# Foreign Trade Effects on Regional Growth in Ukraine

Victor Shevchuk

**Abstract** The effects of foreign trade in general and foreign output in particular upon regional growth in Ukraine are estimated with the dynamic Arellano-Bond estimator. An annual dataset of the 2002–2017 period is used. It has been found that regional growth in Ukraine benefits from gross domestic product (GDP) growth in the Eurozone and Russia, while foreign output effects are negative in the case of Central and Eastern European countries (the Czech Republic, Hungary, Poland, Romania, Slovakia). As expected, higher investments in physical capital positively influence both regional output and exports, while contributing to a decrease in imports. Both regional exports and imports bring about a higher rate of regional growth, being related to foreign output in the same fashion as regional output. Although both exports and imports are factors behind a higher rate of regional growth, the reverse causality seems to be rather weak. Regional foreign trade is negatively correlated with the distance from the Western border of Ukraine. If account for both current and lagged effects is taken, there appears a weak expansionary effect of the exchange rate depreciation on regional growth, with a decrease in exports and higher imports as well.

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Economic conditions of the Ukraine's Eastern regions are inferior to regional growth and foreign trade. Somewhat counterintuitively, the crisis developments of 2009 are found to be at least neutral with respect to regional growth, with a clear stimulating effect on exports and imports.

# 1 Introduction

Foreign trade effects on regional growth in Ukraine are of interest for several reasons. First, as Ukraine has started a reorientation towards the European Union countries since the Orange Revolution of 2004, it is of particular interest
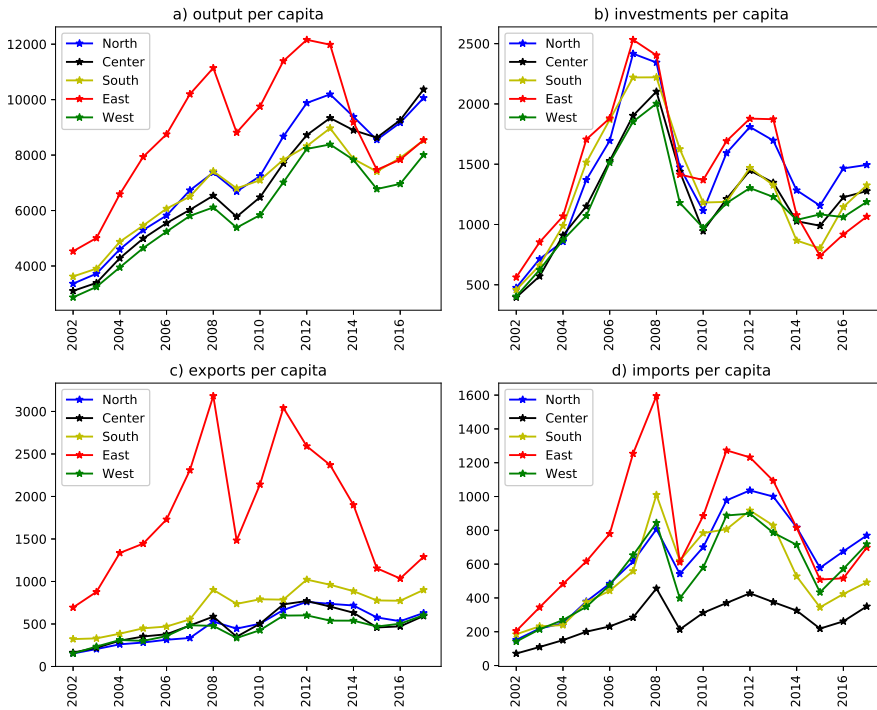


**Figure 1:** Ukraine: Selected regional indicators (on the annual basis), 2002–2017.
Source: Ukraine's State Committee of Statistics (www.ukrstat.gov.ua).

to compare relevant foreign income effects on both output and foreign trade. As the share of exports and imports in regional output exceeds on average 90 %, it is expected that factors of foreign trade, such as income in foreign trade partners or exchange rate, are important in the determination of regional growth as well. Second, Ukraine's economy used to be characterized by deep regional asymmetries (Kallioras and Chiapa, 2015), which could be related to the pattern of foreign trade specialization. Specifically, the Eastern regions of Ukraine experienced above-average output growth over the 2002–2008 period and it is likely to be associated with their export potential (Fig. 1). To the same extent, the post-2008 slowdown with the Eastern regions reflects a decline in exports, much deeper as compared to other regions. Regional differences are rather moderate in respect to investments in physical capital and imports per capita. Third, the exchange rate policy is an important part of macroeconomic adjustment to both domestic and external shocks, with a possibility of uneven effects across Ukraine's regions as well.

