Effects of fiscal consolidation on exports in Ukraine

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January 2016

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JEL: H32, H62, F10

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Abstract

The question of Ukraine's economic recovery after several years of rapid decline is closely connected to the reform of its fiscal policy. Because Ukraine is a country with a small, open economy, exports may be one of the drivers of economic recovery. Monetary policy over the past decades had, for various reasons, a limited impact on the dynamics of exports, while today, a long period of unsustainable fiscal policy forces the government to carry out fiscal consolidation. Adding together all these facts, we can state the importance of studying the influence of fiscal balance parameters on the exports of Ukraine. Using the gravity model, we conclude that fiscal consolidation has a positive effect on Ukraine's exports with a lag of several years. We also find that the effect of fiscal consolidation on exports is mainly due to the correction of the exchange rate. The stimulating effect of fiscal consolidation takes place on an intensive margin of exports; exposing serious structural problems in the Ukrainian economy.

Keywords: structural budget balance, exports, gravity model, fixed effects, random effects, fiscal consolidation, monetary policy, and exchange rate.

Introduction

In a small open economy, the issue of export promotion is particularly important, as the foreign trade state is a factor of macro-financial stability in such economies. The limitation of monetary policy in supporting exports due to the zero lower bound of short-term interest rates or institutional barriers in the form of rigid exchange rate raises the question of the power of fiscal policy in this area. For scientists, the interaction of fiscal and monetary policy to stimulate exports in specific economic conditions is an interesting concern. Government officials are interested in the recommendations such concerns can provide for the regulation of economic dynamics.

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Another aspect of the interaction between fiscal policy and economic dynamics which is widely discussed in the scientific literature is the possibility of expansionary fiscal consolidation. Economies with emerging markets are often forced to carry out radical reductions of budget deficits resulting from long periods of unsustainable fiscal policy. Ukraine's economy today is just at the stage of fiscal consolidation, so the answer to the question of whether compliance with fiscal austerity leads to economic recovery, which is primarily manifested in the dynamics of exports, is important to the formation of fiscal policy parameters. Besides the identification of the fiscal parameters' impact on the dynamics of exports, another important issue is the transmission mechanism of fiscal policy shocks on the terms of external trade. A number of studies have shown that the main effect of fiscal policy on exports is due to exchange rates and interest rates, so the aspect of interaction between the government and the central bank, and changes in the monetary parameters, must be taken into account in the study of the impact of fiscal consolidation on the economy.

In this article, we aim to identify the effects of discretionary fiscal policy in Ukraine on the volume of exports with major trading partners. The analysis was conducted based on panel data with the application of a gravity model for Ukraine's foreign trade. The contribution of the study is that we analyze the impact of fiscal policy on Ukraine’s exports employing a gravity model. Concerning our knowledge, this is the first attempt to conduct research in such a framework. Another important point is that we investigate the effect of discretionary changes in fiscal policy, using structural budget balance as one of the explanatory variables. This variable is rarely used in studies of this type, which leads to the mixing of the automatic and discretionary components of fiscal policy.

The application of gravity models to study the influence of specific factors on export was spearheaded in the article of *Anderson and Wincoop (2003)*. According to reviewed academic literature, fiscal policy is one of these factors. Studies of the external trade effects of fiscal policy typically cover the advanced economies that have formed competitive advantages on world markets and high-quality institutions. Such economies compete on world markets mainly in the technological and marketing aspects; that’s why fiscal incentives are not a priority for them. The opposite situation is inherent to emerging economies. In conditions of hard competition, exporters in these countries feel the lack of the financial resources needed to access world markets and to achieve further promotion of their own products. Given this, it is appropriate to make fiscal instruments' effectiveness to stimulate exports on emerging markets a focus of study.

Ukraine is a typical example of a small, open economy with emerging markets and significant shares of agricultural products and raw materials included in its exports. Weak commodity and geographic diversification of exports against the backdrop of steadily negative

foreign trade balance makes the study of fiscal instruments' prospects to stimulate exports vital for Ukraine.

