) CUSUM statistic along with its mean square variant; the Nyblom (1989) test statistic and its heteroskedasticity-robust version; the Quandt's (1960) likelihood ratio statistic in its Wald form; the Hansen's (1992) mean Wald statistic, Andrews & Ploberger (1994) mean Wald statistic; the Andrews & Ploberger (1994) Wald statistic based on the exponential average.

The empirical model employed in this paper employs a similar set of variables as Bussière *et al*. (2012) who studied the issue of global trade imbalances. The central variables of the empirical model are the real exports and imports (at 2015 prices). The real effective exchange rate and real output (in 2015 prices) are added to proxy for relative prices and domestic demand. Additionally, oil prices and foreign-specific variables are included in the model to capture possible unobserved common factors influencing the CESEE countries' export dynamics. Data on GDP (quarterly data on GDP are disaggregated to monthly frequency using the Chow-Lin procedure (Chow & Lin, 1971) and monthly data on industrial production.), real effective exchange rates and industrial production indices are obtained from Eurostat. Data on imports and exports were obtained from the Direction of Trade Statistics database (DOTS) of the International Monetary Fund (IMF). Oil prices are obtained from Thomson Reuters. All series are seasonally adjusted using the TRAMO/SEATS method within JDEMETRA+ statistical program.

Individual country models include four endogenous (domestic) variables: real exports, real imports, real output and real effective exchange rate. All variables are in logs. Additionally, oil prices are included in all models as a global variable. Furthermore, foreign-specific variables (foreign output and foreign real exchange rate) were also included in the model to proxy for unobserved common factors. Foreign exports and imports are not included in the model. In addition to defining a more parsimonious model, the main reason for their omission is theoretical. Namely, including imports and exports as domestic variables and then imports and exports as

foreign-specific variables would lead to theoretical inconsistency (Greenwood-Nimmo *et al*., 2012a).

Weights play an important role in a GVAR model as they are used in defining foreign-specific variables and in linking country-specific models. Similar to Pesaran *et al*. (2004), Dees & Saint-Guilhem (2009), Dees *et al*. (2007) and Hoxha (2018), this paper employed fixed trade weights calculated as average bilateral trade flows from the last nine years. In defining trade weights IMF Direction of Trade Statistics (DOTS) data on international trade were used. Weights add up to one by column, but not by row. Inconsistency is due to the different ways the countries report their trade. For instance, in some countries, certain costs and taxes are included in the trade value. That is why the exports from country to country are not always equal to imports from country to country . Although literature (Gross, 2013) suggests that the weights can also be estimated along with other parameters of the model, in the case of CESEE countries trade weights appropriately reflect the nature of their linkages. Those linkages are in Table 1.

Table 1: Trade weights

Country	Bulgaria	Czech R.	Estonia	Croatia	Germany	Hungary	Latvia	Lithuania	Poland	Romania	Slovak R.	Slovenia
Bulgaria	0	0,007	0,004	0,016	0,020	0,014	0,004	0,006	0,008	0,081	0,008	0,015
Czech R.	0,063	0	0,030	0,055	0,267	0,087	0,029	0,037	0,127	0,065	0,283	0,069
Estonia	0,002	0,002	0	0,001	0,008	0,002	0,205	0,122	0,008	0,002	0,002	0,002
Croatia	0,011	0,004	0,001	0	0,013	0,023	0,001	0,002	0,004	0,006	0,006	0,152
Germany	0,421	0,607	0,260	0,384	0	0,546	0,201	0,279	0,659	0,506	0,378	0,471
Hungary	0,085	0,052	0,024	0,136	0,147	0	0,015	0,020	0,054	0,172	0,126	0,105
Latvia	0,003	0,002	0,286	0,001	0,008	0,002	0	0,244	0,011	0,001	0,003	0,002
Lithuania	0,007	0,005	0,222	0,004	0,015	0,004	0,366	0	0,026	0,003	0,003	0,005
Poland	0,087	0,140	0,145	0,063	0,325	0,096	0,156	0,264	0	0,098	0,136	0,080
Romania	0,262	0,022	0,009	0,026	0,076	0,091	0,004	0,008	0,029	0	0,033	0,033
Slovak R.	0,035	0,148	0,013	0,039	0,088	0,111	0,015	0,012	0,063	0,050	0	0,067
Slovenia	0,024	0,010	0,004	0,275	0,033	0,025	0,004	0,006	0,010	0,016	0,021	0

Source: authors' calculation.

According to the trade matrix, one can notice that Baltic countries are less exposed to Germany with the share from 20.1% (Latvia) to 27.9% (Lithuania). For all other CESEE countries, Germany is the most important trading partner, its share ranging from 37.8% in the Slovak Republic to 65.9% in Poland. Additionally, Table 1 illustrates the insufficient involvement of the CESEE countries in the intra-regional trade flows, especially considering their geographical proximity. This indicates that the trade potential of the CESEE countries could be higher and expanding trade to regional markets, instead of relying solely on the large EU economies like Germany, could reduce the vulnerability of the CESEE economies to external shocks.

Both unit root tests, the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1981) and a unit root test based on weighted symmetric (WS) estimation of ADF type regressions (Park & Fuller, 1995), indicate that all variables (48 domestic, 34 foreign-specific and one global variable) are *I*(1). Furthermore, weak exogeneity tests indicate that weak exogeneity assumption was rejected in 3 out of 34 conducted tests (8.8%) at 5% level. Furthermore, at 1% level, weak exogeneity assumption was rejected only in one test (2.9%). Results of the unit root and weak exogeneity tests, as well as descriptive statistics for domestic, foreign-specific and global variables, are available upon request.