Although it is common to argue that international trade is beneficial for both developed and developing countries (World Bank, 2011), it is not so convincing for commodity-exporting countries such as Ukraine, where export is dominated by agricultural commodities and metals. Following the financial crises of 2008–2009 and 2014–2015, there has been a deep plunge of exports from the Eastern regions combined with a fall in per capita output, against the backdrop of similar but less pronounced developments in other regions. Since 2014, regions of North and Center of Ukraine have taken the lead in output growth, with the Eastern regions probably continuing to suffer from a combination of lower commodity prices and military conflict with Russia. The Eastern regions have retained their position as main exporters but with a much lower margin. Investments are on a steady decline in all regions since 2008, with a short-lived recovery in 2011–2013, another trough in 2015 and a slow recovery since then (also, it is noteworthy that regional asymmetries are somewhat smaller for investments as compared with other indicators). Regional imports seem to follow the pattern of regional exports. On the whole, it is expected that both exports and imports are important determinants of regional growth, with a close link to foreign output and exchange rate effects.

Our study aims at estimating the foreign trade impact on the regional output in Ukraine, with a focus upon the foreign demand channel. Besides the direct impact on the regional output, the pattern and directions of causality between foreign output and both Ukraine's regional exports and imports are analyzed.

In the remaining parts of the paper, Section 2 provides a review of relevant literature. Section 3 describes data and the statistical model. Section 4 quantifies the dynamic relationship between Ukraine's regional economic indicators and foreign economic growth using the generalized method of moments (GMM) estimator. Section 5 contains conclusions.

## 2 Review of Relevant Literature

Although the factors behind regional growth that deserve a note on the "open-endedness" of growth theories (Brock and Durlauf, 2001) are so numerous, several determinants of growth are quite universal and widely accepted. Starting with the neoclassical growth theory of the 1950s, physical capital accumulation and technological progress are considered among the important growth factors, with a close link to innovations as the main growth engine. Endogenous growth theories of 1980s and 1990s imply that the technological progress brings about higher gains in regions with better endowments in such components of human capital, as education and R&D activities (Lucas, 1988; Grossman and Helpman, 1991; Romer, 1990). Sufficient private and public infrastructure is considered complementary to both physical and human capital stocks, with transport costs being one of the main building blocks of the New Economic Geography (NEG) models with agglomeration effects gaining popularity since the 1990s (Ottaviano, 2008).

International trade is important for both technology transfers from abroad and domestic R&D activities acting through several channels: i) Gains in economic efficiency (resource allocation, productivity, specialization, scale economies, market opportunities, competition), ii) expansion of aggregate demand, iii) factor-price equalization, iv) learning by doing. If trade links are more important than the other channels, countries are supposed to benefit more from trading with developed countries than by trade with non-innovating developing countries (Yanikkaya, 2003). As it is established on the basis of four decades of data for over 100 countries, economic gains are the stronger, the richer the country's trading partners are (Arora and Vamvakidis, 2004). Although trade openness

affects regional growth through accumulation of human capital in the leading industries, among other mechanisms, if the domestic economy is not able to grip efficiently technology transfers than it is likely that trade openness is negatively related to regional output (Rivera-Batiz, 1996). As it is found for Italy, regional growth is not affected by simply being well connected to the outside world or accumulating the stock of human capital, if sectors of regional economy lack complementarity in terms of competences (Boschma and Iammarino, 2009). Among other channels of negative foreign trade effects, depletion of natural resources and specialization on low value-added activities are to be mentioned. Aggregate trade outcomes are dependent upon firm-level characteristics, mainly related to differences in technology, human capital etc. (Cazacu, 2015).

In the spirit of agglomeration economics that imply production cost savings due to geographic clustering of firms and industries, the human capital in a region has a positive impact on the aggregate productivity via the externalities associated with it, but it can also result in a major counterproductive spatial reallocation of factors, especially labour, thus leading to a growth slowdown (Faggian and McCann, 2009). More advanced versions of both NEG and endogenous growth models are dealing with such heterogeneous factors as (i) differences between skilled and unskilled labour, (ii) specialized knowledge in production of intermediate goods, (iii) relations between the stock of human capital and the number of differentiated goods, (iv) knowledge flows between regions (Karl and Velasco, 2004). Some caution is raised with respect to infrastructure policies, as the attraction of capital inflows depends not only on the quantity and quality of transport facilities, but on the quality of the inputs and services supplied (human capital, communication facilities, financial services, research institutes) as well.

In the Keynesian tradition, a direct link between exports and regional growth had been emphasized at the beginning of the 1970s (Thirlwall, 2013). The importance of exports as a growth engine is more pronounced for the more specialized regions, with export growth depending largely on relative prices and output abroad. For example, a direct link between exchange rate depreciation (in real terms) and regional growth is found for the U.S. states (House et al., 2019). Later, supporters of demand-led growth had attracted attention to the importance of balance of payments constraints and, consequently, to the feasibility of a decrease in imports in stimulating output at national and regional levels.