Literature review

A significant portion of the current academic literature analyzes relationships between fiscal policy and exports in the context of a "double deficit" hypothesis, which was first proposed in *M. Feldstein (1986).* The essence of this economic concept is based on the assumption of a correlation between the fiscal balance and current account. The logic of a "double deficit" hypothesis is that cutting taxes or increasing expenditures lead to higher consumption in the economy, because economic agents have additional financial resources. Increased consumption results in a reduction in the rate of savings and encourages an increase in external borrowing. In addition, financial resources borrowed abroad can be used to purchase imported goods. Thus, the stable current account deficit may occur along with the fiscal deficit.

However, the "double deficit" hypothesis didn't find unambiguous empirical confirmation. In *M. Baxter (1996),* on the US data, it was shown that regardless of the fiscal shock design, an increasing of budget deficit by 1% of GDP leads to a deterioration of the current account balance by 0.5% of GDP. *C. J. Erceg et al. (2005).* by restricting the scope of research, and with the help of a dynamic equilibrium open economy model it was possible to estimate the quantitative effects of similar fiscal shocks on the foreign trade balance of the US from 1980-2004. These estimates are much less convincing when compared with the results of *M. Baxter (1996).* The growth of government spending, financed by the budget deficit of 1% of GDP leads to a trade balance worsening by 0.15% of GDP, while a tax cut of 1% of GDP worsens trade balance by only 0.12% only. S. *Kim and N. Roubini (2008).* On the basis of VAR analysis of the US economy frum 1973-2007 the "double deficit" hypothesis can be rejected. Instead, based on their estimations, the authors argue that expansionary fiscal policy leads to improvement of current account and production shocks in this process, and plays a more important role compared to fiscal ones.

Meanwhile, along with the "double deficit" hypothesis there is a large group of studies which examine the impact of fiscal policy, namely on export in the broader context of the analysis of possibilities for expansionary fiscal consolidation. Despite the rather ambiguous conclusions regarding opportunities to stimulate economic growth through maintaining tight fiscal policy, a common view is that export is a driver of economic recovery in periods of fiscal consolidation. These findings formed a basis for case studies, and econometric estimates. In *Perotti (2011)*, based on a detailed analysis of episodes of fiscal consolidation in Sweden, Ireland, Denmark and Finland, the author concludes that over time in most cases of such government policy, economic growth was observed, which was primarily determined by the rapid growth of exports. However, Perotti

indicates that by itself, fiscal consolidation is unlikely to be considered as an instrument of economic incentives, as economic dynamics also depend on interest rate levels, exchange rate regimes, inflation expectations, and the level of real wages; in other words, those factors which determine the level of investments and relative unit labor costs. Fiscal policy can be an instrument that pushes all other factors towards combinations that are favorable for the economy. The leading role of exports in economic recovery leads Perotti to express doubts concerning the mechanism of fiscal consolidating actions, as economic expansion is due to real depreciation, which is usually preceded by budget consolidation. After all, a boom in exports is not a tool that is available to all governments in the world. Nevertheless, the author identifies three reasons why fiscal consolidation is essential to boost the economy, at least in the short term. These are decreased interest rates, moderate growth of wages due to a signal of low inflation, and nominal depreciation.

R. Beetsma et al. (2005), with a combination of a panel VAR and a panel model of foreign trade, estimated externalities of fiscal impulses in the bilateral real exports of 11 EU states during the period of 1965-2002. Results of the study indicate that in the monetary union there are significant externalities in foreign trade, many of which become internalized by trading partners. Fiscal expansion in a separate state stimulates economic activity and leads to the deterioration of its trade balance, which in turn stimulates the exports of trading partners. This fact reduces the number of incentives for a unilateral fiscal stimulation of exports. The introduction of synchronous expansionary fiscal measures is mutually beneficial to trade partners.

S. Beck and A. Chaves (2011) tested the impact of tax burden on exports using data from 25 OECD countries during the period 1970-2006. Their empirical approach was based on a gravity model with fixed effects for panel data. Average effective tax rates on consumption, labor income and capital income were used as indicators of tax burden. In general, an increasing tax burden has a statistically significant negative effect on exports. This is especially true for labor income; an increase in the average effective interest rate of 1% reduces exports by 0.45% in the current year, and by 1.23% for next eight years.