Empirical results

Empirical results reported in the following section are obtained using GVAR Toolbox 2.0 (Smith & Galesi, 2014). Under the assumption that the foreign-specific variables are weakly exogenous (tested in the previous section), individual country models were estimated (Harbo *et al*. 1998; Pesaran *et al*. 2000). Akaike information criterion (AIC) was used as lag order selection criteria for the endogenous (), foreign-specific () and global variables. Following the lag order selection, cointegrating VARX* models were estimated. The rank of the cointegrating space was selected using trace statistics due to its better small sample performance compared to maximum eigenvalue statistics, which is also less robust to departures from normal errors (Cheung & Lai, 1993). Nevertheless, the final verdict on the lag orders and the rank of cointegrating space (Table 2) were made consulting the results of the VAR model diagnostics: namely, the autocorrelation tests and persistence profiles (not reported to preserve space, but are available upon request).

Table 2: VARX* order and number of cointegrating relationships in the country-specific models

Country	Lag length		Number of cointegrating relations	Country	Lag length		Number of cointegrating relations
	Domestic variables	Foreign variables			Domestic variables	Foreign variables	
Bulgaria	2	2	2	Latvia	2	1	2
Czech R.	2	2	1	Lithuania	2	2	3
Estonia	2	2	3	Poland	2	2	2
Croatia	3	2	2	Romania	4	2	1
Germany	2	1	1	Slovak R.	2	2	1
Hungary	2	1	1	Slovenia	3	2	1

The corresponding vector error correction model (VECMX*) had a restricted trend and unrestricted intercept. Individual county models were then estimated subject to reduced rank restrictions and the corresponding error-correcting terms (used

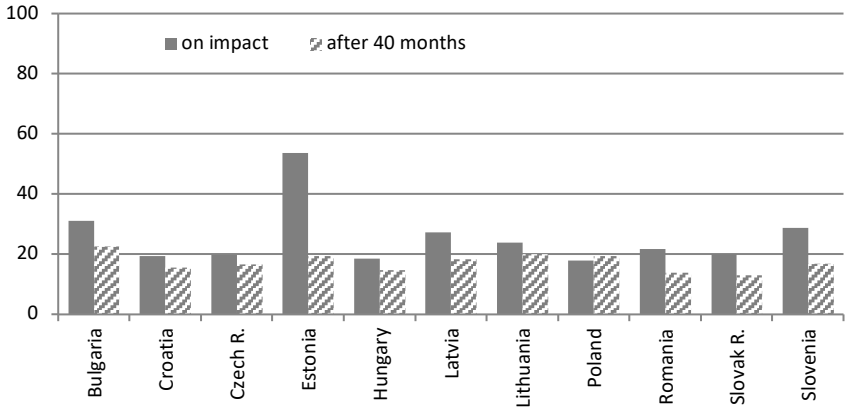
for conducting weak exogeneity tests) were derived. Estimated VARX* and VECMX* models, model diagnostics and other empirical results not reported in the paper are available upon request.

So far, all the prerequisites for the validity of the GVAR approach are satisfied: unit root tests indicate all the variables are $I(1)$, the weak exogeneity assumption is satisfied and so are the results of the diagnostic tests. The final precondition is the dynamic stability of the model which is also achieved. Namely, all the eigenvalues of the estimated GVAR model are on or inside the unit circle. To be more precise, out of 196 eigenvalues 29 lie on the unit circle, suggesting a permanent effect of some shocks on the levels of endogenous variables. Furthermore, as 58 eigenvalues are complex, the impulse responses will have a cyclical pattern.

As all the prerequisites of the GVAR approach are satisfied, one can proceed to the dynamic analysis. The dynamic analysis of the analysed GVAR model is performed using generalised forecast error variance decomposition (GFEVD) and generalized impulse response functions (GIRF). In a high-dimensional multi-country setting, any attempt in deriving a robust structural factorisation of the contemporaneous matrix would be challenging and hard to justify. Therefore, the order-invariance of the generalised approach to dynamic analysis is considered to be one of the advantages of the GVAR approach (Greenwood-Nimmo et al., 2012b).

The assessment of the relative importance of various factors of CESEE countries' export dynamics is performed using GFEVD, figures 4 - 7. GFEVD estimates the proportion of the variance of the h-step ahead forecast errors of each variable that is explained by conditioning on contemporaneous and future values of the generalised shocks of the system.

Figure 4: Share (in %) of the forecast error variance of CESEE countries' exports explained by domestic variables (on impact and after 40 months)

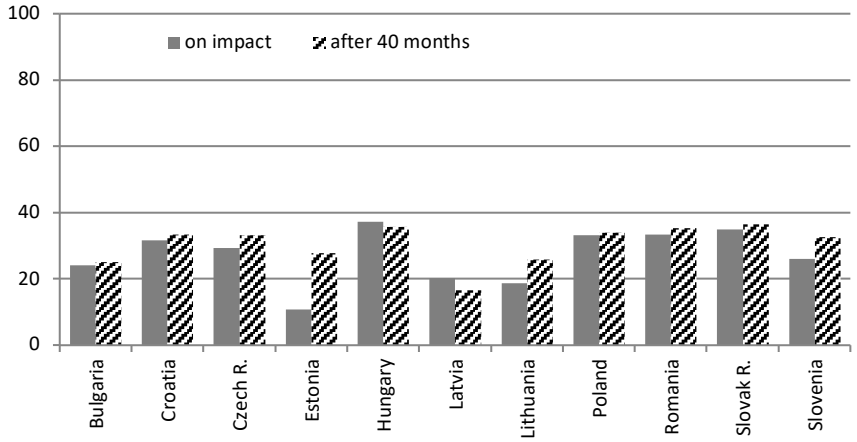


Source: authors' calculation.

Figure 4 illustrates that the foreign variables explain most of the forecast error variance of the historical shock. However, on impact, the share of domestic variables is quite large in Estonia (53.6%) and around 30% in Bulgaria, Latvia and Slovenia. In the long run, the share is in the range from 13% (Slovak Republic) to 22.6% (Bulgaria). Therefore, as expected, given that CESEE countries are mostly small open economies, foreign variables have a dominant impact on the export dynamics. It is also important to note that Poland is the only country in which the share of domestic variables is increasing in the long run. This confirms findings from previous research (Khan, 2020b) that the role of domestic factors is in Poland more pronounced in comparison to other CESEE countries.