Empirical studies are rather inconclusive. A consistent positive impact of trade on regional output is obtained for EU-27 countries (Polasek and Sellner, 2013), Poland and Spain (Brodzicki, 2017), Mexico (Cabral and Mollick, 2012), China (Sun and Heshmati, 2010; Dreger and Zhang, 2013), Russia (Ledyaeva and Linden, 2008; Korgun and Kumo, 2015), Turkey (Oktay and Gozgor, 2013), among others. Badinger and Tondl (2003) state that intensive foreign trade contributes to technological catching-up, emphasizing the importance of trade openness for the EU regions. But the empirical results suggesting that trade effects are less important or even negative in case of low-income developed countries still remain. Daunal and Özyurt (2011) find support for the claim that openness is more beneficial to states with a high level of initial per capita income and therefore contributes to increased regional disparities in Brazil. More industrialized states, well-endowed in human capital, benefit from trade openness, but the effect is weaker for the states whose economic activity is mainly based on agriculture.

Provincial imports do not contribute to regional growth in India (Maiti and Marjit, 2010) and South Africa (Chang et al., 2014). In a similar way, it has been found for Germany that regions with a substantially higher degree of import exposure have experienced a lower growth rate since the beginning of the 1990s, being unable to benefit from the new export opportunities arising in the Eastern European and Asian countries (Dauth and Suedekum, 2014).

Determinants of regional growth in transformation economies are being identified in a wide analytical spectrum: The labour participation rate and the economy's sectoral differences (Herz and Fogel, 2003), sound macroeconomic policies, financial development, high foreign direct investments (FDI), comprehensive structural adjustment (Workie, 2005), pattern of specialization (Giannetti, 2002), export of goods and services (Ledyaeva and Linden, 2008; Dreger and Zhang, 2013). Besides other determinants of regional growth, such as physical capital accumulation, technological progress, education, sufficient infrastructure, FDI-induced knowledge spillovers, many benefits are associated with higher openness to foreign trade. As implied by some of the NEG models, border regions along the national frontier of an integration partner should have a geographic advantage (Niebuhr and Stiller, 2002). More specifically, if the border region has better access to foreign markets, it helps to neutralize the adverse effect of increased competition from neighbouring foreign firms (Brülhart et al., 2004; Brülhart, 2011; Lafourcade and Paluzie, 2005).

However, no particular role of international trade in regional economic growth is found for Croatia, with the quality of human capital, investments in fixed assets and structural features being the most important factors (Miculic and Nagyszombaty, 2015). As established for the South Eastern European countries, trade openness is more beneficial to countries with a higher level of initial income per capita and higher gross fixed capital formation. It is argued that at the time of the financial crisis of 2008 the main factor that caused Polish gross domestic product (GDP) growth to remain positive was domestic demand, not exports (Gurgul and Lach, 2010).

For Ukraine, earlier empirical studies relate the regional growth per capita to capital accumulation, lower employment and pollution (Melnyk et al., 2016), as well as specialization in non-agricultural activities and a higher degree of openness measured as the share of exports and imports in GDP (Kallioras and Chiapa, 2015). However, foreign trade in Ukraine generally does not stimulate innovativeness; although exports to countries being technological leaders (United States, Japan, Germany) contribute to innovations, their contribution is relatively small (Butyter and Wachowska, 2015). One of the empirical studies attribute positive effects of regional exports and investments to the high-income regions only (Shevchuk, 2014).

## 3 Data and Empirical Model

All the annual data concerning the regional domestic product, investments and foreign trade in 25 regions for the period of 2002–2017 are obtained from the Ukraine's State Statistical Committee (www.ukrstat.gov.ua). Time series on the exchange rate are obtained from the International Monetary Fund's (IMF) International Financial Statistics online database (www.imf.org). The panel data sample is balanced.

Assuming a close link between foreign trade and regional output, it is natural to include export and import determinants as explanatory variables into growth regressions, along with such traditional factors as investments in physical capital as well as several dummies regarding structural features of Ukraine's regions. First of all, it seems to be reasonable to control for the the crisis developments of 2009 and 2014–2015. Second, a sharp decline of output and exports in the Eastern regions deserves special attention. Our baseline model takes the following form

