
Trading Partners and Output Growth in Ukraine

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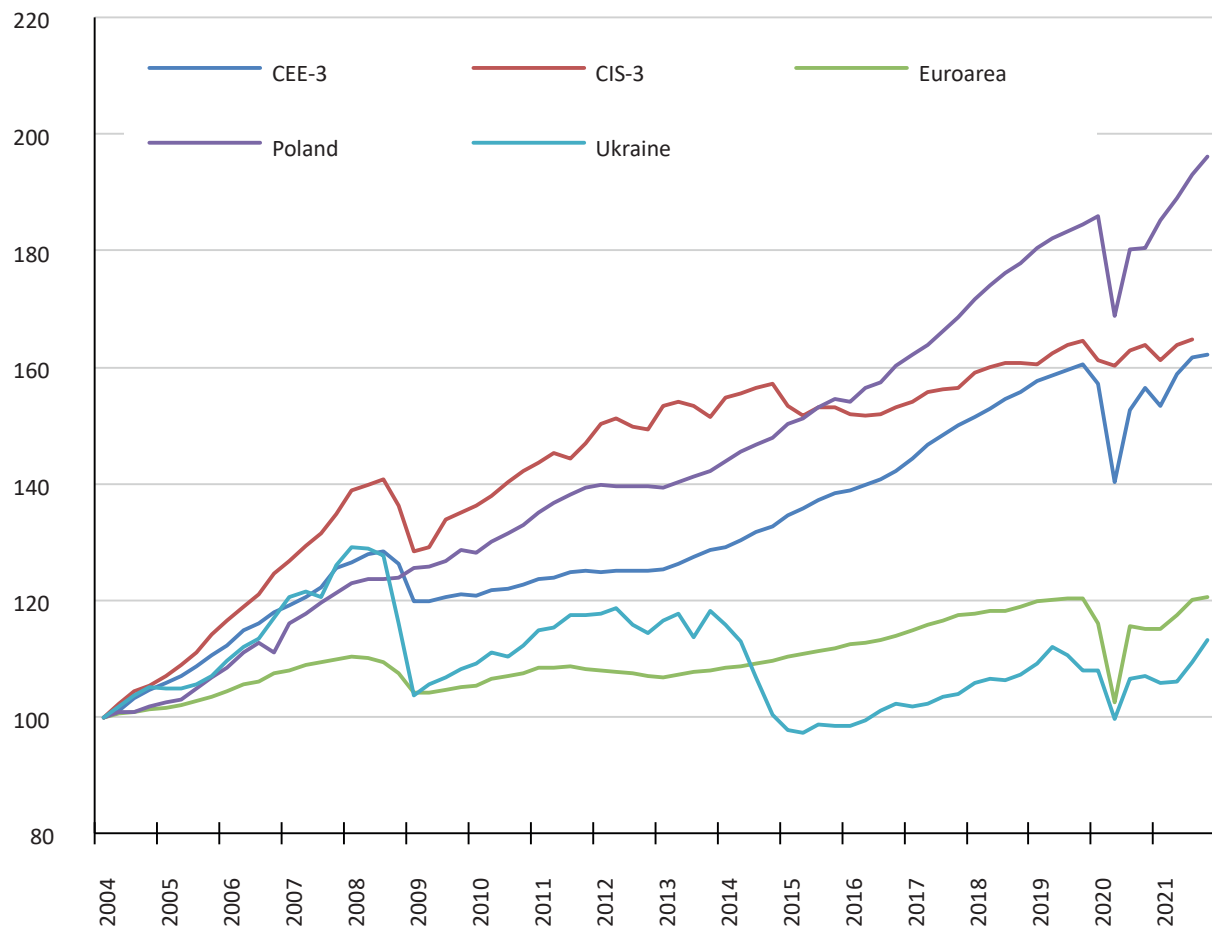
Abstract: This study aimed to empirically estimate the long-term and short-term relations between the output of trading partners and economic growth in Ukraine. With the use of quarterly data over the 2004-2019 period, it was found that an increase of output in the euro area resulted in the most substantial stimulating long-term effect on the level of GDP in Ukraine, followed by spillovers from output growth in Poland. There was no long-term effect of output in other major trading partners, such as other Central and Eastern European countries (Czechia, Hungary, Slovakia) and the former Soviet Union countries (Belarus, Kazakhstan, Russia). In the short run, the stimulating effect of foreign output was confirmed only for spillovers from the euro area. Among other results, there was a long-term contractionary effect of both exchange rate depreciation and liberalisation of the economic environment, as indicated by the Index of Economic Freedom from the Washington-based Heritage Foundation (both factors are neutral with respect to Ukraine's output in the short run).