Among the foreign variables, the German economy accounts for most of the variance in all CESEE countries except the Baltic countries (Figure 5). Actually, in the short run, in the Baltic countries, domestic variables play a more important role than the German economy. In the long run, the share is lowest in the Baltic states and Bulgaria. In other CESEE countries, it takes up above 30% (the highest in the Slovak Republic – 36.5%).

Figure 5: Share (in %) of the forecast error variance of CESEE countries' exports explained by German economy (on impact and after 40 months)

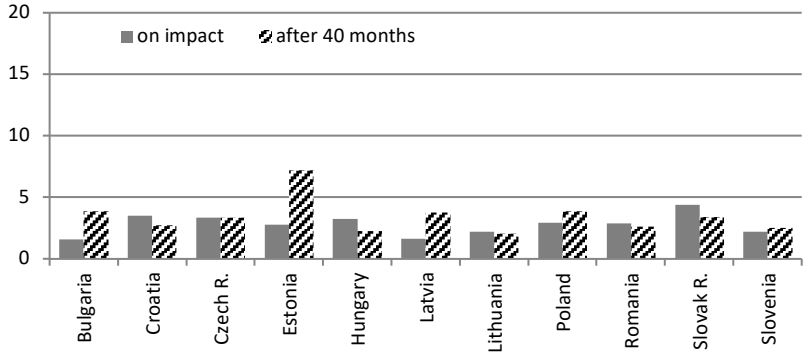


Source: authors' calculation.

Figures 6 and 7 indicate that the contribution of the oil prices and the exchange rates is small in all countries. The role of the exchange rate is less pronounced in comparison to previous research (Jakšić & Žmuk, 2014) thus confirming the fact that participation in global value chains (GVCs) reduces the impact of real effective exchange rate on exports (Ahmed *et al*. 2016). In the long run, the contribution of oil prices is a bit larger in Estonia. Indeed, Estonia has a unique energy system, mostly

based on shale oil. Hence, as one of the main issues is decarbonisation and reducing energy consumption levels, along with an underdeveloped transport system, all these issues create obstacles to achieving higher export growth.

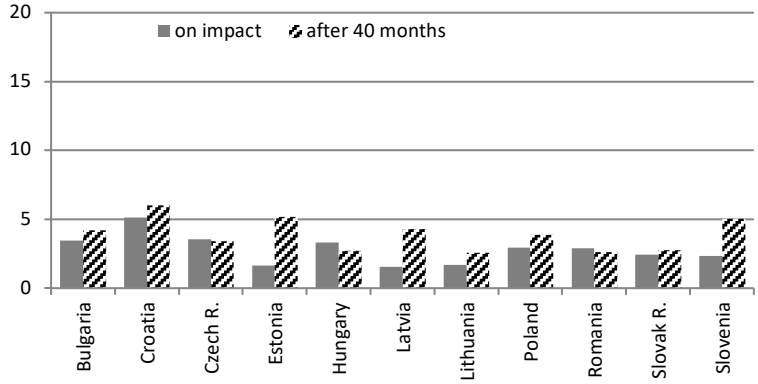
Figure 6: Share (in %) of the forecast error variance of CESEE countries' exports explained by oil prices (on impact and after 40 months)



Source: authors' calculation.

Regarding the real effective exchange rate, in the long run, its contribution is the largest in Croatia. This confirms findings (World Bank, 2016) that Croatia's export industries are mostly present in the segment that is dominated by price competition.

Figure 7: Share (in %) of the forecast error variance of CESEE countries' exports explained by exchange rate dynamics (on impact and after 40 months)

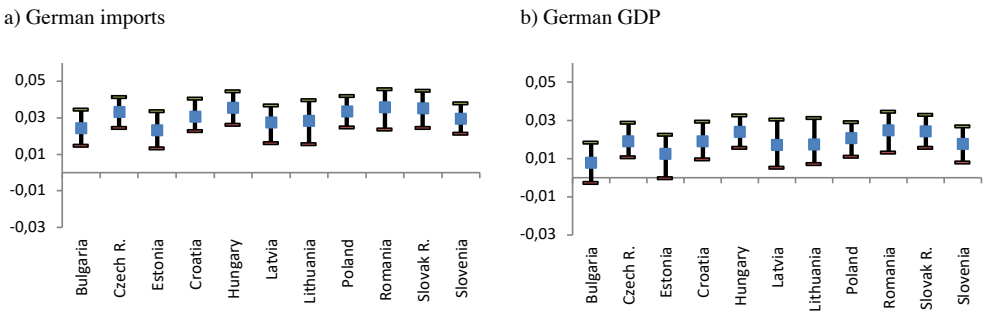


Source: authors' calculation.

In addition to GFEVD, to assess the potential reaction of CESEE countries' exports to shocks, generalized impulse response functions (GIRFs) are presented in Figures 8 – 12, i.e. median estimates and 90 percent bootstrap confidence bands. GIRFs indicate how the effects of variable-specific shocks (all analysed shocks are one standard error in magnitude) on the future states of all the variables in the system, change over time. The following figures illustrate the impact of selected shocks on CESEE countries' exports after one year. Minimum and maximum values on the *y*-axes are the same on all graphs to enable easier evaluation of different shocks. The square on graphs depicts the median, while the lines denote the confidence bands.

Figure 8 indicates that a one standard error shock in German imports (equivalent to an increase in German imports by 1.5% on impact) and a one standard error shock in German output (corresponds to an increase in German output by 0.4% on impact) both lead to increase in CESEE countries' exports. The effect is largest in Romania, Hungary and the Slovak Republic. However, it appears that the effect of an increase in German imports is larger than the increase in German GDP. Moreover, the effect of an increase in German GDP is not statistically significant in Bulgaria and Estonia. That is, in countries where the role of domestic variables is larger, and the role of the German economy smaller in comparison to other CESEE countries. Juráček (2021) found similar results and postulated it as a confirmation of strong trade ties of Baltic countries with Scandinavian countries and Russia.