$$\Delta \ln Y_{it} = \alpha_1 \Delta \ln Y_{it-1} + \alpha_2 \Delta \ln K_{it} + \beta_1 \Delta \ln E_t + \beta_2 \Delta \ln E_{t-1}$$
$$+ \gamma_1 \Delta \ln Y_t^{EURO} + \gamma_2 \Delta \ln Y_t^{CEE} + \gamma_3 \Delta \ln Y_t^{RUS}$$
$$+ \delta_1 \ EAST_i + \delta_2 \ DISTANCE_i + \delta_3 \ CRISIS_t$$
$$+ \eta_i + \tau_t + \varepsilon_{it}, \tag{1}$$

where $Y_{it}$ is the real regional domestic product per capita for region $i$ in period $t$ (thousand of 2002 *hryvnas*), $K_{it}$ stands for the stock of capital per capita (million of 2002 *hryvnas*), $E_t$ is the nominal exchange rate (*hryvnas* per U.S. dollar), $Y_t^{EURO}$, $Y_t^{RUS}$ and $Y_t^{CEE}$ is the real GDP in the Eurozone, Russia and the Central and Eastern European (CEE) countries (index, 2010=100), respectively, $EAST_i$ is a dummy for the Eastern regions of Ukraine, $DISTANCE_i$ is the road distance of regional capital to the nearest Western border crossing of Ukraine (kilometres), $CRISIS_t$ is for the crisis developments of 2009 (1 for 2009, 2014–2015 and 0 otherwise), $\eta_i$ represents the region-specific fixed effect, parameter $\tau_t$ denotes time effects, capturing common shocks to output of all regions, $\varepsilon_{it}$ is the error term, $i$ is the subscript for each region, and $\Delta$ is the operator of the first differences. Regional output and investments are expressed in real terms, by deflating the nominal values using the regional consumer price index (CPI). In the construction of the $Y_t^{CEE}$ index, we used the following weights for particular countries: Poland – 0.39, Hungary – 0.22, the Czech Republic – 0.15, Slovakia – 0.13, Romania – 0.11.

As it is implied by growth models, regional output per capita is a function of the country's trading partners, exchange rate, investments in physical capital, three dummies, region-specific effects and lagged per capita output (in first differences). It is expected that regional growth is inertial ($\alpha_1 > 0$) and stimulated by investments in physical capital ($\alpha_2 > 0$). Exchange rate effects are ambiguous ($\beta_1, \beta_2 <> 0$), depending on the relative strength of asymmetric demand-side and supply-side effects. We expect foreign output effects to be positive ($\gamma_1, \gamma_2, \gamma_3 > 0$).

A visual inspection of Fig. 1 indicates that the structural features of the Eastern regions are likely to be pro-growth ($\delta_1 > 0$). The distance from the border variable $DISTANCE_i$ is intended to capture geographical effects which might be important in the wake of trade reorientation towards the European Union countries ($\delta_2 < 0$). The alternative of studying the effects of the distance from the Eastern border with Russia deserves academic attention too, but is of

little policy importance (in the context of the military conflict with Russia since 2014).

Finally, the coefficient of the crisis dummy is expected to be negative ($\delta_3 < 0$). In addition, foreign output effects are studied with respect to exports and imports:

$$
\begin{aligned}
\Delta \ln X_{it} =& \alpha_1 \Delta \ln X_{it-1} + \alpha_2 \Delta \ln K_{it} + \alpha_3 \Delta \ln Y_{it-1} + \beta_1 \Delta \ln E_t + \beta_2 \Delta \ln E_{t-1} \\
& + \gamma_1 \Delta \ln Y_t^{EURO} + \gamma_2 \Delta \ln Y_t^{CEE} + \gamma_3 \Delta \ln Y_t^{RUS} \\
& + \delta_1\, EAST_i + \delta_2\, DISTANCE_i + \delta_3\, CRISIS_t \\
& + \eta_i + \tau_t + \varepsilon_{it},
\end{aligned}
\tag{2}
$$

where $X_{it}$ stands for exports or imports per capita for region $i$ in period $t$, $EX_{it}$ and $IM_{it}$, respectively. Both variables are expressed in the current US dollars due to the fact that the vast majority of Ukraine's trade is invoiced in the U.S. currency.

Exports and imports are expected to be inertial ($\alpha_1 > 0$) and dependent upon investments ($\alpha_2 > 0$). In order to address the potential reverse causality between regional output and foreign trade, regional growth is introduced with a year lag. It is expected that higher regional growth is associated with an increase in both exports (the so-called "45° rule") and imports ($\alpha_3 > 0$).

It is expected that the exchange rate affects exports and imports in an asymmetrical way ($\beta_1, \beta_2 > 0$ for exports and $\beta_1, \beta_2 < 0$ for imports). Income abroad should be a factor behind higher exports ($\gamma_1, \gamma_2, \gamma_3 > 0$), with no effect upon imports. Regions with a high involvement in foreign trade in the East are supposed to have higher contributions to both exports and imports ($\delta_1 > 0$). Higher distance from the Western border of Ukraine is likely to decrease both exports and imports ($\delta_2 < 0$). The effects of crisis developments are rather ambiguous ($\delta_3 <> 0$), as disruption forces can be neutralized by demand and supply factors.