Keywords: output growth, foreign output spillovers, exchange rate, the Index of Economic Freedom, Ukraine.

1. Introduction

For open economies at different stages of income per capita, it is common to rely on the exports to trading partners as an engine of economic growth. As found by panel estimation results for more than 100 countries, trading partners' growth strongly affects domestic growth, with trading partners'

relative income levels also being positively correlated with growth (Arora and Vamvakidis, 2005). This means that countries benefit from trading with fast-growing and relatively more developed countries. Besides the foreign demand effect (Fassio, 2018), explanations of positive spillovers include such factors as the adoption of new technologies (Coe and Helpman, 1995), a stronger focus on product quality (Kali et al., 2007) and benefits from foreign buyers' technical and managerial expertise, known as the learning-by-exporting effects (Silva et al., 2010). Despite numerous and well-documented positive evidence, mainly of microeconomic origin, the macroeconomic effects of income abroad are not without potential caveats, especially in the short run. First of all, there are risks of foreign trade and production downturn abroad, as happened for the European countries in the wake of the 2008-2009 global financial crisis (Domańska and Serwa, 2013); the dependence on foreign trade partners can also be counterproductive in the long run. As found from estimates regarding 167 countries, the correlation between output in the domestic economy and abroad was not always positive, while a negative link was observed for a third of the countries (Razmi, 2016). Recently, it was recommended for companies from East and Southeast Asia to reduce their exposure to China and advanced economies (Thorbecke and Kato, 2021).



The CEE-3 countries are Czechia, Hungary, and Slovakia, while the CIS-3 countries refer to Belarus, Kazakhstan, Russia

Fig. 1. Real GDP for Ukraine and its main trading partners (index, 2004=100)

Source: Federal Reserve Bank of St. Louis (www.fred.stlouisfed.org).

This study aimed to provide empirical estimates of the relation between foreign output and economic growth in Ukraine, with a focus on the likely differences between the long-term and short-term effects

across the main trading partners, such the European Union and the Commonwealth of Independent States (CIS) countries, as well as Poland and other Central and Eastern European (CEE) countries (Figure 1). For this purpose, the Autoregressive Distributed Lag (ARDL) model was used, as well as the Fully Modified Ordinary Least Squares (FMOLS), the Dynamic Ordinary Least Squares (DOLS) and the Canonical Cointegrating Regression (CCR) estimators to verify the robustness of the obtained long-term coefficients.

In the remainder of the paper, Section 2 provides a brief survey of the results of the theoretical and empirical studies. Section 3 presents the data and a statistical model. The empirical results are discussed in Section 4. Finally, the conclusions and policy implications are summarised in Section 5.

2. Literature Review

In the macroeconomic setting, most theoretical approaches imply a positive direct relation between income abroad and domestic economic growth, but negative spillovers are not ruled out either. While trade and capital inflows from more prosperous countries are advantageous in the long run due to technology adoption, product innovations and the learning-by-exporting effects (Coe and Helpman, 1995; Fassio, 2018; Kali et al., 2007; Silva et al., 2010), demand spillovers from trading partners are ambiguous in the short run. The well-known Mundell-Fleming model implies the stimulating effect of income abroad, but only in economies with some exchange rate stability. According to the modification of the Overlapping Generations Model (OLG), which is positioned as a 'bridge' between the Mundell-Fleming model and the New Open-Economy Macro models (NOEM), foreign output effects depend on the relative strength of asymmetric income and price effects (Ganelli, 2005). It is likely that the expansionary effect of higher demand-driven growth abroad in the short term will be followed by the opposite contractionary long-term effect. The Redux model proposes similar policy implications (Obstfeld and Rogoff, 1995). The interpretation of the foreign trade effects in the Mundell-Fleming model and its flexible price extensions is similar to the logic of the gravitation models of international trade, which imply the dependence of exports and imports on the income of trading partners, transport costs and regional trade agreements (Rault et al., 2009).