Figure 8: Impact of one standard error shocks in German economy on CESEE countries' exports (after one year)

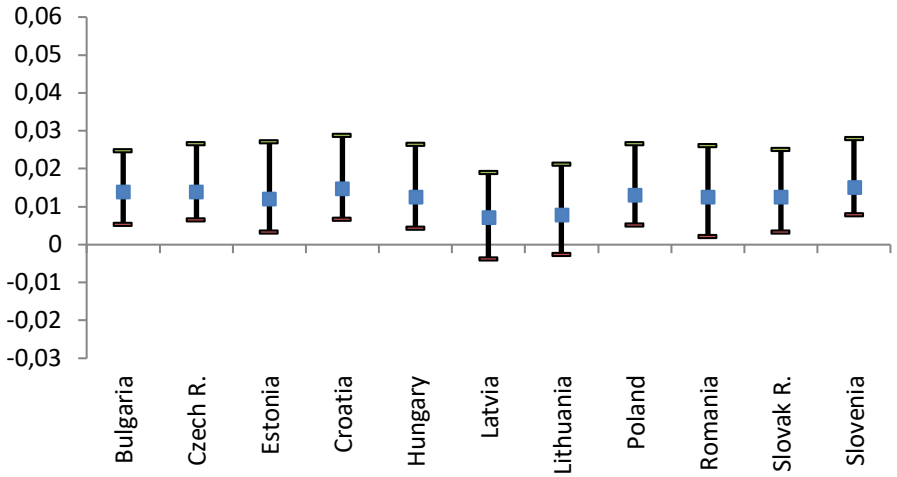


Source: authors' calculation.

A one standard error shock in the German real exchange rate corresponds to an increase of the German real exchange rate by 0.2% on impact. An increase in the real exchange rate implies appreciation, i. e. the German exports become more expensive, while imports become cheaper. In other words, it indicates a loss of competitiveness due to, for instance, an increase in unit labor costs in Germany or higher inflation rel-

ative to other countries. The effect is the largest in Slovenia and Croatia and the lowest in the Baltic countries (in Latvia and Lithuania it is not statistically significant).

Figure 9: Impact of one standard error shock in German real exchange rate on CESEE countries' exports (after one year)



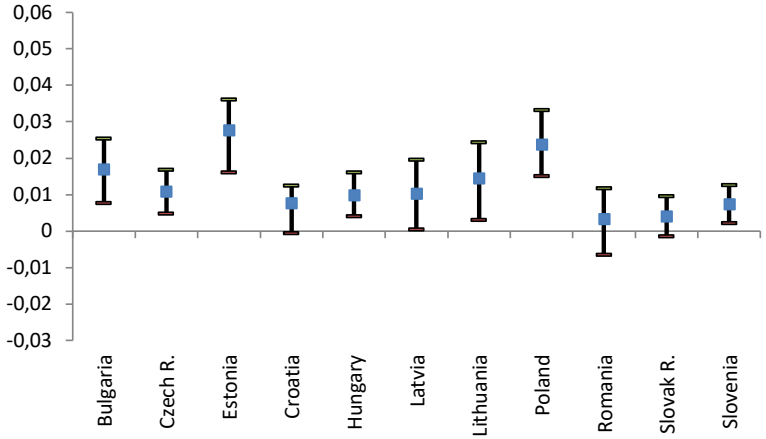
Source: authors' calculation.

When comparing figures 8 and 9, one can notice that the effect of a shock in German imports is two to three times stronger than the effect of a shock in the real effective exchange rate for all CESEE countries. Moreover, although Juráček (2021) found that the shock in the German real exchange rate is more important than a shock to German exports and German GDP, it should be noted that his paper uses quarterly data and cumulative impacts.

The effect of German real exchange rate appreciation on exports of countries with fixed exchange rates is either statistically insignificant (Latvia and Lithuania) or exhibits a larger reaction (Slovenia, Croatia and Bulgaria) in comparison to the countries with floating exchange rate regimes (the Czech R., Poland, Hungary and Romania), which is in line with findings from Colabella (2021). Moreover, it can be noticed that euro area (EA) membership is also not decisive in determining export or economic success (Darvas, 2019).

To proxy for the impact of the domestic demand, a one standard error country-specific shock in domestic GDP is assessed. The effect is positive and statistically significant in all countries besides Croatia, the Slovak Republic and Romania which confirms weak domestic demand in these countries as postulated in previous research (Fidrmuc *et al*. 2013; Li *et al*. 2019). The impact of a shock in German imports is stronger than the effect of a shock in the domestic demand in all countries except Estonia.

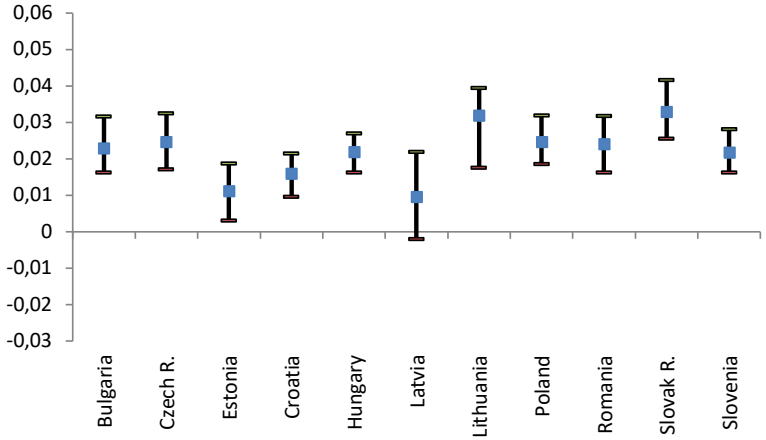
Figure 10: Impact of one standard error country-specific shock in GDP on CESEE countries' exports (after one year)



Source: authors' calculation.