Table 1 suggests that there is indeed a big variation across regions with respect to exports and imports per capita. Regional differences in regional product per capita and investments per capita are smaller. It also can be seen from Fig. 1 that by 2015 the difference between regional exports per capita had been reduced to a minimum. The same is true for imports, except for the regions in the North which have become the biggest importers since 2011.

**Table 1:** Summary of selected variables statistics.

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Regional product per capita ($\ln Y_{it}$) | 350 | 8.844 | .492 | 7.656 | 10.537 |
| Regional investments per capita ($\Delta \ln K_{it}$) | 350 | 7.095 | .643 | 5.210 | 9.194 |
| Regional exports per capita ($\ln EX_{it}$) | 350 | 7.793 | .927 | 3.707 | 8.414 |
| Regional imports per capita ($\ln IM_{it}$) | 350 | 8.756 | 1.009 | 3.242 | 9.481 |

*Note*: $Y_{it}$ is the average regional output per capita in 2002 *hryvnas*, $\Delta \ln K_{it}$ is the average investment per capita in 2002 *hryvnas*, $EX_{it}$ and $IM_{it}$ are average regional exports and imports per capita in dollars, respectively.

## 4 Empirical Results

Our results are presented in Table 2 for several specifications of the baseline model (the panel data estimations were implemented in Stata 9.1). Similar to other studies, for example Li et al. (2016), the two-step variant is chosen that uses residuals from the one-step procedure and is more asymptotically efficient. Foreign output and exchange rate are used as independent variables and other variables as predetermined ones. The relative regional output in comparison to the level of Kyiv metropolitan area is used as an instrument. The Sargan test for over-identification indicates that the null of exogenous instruments is not rejected for all specifications. The test for first-order serial correlation in the residuals AB(1) shows that the null hypothesis of no first-order serial correlation is rejected for all regression models. In all GMM estimations for regional exports (Table 3) and imports (Table 4), the autocorrelation test AB(2) indicates that the instruments cannot be considered invalid due to autocorrelation, but this conclusion is somewhat weaker for regional growth estimates (Table 2). As the majority of regression coefficients is statistically significant at the conventional levels, it allows for an informative interpretation of the estimation results.

After controlling for other growth determinants, the greatest changes in Ukraine's regional growth are associated with growth changes in the Eurozone countries and Russia, while there is a strong and inverse relationship with the output in the CEE countries. Contrary to earlier studies (Ilahi et al., 2009; Movchan and Giucci, 2011), it is premature to claim the weakening of Russian

**Table 2:** Determinants of regional product per capita growth ($\Delta \ln Y_{it}$).

| Variables | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| $\Delta \ln Y_{it-1}$ | 0.664 (25.86***) | 0.592 (37.31***) | 0.667 (27.61***) | 0.571 (27.44***) |
| $\Delta \ln K_{it}$ | 0.002 (3.36***) | 0.002 (3.67***) | 0.001 (1.79*) | 0.001 (2.44**) |
| $\Delta \ln E_t$ | -0.323 (-23.04***) | -0.337 (-27.82***) | -0.323 (-26.01***) | -0.337 (-27.47***) |
| $\Delta \ln E_{t-1}$ | 0.385 (28.44***) | 0.388 (28.93***) | 0.390 (35.96***) | 0.386 (36.64***) |
| $\Delta \ln Y_{it}^{EURO}$ | 0.926 (1.75*) | 0.565 (2.27**) | 1.026 (2.56**) | 0.458 (1.78*) |
| $\Delta \ln Y_{it}^{CEE}$ | -0.965 (-3.01***) | -0.741 (-3.86***) | -1.001 (-3.45***) | -0.665 (-2.77***) |
| $\Delta \ln Y_{it}^{RUS}$ | 1.001 (9.69***) | 0.969 (9.50***) | 1.027 (12.14***) | 0.998 (11.98***) |
| $EAST_i$ | -0.014 (-3.08***) | -0.014 (-3.03***) | -0.020 (-4.89***) | -0.021 (-5.09***) |
| $DISTANCE_i$ | -0.011 (-4.37***) | -0.010 (-3.95***) | — | — |
| $CRISIS_t$ | 0.013 (0.98) | — | 0.020 (2.14**) | — |
| N | 350 | 350 | 350 | 350 |
| Sargan test | 0.62 | 0.59 | 0.59 | 0.59 |
| AB(1) | 0.0*** | 0.0*** | 0.0*** | 0.0*** |
| AB(2) | 0.07* | 0.06* | 0.06* | 0.07* |