Although standard New Keynesian models do not put too much weight on foreign demand shocks in the determination of domestic output, recent developments in the modelling framework have introduced numerous explanations of the link between output abroad and domestic economic growth, such as the fiscal-monetary mix, financial risk, firm and consumer sentiment, shocks to technology or energy prices etc., with a focus on the sources of foreign output growth. For example, asymmetry in output between trading partners is likely under conditions of price stickiness and home bias in consumption abroad (Flotho, 2015). The latter is responsible for an asymmetry between output in trading countries in several international trade models (Soo, 2008). The Real Business Cycle (RBC) models envisage a positive income effect in foreign trade, yet the outcome depends on the country-specific structural features, such as the share of imports (Corsetti and Müller, 2008), labour market developments (Baxter, 1995) and/or the central bank interest rate policy in the trading partner (Corsetti et al., 2013).

If technology-based mechanisms of international trade are more robust, it implies benefits from trade reorientation towards high-income countries (Arora and Vamvakidis, 2005; Yanikkaya, 2003). However, foreign demand considerations can work in the opposite direction, at least in the short run. For the CEE countries, empirical studies are in favour of a direct relation between output in the euro area and domestic economic growth (Backé et al., 2013; Hájek and Horváth, 2016; Keppel and Prettnner, 2015). A study of the spillover effects of trade shocks for the ten CEE-Baltic countries revealed that the Czech Republic, Slovakia, and Poland play a more significant role in this transmission process than the other countries (Khan, 2020). As an inflationary supply shock in the euro area significantly negatively impacts the economic growth in Czechia, Hungary, Poland and Romania (Necula et al., 2022), it can be concluded that the price effect can potentially outweigh the income effect in foreign trade. Other studies found

that the composition of major trading partners is important for economic growth in 23 EU countries (Santos et al., 2016) and Turkey (Dağdemi, 2018).

Research Ukraine and other post-Soviet countries is relatively scarce. Similarly to the CEE countries, it was confirmed empirically that there are positive spillovers from the euro area (Moisei, 2018). For the Baltic States, it was observed that spillovers from the EU countries outweigh those from Russia, with shocks to the real exchange rate generally depressing growth (Obiora, 2010). There is evidence that the CIS countries show the strongest responses to output shocks originating in the US, Russia and within the region itself, with an increase of their sensitivity to the euro area shocks (Faryna and Simola, 2021). As early as at the end of the 2000s, it was found that there was a shrinking role of the trade (exports to Russia) channel for the post-Soviet countries. However, this was still associated with sizable effects on several of them, e.g. Belarus and Kazakhstan (Alturki et al., 2009). According to some estimates, a free trade agreement with the EU countries increased Ukraine's output by 11.8% in the long run, while entering the Customs Union with Russia, Belarus, and Kazakhstan decreased it by 3.7% (Movchan and Giucci, 2011). Based on the analysis of Ukraine's foreign trade potential, it is argued that the USA, France, Canada, Germany, Poland, Slovakia, the Baltic States, Belarus, Georgia and the Czech Republic are among the priority countries in the context of strengthening foreign trade relations (Martyniuk and Muravska, 2020).

3. Data and Statistical Model

3.1. Data

This dataset adopted quarterly series for the period between 2004Q1 and 2019Q4 for Ukraine and its main trading partners, as provided by the Federal Reserve Bank of St. Louis (www.fred.stlouisfed.org) database. The authors analysed the relation between the actual gross domestic product in Ukraine, $yukr_t$, and real output of the Euro area countries, $yeuro_t$, three CIS countries (Belarus, Kazakhstan, Russia), $ycis_t$, three CEE countries (Czechia, Hungary, Slovakia), $ycee_t$, and Poland, $ypol_t$. All real GDP time series (index, 2010=100) were seasonally adjusted. Synthetic output variables $ycee_t$ and $ycis_t$ were constructed as an average of the individual GDP indices for the countries included in the aggregated index.