Furthermore, due to participation in Global value chains, imported inputs have an increasing share in the value of exports. Therefore, to assess the impact of participation in Global value chains, Figure 11 depicts the effect of a one standard error country-specific shock in exports on CESEE countries' imports. A positive country-specific shock in exports leads to an increase in CESEE countries' imports in all CESEE countries except for Latvia where the effect is not statistically significant.

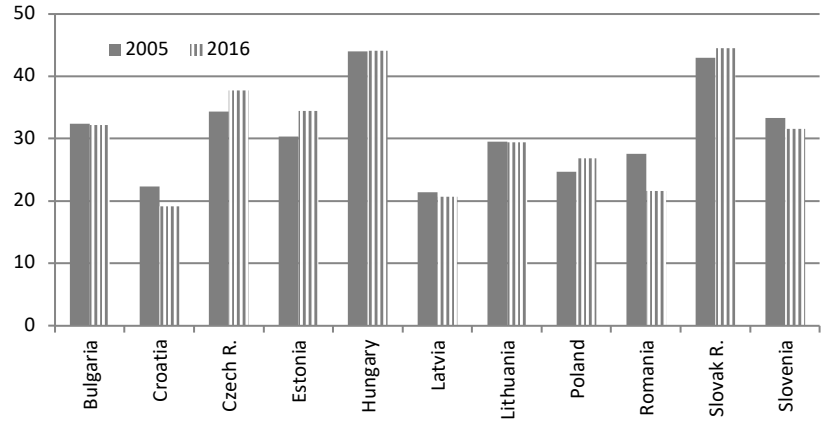
Figure 11: Impact of one standard error country-specific shock in exports on CESEE countries' imports (after one year)



Source: authors' calculation.

For a closer look into the extent to which foreign inputs are included in countries' exports, Figure 12 presents the share of imported inputs in the CESEE countries' exports. The data on import content of exports were available only for the period from 2005 to 2016. However, the pattern was stable and there were no severe changes in the share. The largest decline was in Romania (21.7%) and Croatia (13.9%). On the other hand, the largest increase was in Estonia (13.5%). Latvia and Croatia have the lowest share of import contents (around 20%) while the Slovak Republic and Hungary have the highest share (around 44%). Indeed, Croatia and Latvia are also countries in which the imports reaction to a shock in exports is the smallest. This indicates that imports in these countries are mainly used for consumption and to a lesser extent as inputs for export production.

Figure 12: Import content of exports of CESEE countries' in 2005 and 2016



Source: Organisation for Economic Co-operation and Development (OECD).

Based on the results of the dynamic analysis, the factors behind the 'success stories' (Poland and to a lesser extent the Slovak Republic, the Czech Republic and Romania), at first glance, are not quite clear. It seems that these countries do not stick out at the top or the bottom of the graphs. Notwithstanding, this finding could act as a policy recommendation. Resilience goes hand in hand with not being exposed to one factor (country or variable), being neither at the top nor the bottom regarding price competitiveness, being neither too dependent on imported inputs nor under involved from its usage…

Another interesting finding is the grouping of the Baltic states in case of certain shocks. For instance, the smallest effect of a shock on German imports, output and exchange rate and the stronger effect of a shock on domestic demand. Notwithstanding the similarities, there are also differences. For instance, Estonia and Lithuania

have a larger share of import content which confirms findings from Yashiro *et al*. (2017) and indicates higher involvement in GVCs compared to Latvia. Moreover, the reaction of Lithuania's imports to a one standard error shock in exports is almost two times stronger than Latvia's response.

And, finally, although previous research found differences between CEE and SEE countries' trade patterns, analysed GIRFs and GFEVDs do not point to substantial clear-cut differences between these groups of countries. Obviously, with time, these countries have become more integrated which made the differences less pronounced.

The usual robustness check performed in the GVAR methodology, the model with time-varying weights, was also estimated. The results were very similar (not reported in the paper but are available upon request), which confirms the robustness of the estimated model, just like in the previous papers (Khan, 2020a; Khan, 2020b). Additionally, separate models were estimated for three country groupings: Visegrád 4 (the Czech Republic, Hungary, Poland and the Slovak Republic), Baltic countries (Estonia, Latvia and Lithuania) and South-Eastern Europe (SEE) countries (Bulgaria, Croatia and Romania). Each of these separate models also included Germany as the main trading partner. Again, the patterns of the responses (regarding the signs) were broadly in line with the benchmark model. However, slight differences were observed regarding the sizes of the responses to shocks. The sizes of the responses were quite similar for the Visegrád 4 countries and Romania. Hence, these countries have more robust exports in comparison to the other CESEE countries. On the other hand, in Croatia and Bulgaria, the reaction to shocks is much higher in separate models, which could point to the high exposure of these countries to the German economy which makes them less resilient to adverse shocks. The Baltic countries are again in a completely separate grouping, with their responses lower in comparison to the benchmark model, which confirms that they are highly exposed to the Scandinavian countries and Russia (Sun *et al*. 2013). Thus, intensifying trade relations with other CESEE countries could reduce their exposure and vulnerability to adverse shocks.

Conclusion

Three decades after the beginning of the transition process in the CESEE countries, market mechanisms should be implemented and established. However, in some of these countries, economies are still quite far from being a well oiled and functioning mechanism. In particular, this paper focuses on exports of the CESEE countries as one of the main aspects of the transition process was trade liberalisation. Besides placing their products in new markets, these countries also opened their markets to foreign goods and competition. Thus, the empirical model assessing export dynamics also had to include imports. Furthermore, the employed methodology is designed specifically for modelling interactions and capturing spillovers.