The delimitation of the impact of revenue and expenditure budget aspects on export was addressed in the study *Paweł Borys et al. (2014),* in which an application of panel data was used to analyze the impact of fiscal shocks on the economies of the ten countries that joined the European Union during the period of 1995-2011. Calculations indicated the positive effect of fiscal consolidation on exports. Exports demonstrated an increase of 1.57% in response to budget expenditure cuts of 1% of GDP. On the other hand, fiscal consolidation based on tax increases of 1% of GDP reduced exports by 1.17%. Thus, in the context of export promotion, fiscal consolidation, which is based on expenditure cuts, may be regarded as expansive in terms of export promotion.

It is necessary to note the study *R. Bista et. Al (2014),* in which the authors argue that, despite the uncertainty of fiscal policy's impact on output in economy, there is a statistically significant relationship between fiscal consolidation and export. With the inclusion of fiscal variables in a standard gravity model of foreign trade, it was concluded that fiscal consolidation causes positive and statistically significant effect on exports. To identify the episodes of fiscal consolidation, two approaches were used which had been proposed by *Alesina and Ardagna (2009)* within a sample covering 21 developed countries for the period of 1970-2007, and by *Devries P. (2011)* for a sample of 17 developed countries between 1978 -2009. According to estimates made with the first approach, within three years after an episode of fiscal consolidation, total exports increased by 7.7%. The second approach shows a more optimistic result: a growth of exports by 17.4% within three years after an episode of consolidation. It also found that export growth is due to extensive diversification (expanding the range of exported items). The authors also show that simultaneous fiscal consolidation in countries that are trading partners leads to the leveling of positive effects on exports. Neutral effects of fiscal consolidation on exports are also observed in the countries that are monetary union members. Based on this observation, the conclusion was made that the main channel of fiscal consolidation impact on exports is the exchange rate.

Basically, there is a consensus in the empirical literature regarding the positive impact of fiscal consolidation on exports. Discussing the mechanism of fiscal balance's affect on exports, we can point out several channels:

1. **Formation of positive expectations of economic agents.** According to empirical studies, the decision of a company regarding the participation in external markets associated with significant sunk costs, reduction of budget deficits, and the stabilization of public finances lead to a decrease in uncertainty and an increase in the confidence of economic agents to the government. As a result, the propensity to carry sunk cost increase.
2. **The devaluation of currency.** Fiscal consolidation usually leads to decreased interest rates as a state decreases borrowing and gives signals of a regime of low inflation. On the other hand, to mitigate the impact of fiscal consolidation on consumption and investment, the central banks may reduce interest rates. Investment decisions of domestic and foreign investors lead to capital outflows, which worsens the current account balance. As a result, fiscal consolidation leads to a devaluation of the currency. According to calculations by IMF experts *Bluedorn (2011),* fiscal consolidation of 1% of GDP leads to a depreciation of 1.1% and an increase in the contribution of net exports to GDP by 0.5%. However, empirical results of studies on the relationship between fiscal consolidation and exchange rate are not straightforward. In *Monacelli, Perotti (2007)* it was detected on the basis of SVAR for four OECD countries (USA , UK , Canada, Australia), that

a growth in the budget expenditures causes the fall of the real exchange rate and a deficit of trade balance. *Afonso and Sousa (2009)* identified a similar impact of public spending growth on the real exchange rate. However, the shock of tax revenue increases the real effective exchange rate.

3. **Reduction of labor costs.** Fiscal consolidation based on cuts to government spending reduces demand for labor in the public sector and industries that cater to public procurement. As a result, labor costs are reduced. A reduction in labor costs increases the price competitiveness of exports and may be a factor in export expansion. Also, a reduction in the public sector size leads to a transfer of resources to the private sector, namely the segments that produce tradables. In such a way efficiency growth in export sectors occurs. Meanwhile, an increase of direct taxes on households and business incomes does not stimulate export growth but leads to improvements in trade balance by means of a fall in the demand for imports.