*Note*: $z$-values are given in parenthesis; * significant at 10%; ** significant at 5%; *** significant at 1%; for the Sargan test, AB(1) and AB(2) processes, $p$-values are presented.

output shocks on Ukraine's economy, although their magnitude might have been weakening for several reasons ranging from sectoral shifts in Ukraine in favor of more energy-efficient industries to the realities of a military conflict with Russia. In accordance with the theoretical predictions of both neoclassical and NEG models a stronger stimulating effect of foreign output on regional growth means larger productivity gains and stronger positive spillovers. In the case of

Russia, it is more relevant to suggest that demand considerations prevail, as it is central in the Keynesian context of regional growth. Along the lines of NEG models, an inverse relationship with the output in the CEE countries can be explained by agglomeration effects. Also, the CEE countries do not constitute a significant export market for the Ukrainian exporters.

As expected, regional growth is inertial and investments in physical capital contribute to regional growth. Both results are robust to changes in the specifications of the regression model. Exchange rate depreciation is contractionary in the current period in all specifications, and turns out expansionary with a year lag.

As the coefficients of $\Delta \ln E_t$ and $\Delta \ln E_{t-1}$ are of similar magnitude in all specifications, current and lagged exchange rate effects almost offset each other. On the aggregate, an exchange rate depreciation by 10% brings about an increase in the rate of regional growth by no more than 0.4 to 0.6 percentage points.

As the coefficient of $CRISIS_t$ is positive and significant at 5% in specification 3, 0.020 (2.14), it suggests that a deep plunge in regional output in 2009 had been caused by either a large exchange rate depreciation or output decline in the Eurozone and Russia, not by crisis developments *per se*. It is worth noting that marking 2014 and 2015 as crisis years leads to insignificant coefficients on $CRISIS_t$ in all specifications. Consequently, only 2009 has been marked as a year with potential economic problems. On the other hand, higher distance from the Western border, which itself is detrimental to regional growth, offsets the rather counterintuitive positive relationship between $CRISIS_t$ and $\Delta \ln Y_{it}$ (specification 1). It is likely that investors avoid more distant regions due to the lack of proper infrastructure or problems with human capital.

Although the Eastern regions have a strong industrial base, their specialization in mining and energy-intense production might imply a strong anti-growth bias suggesting that the stimulating effect of local industrial facilities cannot offset the negative impact of mining and related industries on regional growth. Among other possible explanations, lower capacity for adoption of modern technologies (Rivera-Batiz, 1996) or complementarity in competences (Boschma and Iammarino, 2009) seem to be highly relevant, along with specialization on low value-added activities (Faggian and McCann, 2009) and insufficient quality of inputs and services (Karl and Velasco, 2004).

As there is a positive coefficient on $\Delta \ln K_{it}$ in all specifications, the key prediction of neoclassical models is thus confirmed: Investments into physical

capital do promote regional growth. On the other hand, a strong relationship between foreign output and regional growth is an argument in favour of the Keynesian models of economic growth. However, an inverse relationship with output in the CEE countries and statistical significance of regional and geographical distance dummies support arguments of the NEG models.

Except the CEE countries, a positive relationship between foreign output and regional growth in Ukraine supports the assumption of beneficial trade effects. If the direct effect of foreign trade is considered, both exports and imports contribute to regional growth:

$$\Delta \ln Y_{it} = 0.533 \Delta \ln Y_{it-1} + 0.112 \Delta \ln EX_{it} + 0.152 \Delta \ln IM_{it}. \qquad (3)$$
$$(53.83^{***}) \qquad (17.46^{***}) \qquad (22.03^{***})$$

The estimated coefficients for exports and imports are significant and positive, with the size of the coefficient on $\Delta \ln IM_{it}$ slightly bigger than on that of $\Delta \ln EX_{it}$. It is worth noting that controlling for $DISTANCE_i$ and $CRISIS_t$ does not substantially change the size of the coefficients for $\Delta \ln EX_{it}$ and $\Delta \ln IM_{it}$. Hence, it is possible to conclude that both exports and imports are important in the growth process, even if their growth-enhancing mechanisms are different. As imports contribute to regional growth, there is no support for models of the the balance-of-payments (BOP) constrained economic growth. Our results confirm previous studies highlighting the importance of foreign trade effects upon regional growth, including Ukraine and other transformation economies.