The estimated GIRFs indicate that a one standard error shock in German imports has a larger impact on CESEE countries' exports than a one standard error shock in German output. Moreover, both of these shocks have a two to three-time larger effect in comparison to a one standard error shock in the German real exchange rate. This indicates that the role of the real exchange rate is less pronounced in comparison to previous similar research (Jakšić & Žmuk, 2014). Hence, this also confirms that participation in global value chains (GVCs) reduces the impact of real effective exchange rate on exports (Ahmed *et al*. 2016).

Additionally, as expected, GFEVDs indicate the predominant role of foreign variables on export dynamics except for Estonia where domestic variables play a more important role in the short run. The results also indicate that the Baltic countries share some similar features and yet, in some instances, are quite diverse. Like, for instance, much higher involvement of Lithuania and Estonia in GVCs compared to Latvia. Moreover, it turned out that countries that were slower to recover are also less involved in GVCs and are thus not making the most of the potential transfer of know-how.

As for the countries that turned out to be most resilient to the global turbulences, the results indicate that these countries do not tend to overreact or underreact to shocks, nor are they too exposed to a certain factor or a country and they also make the most of the taking part in GVCs. Turning to the countries whose growth was not robust there is no unique policy recommendation. Instead, each has its country-specific difficulties and obstacles. For instance, Hungary is highly dependent on cyclical industries, such as automotive, which makes its economy particularly exposed to recessions. Croatian recommendations issued by European Commission remain more or less the same for more than a decade which suggests a very persistent postponement of the structural reforms. Consequentially, export growth is very modest and GDP growth rates are below its regional peers. The main recommendation regarding exports is switching from a price competitiveness segment (in which it cannot compete) to a quality competitiveness niche.

Moreover, the trade potential of the CESEE countries could be higher and expanding trade to regional markets, instead of relying solely on the large EU economies like Germany, could reduce the vulnerability of the CESEE economies to external shocks. Meanwhile, speaking of external shocks, CESEE countries, together with other world economies, enter another crisis period, consequences of which are yet to be assessed. It will be interesting to see how the CESEE countries will cope with the ongoing COVID 19 crisis and the challenges it brings, like the disruptions in GVCs. Hopefully, the crisis will finally spur the necessity of structural reforms in some countries.

As a recommendation for future research, one possibility is the inclusion of other countries that CESEE countries are exposed to, such as Scandinavian countries to which the Baltic countries are exposed, or Italy to which Croatia is exposed. Howev-

er, although the model can be expanded to a much larger number of countries, two things should be kept in mind. First, the model should not be oversized so as not to lose focus on analysed CESEE countries. And second, the dynamic stability of the model was a difficult task to achieve for the current model and would probably be much more challenging in case of a significant increase in the number of countries.

REFERENCES

Ahmed, S., Appendino, M. & Ruta, M. (2016). Global value chains and the exchange rate elasticity of exports. The BE Journal of Macroeconomics, 17(1). DOI: https://doi.org/10.1515/bejm-2015-0130

Andrews, D. W., & Ploberger, W. (1994). Optimal tests when a nuisance parameter is present only under the alternative. Econometrica: Journal of the Econometric Society, 1383-1414. DOI: https://doi.org/10.2307/2951753

Backe, P., Feldkircher, M. & Slačik, T. (2013). Economic Spillovers from the Euro Area to the CESEE Region via the Financial Channel: A GVAR Approach, Focus on European Economic Integration, No. 4, 50-64.

Baldwin, R. E. (1994). Towards an Integrated Europe. London: CEPR.

Berman, N., Berthou, A. & Héricourt, J. (2015). Export dynamics and sales at home. Journal of International Economics, 96(2), 298-310. DOI:

https://doi.org/10.1016/j.jinteco.2015.04.001.

Bussière, M., Chudik, A. & Sestieri, G. (2012). Modelling global trade flows: results from a GVAR model. Globalization and Monetary Policy Institute Working Paper 119, Federal Reserve Bank of Dallas.

Bussière, M., Fidrmuc, J. & Schnatz, B. (2005). Trade Integration of Central and Eastern European Countries: Lessons from a Gravity Model. Working Paper Series No. 545 (November). Frankfurt: European Central Bank.

Chow, G. C. & Lin, A. L. (1971). Best linear unbiased interpolation, distribution, and extrapolation of time series by related series. The review of Economics and Statistics, 372-375.

Cieślik, A. & Hagemejer, J. (2011). The Effectiveness of Preferential Trade Liberalization in Central and Eastern Europe. The International Trade Journal, 25(5), 516-538, DOI: https://doi.org/10.1080/08853908.2011.604298

Colabella, A. (2021). Do ECB's Monetary Policies Benefit EMEs? A GVAR Analysis on the Global Financial and Sovereign Debt Crises and Postcrises Period. Oxford Bulletin of Economics and Statistics, 83(2), 472-494. DOI: https://doi.org/10.1111/obes.12403

Collins, S. & Rodrik, D. (1991). Eastern Europe and the Soviet Union in the World Economy. Washington, D.C.: Institute for International Economics.

Cuaresma, J. C., Eller, M., & Mehrotra, A. N. (2011). The economic transmission of fiscal policy shocks from western to eastern Europe. BOFIT Discussion Papers 12/2011 Retrieved May 12 2022, from

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1868789

Damijan, J. P., De Sousa, J. & Lamotte, O. (2006). The effect of trade liberalization in South-Eastern European countries (No. 070). wiiw Balkan Observatory Working Papers.

Damijan, J. P. & Kostevc, C. (2011). Trade liberalisation and economic geography in CEE countries: The role of FDI in the adjustment pattern of regional wages. Post-Communist Economies, 23(02), 163-189. DOI: https://doi.org/10.1080/14631377.2011.570041.

Damijan J., Kostevc Č. & Rojec M., (2013). Bright Past, Shady Future? Past and Potential Future Export Performance of CEE Countries in a Comparative Perspective. GRINCOH Working Paper Series, Paper No. 2.03

Damijan, J., Rojec, M. & Ferjančič, M. (2011). The Growing Export Performance of Transition Economies: EU Market Access versus Supply Capacity Factors. Panoeconomicus, 58(4), 489-509. DOI: http://dx.doi.org/10.2298/PAN1104489D.