Estimation method

To assess the effects of fiscal policy on the exports of Ukraine, we propose to use the gravity model. The practice of constructing gravity models indicates that they are used for the analysis of bilateral trade relations within groups of countries. The classic gravity model contains two types of variables: those that are time variants and indicate the scale of the economy (GDP, population) or the distance between the partner countries; and those that hardly vary in time and reflect multilateral trade resistance. Multilateral trade resistance is a rather abstract concept, which depends on the relative trade cost, when the propensity of country *j* to import goods from country *i* is determined by the cost of trading between countries *j* and *i* relative to the weighted average trading cost with all the contractors and to the average cost of export from the country *i* (*Anderson and Wincoop ,2003)*. The need for the consideration of multilateral trade resistance in gravity models is due to the fact that the volume of international trade is affected by many external conditions that are not limited only to geographical distances. The trade between two countries is also affected by the availability of other partners with large economies, mountainous terrain at the border, the presence of access to the world ocean, and so on. Ignoring any of these factors leads to biased or inefficient estimations of coefficients. A common method for identifying multilateral trade resistance in gravitational models is the use of discrete variables that indicate the cost of trade (the existence of a common border, common language, participation in trade associations, etc.), and the introduction of dummy variables for each exporting and importing country a separate pair of counteragents to account for heterogeneity in trade that occurs at the level of each individual state and a pair of countries and is not reflected by other variables.

The specification of a gravity model is standard in terms of the variables mentioned above. However, the standard model is often supplemented by certain variables which are the

subject of analysis. These variables can designate processes in fiscal and monetary policy, political systems, and social spheres. The central statistical problem in assessing the parameters of gravity models is the choice between fixed and random effects in panel data. These two approaches to the interpretation of data features have their own advantages and disadvantages, which are described in the literature (*Baltagi et al., 2014; Gómez-Herrera, 2013*). Models with random effects assume that specific terms of trade which are not accounted for by variables in the model are stochastic with known distribution. These unaccounted factors are contained within the errors of the model and do not affect the estimation of coefficients. In turn, the model with fixed effects takes into account the heterogeneity of trade that is inherent to each country, as well as to country-pairs by means of dummy variables. Dummy variables are introduced for each exporter, importer, and exporter-importer pair and thus take into account the full range of factors which determine the cost of trade between the contracting parties at the national level (internal heterogeneity) and international level (external heterogeneity). Compared with random effects, the fixed effects model has one important advantage – the estimate of coefficients will be guaranteed to be unbiased, since endogeneity (the correlation between time/item specific effects and explanatory variables) is impossible. Instead, the drawback is that in such models the coefficients of the variables that have a low variation in time and indicate the specific determinants of trade cost cannot be estimated. These models use a so-called 'within estimator', which takes into account only the internal variations of data, but ignores variation between panels, making the estimated coefficients less efficient than random effects estimates.

Both approaches are widespread in the academic literature. Applying them, researchers use different methods to minimize the impact of their respective disadvantages. In textbooks on gravity models, authors are more prone to use fixed effects models that greatly simplify reality, but give a guarantee of the coefficients' unbiasedness. At the start of our estimations, we use both approaches and stop on a model that gives unbiased results.

Gravity models of external trade are usually based on panel data. Therefore, they describe patterns of external trade and the effects of external trade policy within a given set of countries. The goal to construct a gravity model of foreign trade for a single country needs a modification of the traditional empirical approach.

In our study, we estimate the gravity model with an inclusion of fiscal and monetary variables for Ukraine. This fact renders us unable to include fixed effects for exporters and importers, because the single exporter is Ukraine, and the inclusion of fixed effects for importers is equivalent to the inclusion of dummy variables for different exporter-importer pairs. In the studies, which are cited above, gravity models are built for groups of countries to characterize their trade relations. However, there are also studies in which external trade is described with a model for

individual countries (*Brodzicki, 2009; Tripathi, 2013*). The methodological bases for estimation of models on national data are the same as for the data on a set of countries.