The authors deliberately excluded the 2020-2021 period from the analysis because of the excessive turbulence caused by the COVID-19 pandemic, a purely stochastic shock with unclear consequences in the long run (Figure 1). Poland is an excellent example of a fast-growing economy, with a twofold increase in the GDP level over the 2004-2021 period; for the CEE-3 and CIS-3 countries the magnitude of the increase in the output level was similar. Still, both groups of countries are quite different with respect to the quality of economic growth (the latter are mainly commodity exporters). Finally, the euro-area countries are rich and technology-advanced, although they have a relatively low rate of economic growth.

In addition, the study used such determinants of Ukraine's output as the nominal effective exchange rate, $neer_t$, as provided by the IMF International Financial Statistics (www.data.imf.org), the Index of Economic Freedom (ranging from 0 to 1, with higher values indicating more liberal economic environment), $herit_t$, as provided by the Heritage Foundation (www.heritage.org), the terms-of-trade, tot_t , defined as the relation between the world prices for metals (a proxy for export prices) and for crude oil (a proxy for import prices). Both commodity prices were obtained from the IMF primary commodity prices database (<https://www.imf.org/en/research/commodity-prices>). It is generally argued that analysis of export destinations should account for institution-based factors, in addition to such factors as exchange rate flexibility, resource endowments and trade integration (Boeche et al., 2016; Gruss et al., 2020). Similarly to other studies of foreign output spillovers (Obiora, 2010), control of the exchange rate is important due to the heavy reliance of the Ukraine's economy on either exports or imports (their combined share in GDP exceeded 90% over the period of study).

As obtained by several unit root tests (Table 1), most of the variables were nonstationary in levels and stationary in first differences, i.e. I(1), while only terms-of-trade tot_t were likely to be stationary according to 3 out of 4 unit root tests.

3.2. Statistical Model

For the analysis of foreign output spillovers, the choice of the Autoregressive Distributed Lag Model (ARDL) has advantages of its own, as (i) it applies to the situation of variables being a mixture of I(1) and I(0), and (ii) it is possible to estimate both the short and the long-term effects simultaneously (Pesaran and Shin, 1998). Following Kripfganz and Schneider (2022), the statistical model for Ukraine’s GDP gross domestic product is as follows:

$$y_t = c_0 + c_1t + \sum_{i=1}^p \phi_i y_{t-i} + \sum_{i=0}^q \beta_i' x_{t-i} + \varepsilon_t, \quad t = 1 + p^*, \dots, T, \quad (1)$$

where c_0 is the intercept, c_1 is the linear trend, x_t is a five-variable vector of the exogenous variables ($ycee_t, ycis_t, yeuro_t, ypol_t, neer_t, herit_t, tot_t$), p and q are lag orders, is the maximum admissible lag order, T is the number of observations in the dataset, ε_t is white noise disturbance, and t is the time dimension.

Table 1. Unit root test analysis

Variables	Augmented Dickey–Fuller		Dickey–Fuller GLS		Phillips–Perron		Kwiatkowski–Phillips–Schmidt–Shin	
	Level	Δ	Level	Δ	Level	Δ	Level	Δ
$ycee_t$	-2.01	-4.54***	-1.69	-4.58***	-1.86	-4.54***	0.12*	0.09***
$ycis_t$	-2.31	-5.99***	-1.08	-6.03***	-2.37	-5.78***	0.23	0.09***
$yeuro_t$	-2.26	-3.86**	-2.25	-3.84***	-1.72	-3.89***	0.14*	0.09***
$ypol_t$	-1.54	-2.98*	-1.44	-2.98*	-1.82	-8.17***	0.12*	0.10***
$yukr_t$	-2.92	-4.96***	-2.30	-4.87***	-2.61	-4.92***	0.12*	0.15**
$herit_t$	-1.27	-5.56***	-1.56	-4.17***	-0.83	-5.44***	0.22	0.10***
$neer_t$	-2.90	-2.45***	-2.68	-2.45	-2.07	-5.46***	0.10***	0.10***
tot_t	-3.06	-7.95***	-2.97*	-7.66***	-3.25*	-7.96***	0.04***	0.03***