Darvas, Z. M. (2019). With or without you: are central European countries ready for the euro? (No. 2019/12). Bruegel Policy Contribution.

Dees, S., di Mauro, F., Pesaran, M. H. & Smith, L. V. (2007). Exploring the International Linkages of the Euro Area: A Global VAR Analysis. Journal of Applied Econometrics, 22(1), 1-38. DOI: https://doi.org/10.1002/jae.932.

Dees, S. & Saint-Guilhem, A. (2009). The role of the US in the global economy and its evolution over time. ECB Working Paper Series, no. 1034, 1-46.

Dickey, D. & Fuller, W. (1981). Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. Econometrica, 49(4), 1057-1072.

Egger, P. (2003). An econometric view on the estimation of gravity models and the calculation of trade potentials. The World Economy, 25(2), 297-312. DOI: https://doi.org/10.1111/1467-9701.00432.

El-Shagi, M., & Tochkov, K. (2022). Shadow of the colossus: Euro area spillovers and monetary policy in Central and Eastern Europe. Journal of International Money and Finance, 120, 102501. DOI: https://doi.org/10.1016/j.jimonfin.2021.102501

Feldkircher, M. (2015). A Global Macro Model for Emerging Europe. Journal of Comparative Economics, 43(3), 706-726. DOI: https://doi.org/10.1016/j.jce.2014.09.002.

Feldkircher, M., & Korhonen, I. (2014). The Rise of China and its Implications for Emerging Markets-Evidence from a GVAR model. Pacific Economic Review, 19(1), 61-89. DOI: https://doi.org/10.1111/1468-0106.12052

Fidrmuc, J. & Fidrmuc, J. (2003). Disintegration and trade. Review of International Economics, 11(5), 811-829. DOI: https://doi.org/10.1046/j.1467-9396.2003.00419.x.

Fidrmuc, J., Klein, C., Price, R., & Wörgötter, A. (2013). Slovakia: A Catching up Euro Area Member in and out of the Crisis. IZA Policy Paper No. 55.

Fleming, J. M. (1962). Domestic Financial Policies Under Fixed and Under Floating Exchange Rates. International Monetary Fund Staff Papers, 9(3), 369-379.

Frankel, J. A. & Romer, D. (1999). Does trade cause growth? American Economic Review, 89(3), 379-399. DOI: https://doi.org/10.1257/aer.89.3.379

Fugazza, M. (2004). Export Performance and Its Determinants: Supply and Demand Constraints. Policy Issues in International Trade and Commodities Study Series No. 26. New York and Geneva: United Nations Conference on Trade and Development (UNCTAD).

Garratt, A., Lee, K., Pesaran, M. H., & Shin, Y. (2006). Global and national macroeconometric modelling: a long-run structural approach. OUP Oxford.

Greenwood-Nimmo, M., Nguyen, V. H. & Shin, Y. (2012a). Probabilistic forecasting of output growth, inflation and the balance of trade in a GVAR framework. Journal of Applied Econometrics, 27(4), 554-573. DOI: https://doi.org/10.1002/jae.1208.

Greenwood-Nimmo, M., Nguyen, V. H. & Shin, Y. (2012b). International linkages of the Korean economy: The global vector error-correcting macroeconometric modelling approach. Melbourne Institute Working Paper Series, Working Paper No. 18/12.

Gross, M. (2013). Estimating GVAR weight matrices. European Central Bank, Working Paper Series, NO 1523.

Hamilton, C. B. & Winters, L. A. (1992). Opening up International Trade for Eastern Europe. Economic Policy, 7(14), 78-115. DOI: https://doi.org/10.2307/1344513.

Hanson, B. E. (2002). Tests for parameter instability in regressions with I (1) processes. Journal of Business & Economic Statistics, 20(1), 45-59. DOI: https://doi.org/10.1198/073500102753410381

Harbo, I., Johansen, S., Nielsen, B. & Rahbek, A. (1998). Asymptotic inference on cointegrating rank in partial systems. Journal of Business and Economic Statistics, 16 (4), 388-399. DOI: https://doi.org/10.1080/07350015.1998.10524779.

Havlik, P., Landesmann, M. & Stehrer, R. (2001). Competitiveness of CEE Industries: Evidence from Foreign Trade Specialization and Quality Indicators. WIIW Research Reports, No. 278 (July). Vienna: The Vienna Institute for International Economic Studies.

Havlik, P. (2000). Trade and Cost Competitiveness in the Czech Republic, Hungary, Poland and Slovenia. World Bank Technical Paper No. 482 (November). Washington, D.C.: World Bank.

Havrylyshyn, O. & Al-Atrash, H. (1998). Opening Up and Geographic Diversification of Trade in Transition Economies. IMF Working Paper, WP/98/22. Washington, D.C.: International Monetary Fund, European II and Policy Development and Review Departments.

Havrylyshyn, O. & Pritchett, L. (1991). European Trade Patterns after the Transition. Policy, Research and External Affairs, Working Papers, Trade Policy, WPS 748. Washington, D.C.: World Bank.

Hoxha, A. (2018). Explaining the impact of the global financial crisis on European transition countries: a GVAR approach. Focus on European Economic Integration, (Q2-18), 81-97.

Jakab, Z., Kovacs, M. A. & Oszlay, A. (2001). How far has trade integration advanced? An Analysis of the actual and potential trade of three Central and Eastern European countries. Journal of Comparative Economics, 29(2), 276-292. DOI: https://doi.org/10.1006/jcec.2001.1709.

Jakšić, S. & Žmuk, B. (2014). Modelling Croatian export dynamics using global macroeconometric model. Zagreb International Review of Economics & Business, 17(SCI), 31-48.

Johansen, S. (1988). Statistical analysis of cointegration vectors. Journal of Economic Dynamics and Control, 12(2-3), 231-254. DOI: https://doi.org/10.1016/0165-1889(88)90041-3.