According to the goal of our study, we propose a standard gravity model that includes fiscal variable with lags and variables that control the effects of fiscal policy on the fluctuations in exchange rates and price levels. From the start, we considered two specifications for our analysis – regression with random effects (1) and regression with fixed effects (2):

$$LEXP_{uit} = \alpha_0 + \alpha_1 LGDP_{uit} + \alpha_2 LPOP_{uit} + \alpha_3\, LAREA_{uit} + \alpha_4 LDIST_{uit} + \alpha_5\, \mathrm{CONT}_{uit} + \alpha_6 COMLANG_{uit} + \alpha_7 SEA_{uit} + \alpha_8 \mathrm{RTA}_{uit} + \sum_{n=0}^{n=3} \beta_n FISC_{ut-n} + \sum_{k=0}^{k=2} \varphi_k EX_{uit-k} + (u_i + e_{it}), \quad (1)$$

$$LEXP_{uit} = (\alpha_0 + u_i) + \alpha_1 LGDP_{uit} + \alpha_2 LPOP_{uit} + \alpha_8 \mathrm{RTA}_{uit} + \sum_{n=0}^{n=3} \beta_n FISC_{ut-n} + \sum_{k=0}^{k=2} \varphi_k EX_{uit-k} + e_{it}. \quad (2)$$

Regressions contain the following variables: $LEXP_{uit}$ – the logarithm of commodity export from Ukraine to the country *i*; $LGDP_{uit}$ – combined GDP of Ukraine and country *i*; $LPOP_{uit}$ – a combined population of Ukraine and country *i*; $LAREA_{uit}$ – a combined area of Ukraine and country *i*; $LDIST_{uit}$ – the distance between the capitals of Ukraine and country *i*; CONT_{uit} – a dummy variable indicating the presence of common border between Ukraine and country *i*; $COMLANG_{uit}$ – a dummy variable indicating the spread of Russian as a language of communication in the country *i*; SEA_{uit} – a dummy variable denoting country with access to the seas and oceans; RTA_{uit} – a dummy variable indicating the country's participation in regional trade unions in common with Ukraine; $FISC_{ut-n}$ – a variable that reflects the discretionary component of the fiscal position of Ukraine; EX_{uit-k} – a variable denoting the nominal exchange rate and balance of prices; u_i – random or fixed effects inherent to each group of observations (*i*) or time period (*t*) which are not included in the regression; e_{it} – independently and identically distributed errors, $e_{it} \sim IID(0, \sigma_v^2)$. The estimation of regression with fixed effects makes it impossible to estimate the coefficients of dummy variables because of multicollinearity, that's why they are excluded from the regression (2). Instead, it is assumed that heterogeneous constants for each group of observations take into account the impact of these variables. Because of multicollinearity issues instead of economy scale indicators (GDP, population, area) of exporting and importing countries, we also have introduced combined variables – products of relevant indicators of Ukraine and importing countries. Since there is only one exporter (Ukraine) in our data, the variance of data for the exporter is very low and in some cases (the area of Ukraine) demonstrates perfect intergroup multicollinearity. This makes estimations impossible and reduces the efficiency of models with

random effects. Combining the variables for exporters and importers is the common approach applied to avoid multicollinearity, and is used in empirical studies (*Bista, 2014*).

A variable of particular interest in the presented model is the indicator of fiscal policy. Since we were interested in the effects of discretionary government action in the area of public finance, we introduced an indicator of structural budget balance (SBB). Since we assume that the effect of fiscal policy on commodity exports takes place with a certain lag, we assessed various specifications of proposed models with a lag of up to 3 years.