As demonstrated in Tables 3 and 4, income of Ukraine's trade partners contributes to both regional exports and imports, with the former effect being somewhat stronger in the baseline model. The Eurozone countries have the strongest stimulating effect on Ukraine's regional exports. All regressions display large parameter estimates of $\Delta \ln Y_{it}^{EURO}$, especially in specifications (1) and (3) with $CRISIS_t$, underlying probably the importance of the size of export markets. A much weaker impact is observed for the external demand from Russia, being in accordance with a finding by Ilahi et al. (2009) that since the 1998 crisis there is a shrinking role of the trade (exports to Russia) channel. As in all regressions for export the growth coefficients of $\Delta \ln Y_{it}^{EURO}$ are much larger in magnitude if compared to the coefficients of $\Delta \ln Y_{it}^{RUS}$, it casts a different light on the merits of trade reorientation towards the Eurozone countries. With respect to imports, there is the same strong link to income in the Eurozone and Russia. Referring to

**Table 3:** Determinants of regional exports per capita growth ($\Delta \ln EX_{it}$).

| Variables | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| $\Delta \ln EX_{it-1}$ | 0.234 (6.84***) | 0.236 (7.69***) | 0.231 (6.43***) | 0.241 (7.71***) |
| $\Delta \ln K_{it}$ | 0.016 (6.48***) | 0.014 (5.79***) | 0.010 (3.95***) | 0.010 (3.28***) |
| $\Delta \ln Y_{it-1}$ | 0.112 (1.06) | 0.043 (0.40) | 0.172 (1.76*) | 0.064 (0.62) |
| $\Delta \ln E_t$ | -0.528 (-10.92***) | -0.593 (-12.45***) | -0.497 (-10.12***) | -0.574 (-12.21***) |
| $\Delta \ln E_{t-1}$ | 0.216 (2.99***) | 0.297 (4.15***) | 0.275 (3.57***) | 0.324 (4.29***) |
| $\Delta \ln Y_{it}^{EURO}$ | 8.161 (3.72***) | 2.681 (2.67***) | 7.539 (5.52***) | 2.498 (1.85*) |
| $\Delta \ln Y_{it}^{CEE}$ | -4.953 (-4.88***) | -2.075 (-3.80***) | -4.705 (-4.51***) | -1.991 (-3.03***) |
| $\Delta \ln Y_{it}^{RUS}$ | 1.338 (4.14***) | 1.427 (5.85***) | 1.590 (5.12***) | 1.515 (5.73***) |
| $EAST_i$ | -0.019 (-2.47**) | -0.023 (-3.15***) | -0.044 (-9.85***) | -0.046 (-7.19***) |
| $DISTANCE_i$ | -0.038 (-8.47***) | -0.037 (-9.51***) | — | — |
| $CRISIS_t$ | 0.164 (3.20***) | — | 0.172 (4.79***) | — |
| N | 350 | 350 | 350 | 350 |
| Sargan test | 0.73 | 0.73 | 0.72 | 0.73 |
| AB(1) | 0.11 | 0.12 | 0.12 | 0.12 |
| AB(2) | 0.16 | 0.18 | 0.15 | 0.19 |

*Note*: $z$-values are given in parenthesis; * significant at 10%; ** significant at 5%; *** significant at 1%; for the Sargan test, AB(1) and AB(2) processes, $p$-values are presented.

**Table 4:** Determinants of regional imports per capita growth ($\Delta \ln IM_{it}$).

| Variables | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| $\Delta \ln IM_{it-1}$ | 0.337 (8.23***) | 0.430 (14.58***) | 0.325 (8.74***) | 0.403 (12.67***) |
| $\Delta \ln K_{it}$ | -0.004 (-1.22) | -0.004 (-1.48) | -0.006 (-1.80*) | -0.006 (-1.66*) |
| $\Delta \ln Y_{it-1}$ | 0.177 (0.90) | 0.066 (0.92) | 0.267 (2.02**) | 0.074 (0.58) |
| $\Delta \ln E_t$ | -0.772 (-9.45***) | -0.779 (-19.93***) | -0.743 (-14.95***) | -0.783 (-15.68***) |
| $\Delta \ln E_{t-1}$ | 0.821 (9.71***) | 0.946 (19.15***) | 0.849 (13.04***) | 0.932 (13.17***) |
| $\Delta \ln Y_{it}^{EURO}$ | 6.224 (4.00***) | 3.160 (2.83***) | 6.550 (4.65***) | 2.578 (2.10**) |
| $\Delta \ln Y_{it}^{CEE}$ | -2.914 (-2.08**) | -1.967 (-2.45**) | -3.319 (-3.81***) | -1.533 (-1.85*) |
| $\Delta \ln Y_{it}^{RUS}$ | 2.902 (7.26***) | 3.195 (13.30***) | 3.093 (13.43***) | 3.199 (13.68***) |
| $EAST_i$ | -0.008 (-1.01) | -0.005 (-0.77) | -0.015 (-2.43**) | -0.019 (-2.88***) |
| $DISTANCE_i$ | -0.013 (-1.43) | -0.019 (-2.40**) | — | — |
| $CRISIS_t$ | 0.158 (4.70***) | — | 0.171 (5.85***) | — |
| N | 350 | 350 | 350 | 350 |
| Sargan test | 0.67 | 0.62 | 0.65 | 0.62 |
| AB(1) | 0.0*** | 0.0*** | 0.0*** | 0.0*** |
| AB(2) | 0.28 | 0.34 | 0.20 | 0.31 |