Johansen, S. (1991). Estimation and hypothesis testing of cointegrating vectors in gaussian vector autoregressive models. Econometrica, 59(6), 1551-1580. DOI: https://doi.org/10.2307/2938278.

Johansen, S. (1995). Likelihood-Based Inference in Cointegrated Vector Autoregressive Models. Oxford University Press, Oxford.

Juráček, M. (2021). German exports: Impact on the selected EU countries. Review of Economic Perspectives, 21(1), 41-55. DOI: https://doi.org/10.2478/revecp-2021-0003

Kaminski, B., Wang, Z. K. & Winters, L. A. (1996a). Trade performance, Export Reorientation in the Transition. Economic Policy, 11(23), 421-442. DOI: https://doi.org/10.2307/1344709.

Kaminski, B., Wang, Z. K. & Winters, L. A. (1996b). Foreign Trade in The Transition: The International Environment and Domestic policy. Studies of Economies in Transformation, No. 20. Washington, D.C.: World Bank.

Khan, N. S. (2020a). Spillover Effects of Trade Shocks in the Central and Eastern European and Baltic Countries. Journal of Economic Integration, 35(1), 39-68. DOI: https://doi.org/10.11130/jei.2020.35.1.39

Khan, N. S. (2020b). Propagation of economic shocks from Russia and Western European countries to CEE-Baltic countries. Eurasian Economic Review, 10(3), 489-512. DOI: https://doi.org/10.1007/s40822-020-00146-1

Li, Z. Z., Su, C. W., Tao, R., & Lobonţ, O. R. (2019). Can Foreign Direct Investment Promote Exports in Slovakia?. Ekonomicky Casopis, 67(2), 135-156.

Mundell, R. A. (1963). Capital Mobility and Stabilization Policy Under Fixed and Flexible Exchange Rates. Canadian Journal of Economics and Political Science, 29(4), 475-485. DOI: https://doi.org/10.2307/139336.

Nguyen, H. S., & Rondeau, F. (2016). European Union Enlargement in 2004, Euro adoption and Trade Spillovers: A Near-Var Approach. Retrieved May 5 2022, from the European Trade Study Group (ETSG) https://www.etsg.org/ETSG2016/Papers/108.pdf

Nyblom, J. (1989). Testing for the constancy of parameters over time. Journal of the American Statistical Association, 84(405), 223-230. DOI:
https://doi.org/10.1080/01621459.1989.10478759

Park, H. J. & Fuller, W. A. (1995). Alternative Estimators and Unit Root Tests for the Autoregressive Process. Journal of Time Series Analysis, 16(4), 415-429. DOI: https://doi.org/10.1111/j.1467-9892.1995.tb00243.x.

Pesaran, M. H., Schuermann, T. & Treutler, B. J. (2007). Global Business Cycles and Credit Risk. Ch. 9, in The risks of financial institutions, eds M. Carey and R. Stultz, University of Chicago Press., Chicago.

Pesaran, M. H., Schuermann, T., Treutler, B. J. & Weiner, S. M. (2006). Macroeconomic Dynamics and Credit Risk: A Global Perspective. Journal of Money, Credit and Banking, 38(5), 1211-1262.

Pesaran, M. H., Schuermann, T. & Weiner, S. M. (2004). Modeling regional interdependencies using a global error-correcting macroeconometric model. Journal of Business and Economic Statistics, 22 (2), 129-162. DOI: https://doi.org/10.1198/073500104000000019.

Pesaran, M. H., Shin, Y. & Smith, R. J. (2000). Structural analysis of vector-error correction models with exogenous I(1) variables. Journal of Econometrics, 97(2), 293-343. DOI: https://doi.org/10.1016/S0304-4076(99)00073-1.

Ploberger, W., & Krämer, W. (1992). The CUSUM test with OLS residuals. Econometrica: Journal of the Econometric Society, 271-285. DOI: https://doi.org/10.2307/2951597

Quandt, R. E. (1960). Tests of the hypothesis that a linear regression system obeys two separate regimes. Journal of the American statistical Association, 55(290), 324-330. DOI: https://doi.org/10.1080/01621459.1960.10482067

Redding, S. & Venables, A. J. (2004a). Geography and Export Performance: External Market Access and Internal Supply Capacity. NBER Chapters, in: Challenges to Globalization: Analyzing the Economics, pages 95-130 National Bureau of Economic Research, Inc.

Redding, S. & Venables, A. J. (2004). Economic Geography and International Inequality. Journal of International Economics, 62(1), 53-82. DOI: https://doi.org/10.1016/j.jinteco.2003.07.001.

Rosati, D. (1992). Problems of Post-CMEA Trade and Payments. Discussion Paper 650. London: Center for Economic Policy Research.

Slacik, T., Steiner, K. & Wörz, J. (2014). Can Trade Partners Help Better FORCEE the Future? Impact of Trade Linkages on Economic Growth Forecasts in Selected CESEE Countries. Focus on European Economic Integration, Oesterreichische Nationalbank.

Smith, L. V. & Galesi, A. (2014). GVAR Toolbox 2.0. Retrieved from https://sites.google.com/site/gvarmodelling/gvar-toolbox.

Sun, Y., Heinz, F. F. & Ho, G. (2013). Cross-Country Linkages in Europe: A Global VAR Analysis. IMF Working Paper, No. 13/194, 74.

World Bank (2016) Croatia Policy Notes 2016: Restoring Macroeconomic Stability, Competitiveness and Inclusion.

Yashiro, N., De Backer, K., Hutfilter, A. F., Kools, M. & Smidova, Z. (2017). Moving up the global value chain in Latvia. OECD Economics Department Working Papers, No. 1438, OECD Publishing, Paris, DOI: https://doi.org/10.1787/3a486c5e-en

Zinnes, C., Eilat, Y. & Sachs, J. (2001). Benchmarking competitiveness in transition economies. Economics of Transition, 9(2), 315-353.