The logic of including the variable indicating the nominal exchange rate and balance of prices is that fiscal policy may cause effects on exports through the exchange rate or price fluctuations. Thus, control of export variation on this factor will help to assess the net effect of fiscal parameters. Such an approach looks reasonable, considering existing studies where the authors argue that fiscal consolidation has an impact on exports only when trading partners have independent currencies (*Guajardo, 2014*), i.e. are not monetary union members and thus currencies are not anchored to each other. In a similar study, the authors also argue that there is strong empirical evidence that the primary mechanism of the impact of fiscal consolidation on the volume of international trade are the changes in exchange rate (*Bista, 2014*). For this analysis, we have introduced several variants of variables reflecting exchange rate fluctuations. The nominal exchange rate *(ER)* we estimated as a cross-rate of Ukrainian hryvnia against the currencies of importing countries based on the US dollar. To take into account both the effect of nominal exchange rate and price level fluctuations in the importing countries we also used real effective exchange rate (REER), which we calculated as follows: $REER_{uit} = ER_{uit} \times (P_{it}/P_{ut})$, where ER_{uit} – the exchange rate of hryvnia against the currencies of the importing countries, P_{it} – the price level in the importing country, P_{ut} – the price level in the importing country, – the price level in Ukraine. In our case, the growth of REER was caused by the devaluation of the national currency or a decrease in domestic prices relative to the prices of the importer. This means better conditions for exports and a rise in the cost of imports.

Data

To estimate the gravity model we used annual data for the period of 2004-2014 for Ukraine and its main trading partners. To select trading partners, we calculated the share of each country in total Ukrainian exports during the period of 2004-2014 and formed their ranking based on this measure. According to this ranking the list of countries whose share in Ukrainian export during the

period of 2004-2014 was the highest and collectively accounted for 95% was selected. The list of the largest importers of Ukrainian goods includes 61 countries[3].

Information on the volumes and commodity classification of exports and imports were derived from the World Intergated Trade Solution (WITS), which contains detailed bilateral data on export-import operations for more than 170 countries. The source of information on GDP, area, and population of analyzed countries was the World Bank's database, World Development Indicators. Information on monetary variables, such as exchange rate and real effective exchange rate was obtained from the *International Financial* Statistics database of the International Monetary Fund. Data concerning structural budget balance was collected from the IMF's World Economic Outlook Databases. The source of data regarding participation in regional trade associations was the *Regional Trade Agreements Information System.* Geographic data and data on cultural features were taken from the *Centre d'Études Prospectives et d'Informations* Internationale.

Results

Given the problems associated with estimations in gravity models, we first built a regression (1) and (2) with an application of a robust variance-covariance matrix. Note that we assumed two-way random effects in model (1) and two-way fixed effects in model (2). After that, we performed a test of overidentifying the restrictions, which can be applied to robust estimations and helps to assess the degree of coefficient bias in the random effects model. The null hypothesis is that the random effects model provides unbiased results and it is preferred to the fixed effects model. The results presented in Table 1 are in favor of a fixed effects model. This is no surprise, given the high correlation between the errors on the panel level and regressors (corr (u_i; Xb) in Table 1). The fact that most of the variations in data concentrated at panel level *(u_i),* while variation between panels is negligible (the rho statistics) is significant. Obviously, variables contained in the random effects model don't describe panel fixed effects as well as a model with fixed effects, leading to errors in correlation with explanatory variables - endogeneity.

For the model with fixed effects, we conducted tests against a cross-sectional independence of errors (null hypothesis - error for different objects are not correlated), heteroskedasticity and autocorrelation of errors. The results in Table 1 indicate that heteroskedasticity and an autocorrelation of errors are serious problems. Therefore, we estimated a two-way fixed effects

[3]The list includes: Russia, Turkey, Italy, Poland, Belarus, Egypt, Kazakhstan, Germany, China, India, Hungary, USA, Netherlands, Spain, Moldova, Iran, Saudi Arabia, Turkey, Slovakia, Syria, Lebanon, Romania, Bulgaria, Czech Republic, Georgia, France, Israel, Jordan, Austria, UK, UAE, Korea, Iraq, British Virgin Islands, Indonesia, Uzbekistan, Belgium, Turkmenistan, Lithuania, Switzerland, Tunisia, Brazil, Algeria, Nigeria, Latvia, Thailand, Singapore, Morocco, Cyprus, Pakistan, Greece, Libya, Armenia, Mexico, Japan, Portugal, Denmark, Estonia, Vietnam, Bangladesh, Canada.

model applying a Prais-Winsten approach with panel corrected standard errors. Today, several approaches to correcting estimates on heteroskedasticity and autocorrelation have been developed, but they are often implemented in software with significant restrictions. For example, it's possible to correct the standard errors for only one type of panel regressions; regressions cannot contain factor variables and time-series operators, or only very simple forms of autocorrelation and heteroscedasticity can be corrected. The *Prais-Winsten* algorithm enables the estimation of the coefficients for the model of proposed fit (2). However, we assume panel-specific AR(1) autocorrelation structure and panel-level heteroskedastic errors.