* Specification with trend and intercept is used for all unit root tests, with automatic selection of lag length; ***, **, and * denote statistical significance at 1%, 5% and 10% levels; Δ refers to first differences.

Source: authors’ calculations.

The ARDL model can be reformulated in the error-correction representation in the following way:

$$\Delta y_t = c_0 + c_1t - \alpha(y_{t-1} - \theta x_{t-1}) + \sum_{i=1}^{p-1} \psi_{yi} \Delta y_{t-i} + \omega' \Delta x_t + \sum_{i=0}^q \psi_{xi}' \Delta x_{t-i} + \varepsilon_t. \quad (2)$$

The coefficients in Eq. (2) are related to those in Eq. (1) as follows:

$$\alpha = 1 - \sum_{i=1}^p \phi_i, \quad \theta = \frac{\sum_{j=0}^q \beta_j}{\alpha}, \quad \psi_{yi} = -\sum_{j=i+1}^p \phi_j, \quad \psi_{xi} = -\sum_{j=i+1}^q \beta_j$$

For computational purposes, the following model is estimated:

$$\Delta y_t = c_0 + c_1t + \pi_y y_{t-1} + \pi_x x_{t-1} + \sum_{i=1}^p \psi_{yi} \Delta y_{t-i} + \sum_{i=0}^q \psi_{xi}' \Delta x_{t-i} + \varepsilon_t. \quad (3)$$

where $\alpha = -\pi_y$ is the speed-of-adjustment coefficient and $\theta = \pi_x/\alpha$ stands for the long-run coefficients. The speed-of-adjustment coefficient demonstrates how fast the output reverts back to its long-run equilibrium, with $0 < \alpha < 1$ reflecting a partial-adjustment process.

For estimation purposes four lags for both endogenous and exogenous variables were used. Both ARDL bounds tests suggested rejecting the null hypothesis of no cointegration at the 1% level of statistical significance (Table 2).

Table 2. ARDL bounds test analysis

Test statistics	Value	Significance	Critical values	
			I(0)	I(1)
F-statistics k = 6	8.54***	10%	2.69	3.83
		5%	3.13	4.36
		1%	4.11	5.59
t-statistics	-5.56***	10%	-3.13	-4.37
		5%	-3.41	-4.69
		1%	-3.96	-5.31

* The optimal lag length on each variable is chosen by the Schwarz's Bayesian information criterion.

Source: authors' calculations.

As reported in Table 3, diagnostic statistic tests revealed that the ARDL model meets the requirements for the absence of serial correlation (the LM test), heteroskedasticity (the Breusch–Pagan–Godfrey and ARCH tests) and normal distribution of residuals (the Jarque–Bera Test). Additionally, the Ramsey RESET test and the CUSUM and CUSUM Square tests indicated the stability of the estimated coefficients.

Table 3. Diagnostic statistic tests

Diagnostic Statistics Tests	χ^2 (p Values)	Results
Breusch–Godfrey LM test	0.27	No problem of serial correlations
Breusch–Pagan–Godfrey test	0.29	No problem of heteroskedasticity
ARCH test	0.80	No problem of heteroskedasticity
Ramsey RESET test	0.43	Model is specified correctly
Jarque–Bera test	0.40	Estimated residuals are normal

Source: authors' calculations.