*Note*: $z$-values are given in parenthesis; * significant at 10%; ** significant at 5%; *** significant at 1%; for the Sargan test, AB(1) and AB(2) processes, $p$-values are presented.

the empirical evidence of benefits of trade with richer trade partners (Arora and Vamvakidis, 2004), these ones seem to be more relevant with respect to exports to the Eurozone countries in Ukraine's case, as their advantage in stimulating regional output is not observed. However, relatively rich CEE countries do not create any incentives for either regional exports, or output.

Our estimations indicate that the exchange rate depreciation is associated with a decrease in exports in the current period that is followed by a weaker stimulating effect in a year. Such outcomes suggest that reliance on imported goods is stronger among exporters. At the same time it is likely that a weaker currency does not curb imports over a two year time span. In all regressions, a decrease in imports in the current year is followed by a stronger recovery in imports with a lag of a year. The main conclusion in this respect is that exchange rate depreciation is not able to stimulate regional growth at a sustainable basis, i.e. without worsening of the trade balance, as it is highlighted by supporters of the balance of payments constrained growth theory (Thirlwall, 2013). At the same time, it is not ruled out that domestic-market oriented sectors may benefit from the expenditure-switching effects (with a lag of a year).

Besides differences in the magnitude of foreign output effects, estimates for imports are very similar to those for exports, including the magnitude of the autoregressive relationship and pattern of exchange rate and lagged regional output effects. The only notable difference is that there is an asymmetric relationship between investments in physical capital and foreign trade components. While exports benefit from an increase in investments in physical capital, the effect on imports is predominantly negative. Using $EAST_i$ and $DISTANCE_i$ in the same specification leads to insignificant coefficients for both $\Delta \ln K_{it}$ and $EAST_i$ (specification 1). Similar to estimates for exports, in all specifications except one the coefficient on lagged regional output is not significant. Inclusion of $CRISIS_t$ does not change the size of the coefficient for $\Delta \ln K_{it}$, but it establishes at a statistically significant level a positive relationship between the lagged regional output growth and imports (specification 3). Hence, we conclude that a negative relationship between investments and imports is associated with a distance from the Western border of Ukraine. Also, there is no empirical relationship between a dummy for the Eastern regions and imports in specifications (1) and (2) once $DISTANCE_i$ is included.

The results of all estimations demonstrate that the distance from the Western border of Ukraine has a significantly negative impact on regional exports, suggesting that a positive impact of $DISTANCE_i$ on regional growth can be related to export activities. Probably, it is the outcome of location effects or much larger remittances from workers abroad as the labour migration is concentrated in the Western regions of Ukraine. Quite surprisingly, it becomes largely apparent that the Eastern regions do not contribute to regional exports,

while being a factor behind a decrease in imports. The crisis developments are associated with an increase in both regional exports and imports.

## 5 Conclusions

There is a significant positive foreign output effect upon Ukraine's regional output, exports and imports, regarding output in the Eurozone and Russia. However, an inverse relationship with the output in the CEE countries is found. Exchange rate depreciation is contractionary on impact, with a slightly stronger stimulating lagged effect. Weakening of the *hryvnia* does not bring about an increase in regional exports, while regional imports are not decreased either, when accounting for both current and lagged effects. As expected, higher investments in physical capital influence positively both regional output and exports, while contributing to a decrease in imports. Although both exports and imports are factors behind higher rate of regional growth, the reverse causality seems to be rather weak. Higher distance from the Western border of Ukraine is detrimental to both regional growth and foreign trade volumes. As suggested by a regional dummy, economic conditions of the Eastern regions are inferior to regional growth and foreign trade. Somewhat counterintuitively, the crisis developments of 2009 are found to be at least neutral with respect to regional growth, with a clear stimulating effect on exports and imports.

The directions for future research are straightforward. As the latest empirical studies imply a bidirectional causality between foreign trade and economic growth (for example, Pilinkiene (2016)), it is of interest to study mutual causality between regional output, exports and imports, using a panel VAR model. Extension of the set of explanatory variables by accounting for FDI, remittances, structural features (the share of agriculture in GDP, number of students, informal activities), religion, life satisfaction, political preferences etc. The explanation of non-conventional outcomes with respect to foreign output of CEE countries are also worth attention.

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