4. Empirical Results

The study estimates of the long-term and short-term coefficients are presented in Tables 4 and 5, respectively. The robustness of the former was confirmed using alternative FMOLS, DOLS and CCR estimators. Regardless of the estimator used, it was found that positive spillovers from output abroad were most substantial in the case of the euro area (all coefficients are significant at 1% level). Such a result is in full accordance with previous studies, for example Moisei (2018) and Movchan and Giucci (2011). The stimulating effect of Poland's output is significant according to three out of four estimators. The estimates of spillovers from output in the CIS countries were not stable across different estimators, further supporting earlier findings of the shrinking role of trade with Russia for the post-Soviet countries (Alturki et al., 2009). There is robust evidence of Ukraine's long-term output neutrality with respect to economic growth in the CEE-3 countries. As indicated by the coefficient on $trend_t$, there is a secular decline in the trend value of Ukraine's output.

Table 4. Estimates of the long-term coefficients

Variables	ARDL	FMOLS	DOLS	CCR
$ycee_t$	0.280 (0.196)	-0.096 (0.162)	0.192 (0.246)	-0.053 (0.157)
$ycis_t$	0.176 (0.121)	0.273*** (0.074)	-0.017 (0.189)	0.210** (0.083)
$yeuro_t$	1.159*** (0.358)	1.563*** (0.224)	1.481*** (0.233)	1.549*** (0.239)
$ypol_t$	0.607*** (0.127)	0.414*** (0.130)	0.567 (0.170)	0.456*** (0.132)
$neer_t$	-0.223*** (0.027)	-0.229*** (0.016)	-0.281*** (0.034)	-0.236*** (0.016)
$herit_t$	-0.267*** (0.086)	-0.231*** (0.057)	-0.427*** (0.125)	-0.273*** (0.061)
tot_t	–	-0.070*** (0.017)	-0.058*** (0.031)	-0.085*** (0.020)
$trend_t$	-0.006*** (0.002)	-0.004*** (0.001)	-0.004** (0.002)	-0.004*** (0.001)
R^2		0.94	0.95	0.94

Source: authors' calculations.

In a broader context, the estimates of the long-term foreign output spillovers support earlier studies that more developed trading partners with higher income levels generate more substantial spillovers (Arora and Vamvakidis, 2005). As the sources of positive effects are numerous (economies of scale, adoption of new technologies, higher product quality, better technical and managerial expertise etc.), it sets the stage for future research with the use of the company-level data. It was also confirmed that there could be no correlation between domestic and foreign output, as obtained by Razmi (2016). However, the authors did not find any long-term negative spillovers from the output of trading partners. This means that the mechanisms of the *Redux* and similar models, as proposed by Obstfeld and Rogoff (1995) and Ganelli (2005), are not very relevant for explaining Ukraine's interaction with its trading partners.

On the other hand, the stimulating short-term foreign output effect was shown only for the euro area (Table 5). Every percentage point of output growth in the euro area resulted in an increase in Ukraine's GDP growth rate by 2.1 percentage points. In contrast to the long-term estimates, output growth in Poland was negatively correlated to output growth in Ukraine in the short run. A similar asymmetry was noted for spillovers from output growth in the CIS countries. No difference with the long-term estimates was observed, namely there was neutrality with respect to output growth in the CEE-3 countries. As revealed by the value of the coefficient on the error-correction term (ECT_{t-1}), adjustment of the long-term relation was very fast, i.e. during one quarter.

Table 5. Estimates of the short-term coefficients (ARDL)

Variables	Lags			
	0	1	2	3
$\Delta y ukr_t$	–	0.257*** (0.092)	0.327*** (0.093)	0.257*** (0.087)
$\Delta y cee_t$	–	–	–	–
$\Delta y cis_t$	0.196 (0.210)	0.120 (0.202)	-0.734*** (0.208)	–
$\Delta y euro_t$	2.146*** (0.371)	–	–	–
$\Delta y pol_t$	-0.222 (0.211)	-0.971*** (0.260)	-0.803*** (0.247)	–
$\Delta neer_t$	-0.099*** (0.033)	0.153*** (0.038)	–	–
$\Delta herit_t$	–	–	–	–
Δtot_t	-0.091*** (0.018)	–	–	–
ECT_{t-1}	–	-0.968*** (0.117)	–	–

Source: authors' calculations.

While the logic of the Mundell-Fleming could easily explain the short-term positive link between foreign and domestic output, explanations of the negative effect are not straightforward. Based on the example of spillovers from Poland's output, the negative effect in the short run was likely to result from the price stickiness and home bias in consumption, as elaborated by Flotho (2015), or labour market developments (Baxter, 1995). It is possible to argue that a stronger output growth in Poland attracts migrant workers from Ukraine, thus creating asymmetry in the short-term output dynamics. Similar to the findings by Necula et al. (2022), one may argue that an inflationary supply shock causes a significant negative effect. The same argument is relevant for the explanation of negative short-term spillovers from output growth in the CIS countries. There is no correlation with the short-term output dynamics in the CEE-3 countries.

Among other results, there was a robust long-term contractionary effect of both exchange rate depreciation and economic liberalisation (Table 5). The same effect was noted for improving the terms-of-trade, although excluding the ARDL estimates, with the same negative effect of the terms-of-trade shock observed in the ARDL short-term estimates (Table 6). On the other hand, short-term estimates provide a more favourable pattern for the exchange rate output effects. Liberalisation efforts become neutral with respect to the output dynamics.

5. Conclusions

Based on the example of Ukraine, it was confirmed that countries benefit most from trading with prosperous and technology-advanced economies, such as those in the euro area. Somewhat weaker positive spillovers are generated by fast-growing economies, e.g. Poland, but only for long-term relations. Output has no long-term effect on other major trading partners, such as the CIS-3 and the CEE-3 countries. In the short run, the stimulating effect of foreign output was confirmed only for spillovers from the output in the euro area, with asymmetry in output dynamics for other trading partners. Among other results, there was a long-term contractionary effect of both exchange rate depreciation and liberalisation of the economic environment, with a weak expansionary effect of the former and neutrality in the short run for the latter.

This study suggests that deepening economic integration with the euro area countries brings positive expansionary long-term and short-term output effects in Ukraine. As the same positive spillovers from economic growth in Poland were observed only in the long run, this requires the search for mechanisms capable of neutralising unfavourable short-term effects, probably in the context of cross-border cooperation at regional level and labour market policies. As the sources of positive spillovers are numerous (economies of scale, adoption of new technologies, higher product quality, better technical and managerial expertise etc.), this set the stage for future research using company-level data. Other policy implications refer to the need for caution in implementing economic liberalisation and the feasibility of exchange rate appreciation. Both issues require a comprehensive study of sectoral effects in the foreign trade and capital flows, focusing on their impact in the long and short run.

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Dochód krajów – partnerów handlowych i wzrost gospodarczy w Ukrainie

Streszczenie: Przeprowadzone badanie ma na celu oszacowanie empiryczne relacji długo- i krótkookresowych między dochodem krajów – partnerów handlowych i wzrostem gospodarczym na Ukrainie. Na podstawie danych kwartalnych z lat 2004-2019 oszacowano, że największy wpływ na poziom PKB Ukrainy ma wzrost dochodu w krajach strefy euro, a kolejnym stymulatorem jest wzrost gospodarczy w Polsce. W długim okresie nie odnotowano oddziaływania wzrostu gospodarczego krajów Europy Środkowo-Wschodniej (Czechy, Słowacja, Węgry) oraz krajów byłego Związku Radzieckiego (Białoruś, Kazachstan, Rosja). W krótkim okresie potwierdza się stymulujący wpływ dochodu partnerów handlowych wyłącznie z krajów strefy euro. W długim okresie deprecjacja kursu walutowego oraz liberalizacja środowiska ekonomicznego ma niekorzystne oddziaływanie na wzrost gospodarczy Ukrainy, co ustalono na podstawie Indeksu Wolności Gospodarczej amerykańskiej fundacji Heritage Foundation (oba czynniki są neutralne względem wzrostu gospodarczego Ukrainy w krótkim okresie).

Słowa kluczowe: wzrost gospodarczy, efekt dochodu za granicą, kurs walutowy, Indeks Wolności Gospodarczej, Ukraina.