Table 1

Coefficients of gravity model of Ukraine with the inclusion of structural budget balance (FISC)

Explanatory variables	**RE**	**FE**	**PCSE**
$LGDP_{uit}$	0.027***	0.046***	0.052***
$LPOP_{uit}$	-0.013	-0.43***	-0.38**
$LAREA_{uit}$	0.001		
$LDIST_{uit}$	-0.42*		
CONT_{uit}	0.78**		
$COMLANG_{uit}$	0.31		
SEA_{uit}	0.03		
RTA_{uit}	0.22**	0.13	0,16
$FISC_{ut}$	-0.047*	-0.013	0,004
$FISC_{ut-1}$	-0.009	0.058	0,058*
$FISC_{ut-2}$	-0.002	0.02	0,038*
$FISC_{ut-3}$	0.03**	0.05**	0,044***
Const	5.06**	4.4**	3,2
obs.	484	484	484
corr (u_i; Xb)	assumed zero	-0.93	
rho	0.78	0.97	
Pesaran's test of cross sectional independence		0.57	
Modified Wald test for groupwise heteroskedasticity		0.00	
Wooldridge test for autocorrelation in panel data		0.00	
Test of overidentifying restrictions	0.00		

* - Statistical significance factor of 10%, ** - coefficient statistical significance at 5%, *** - factor statistical significance at 1%.

The coefficients of a random effects model are largely expected. The positive effects on exports are caused by the GDP of importing country, the participation of importers in trade associations with Ukraine, and the presence of a common border. The negative factor is the distance between the capitals of importers and Kyiv. Any significant impact by access to the World Ocean, population, area of the importer, or the common Russian language was not detected. Models with fixed effects indicate a positive impact of GDP, and a negative effect of population.

Coefficients of fiscal variables indicate that fiscal consolidation had a statistically insignificant impact on Ukraine's exports in the year of its implementation. However, with a lag of one year such impact becomes positive and statistically significant (PCSE). Thus, the conclusion about the possibility of expansionary fiscal consolidation, at least with regard to exports, has a statistical basis in the case of Ukraine.

As already mentioned, a number of authors argue that the impact of fiscal policy on exports is mainly due to fluctuations in exchange rates. It is assumed that fiscal consolidation leads to currency devaluation, stimulating exports. This is an important assumption; its confirmation means that fiscal policy can have no impact on exports when the exchange rate is rigid, for example, in conditions of monetary union or a fixed exchange rate regime. To test this hypothesis, we included in the gravity model of Ukraine nominal and real exchange rates with lags of up to two years (Table 2). Besides PCSE and FE models, we also present the results of estimations with the application of “difference” and “system” generalized method-of-moments (GMM) dynamic panel estimators, which is another method of solving the problem of endogeneity. We present the GMM results in demonstrative purpose, since the number of observations compared with the number of instruments is quite small, which leads to difficulties in conducting overidentification tests. Specifically, in this model, we assume as endogenous exports, GDP, exchange rate, structural budget balance. The remaining variables were instruments in the equations for the levels. Tests against the second order autocorrelation of errors in the model gave a probability 0.4, but Sargan-Hansen and Difference-in-Hansen tests were inconclusive due to large instrument numbers (111). We note only that GMM estimations were conducted for all specifications of gravity model and received results that correspond to PCSE and FE models.

The results in Table 2 indicate two important points. First, coefficients of fiscal variables become insignificant with a lag of up to three years in models with the inclusion of the nominal exchange rate, and with a lag of up to two years in models with the inclusion of real exchange rate. Secondly, exchange rate growth (devaluation and reduction in domestic prices) does not lead to

an immediate positive impact on exports. This result is similar to the J-effect when the devaluation of the currency in the short term (one year) is accompanied by a drop in exports, after which there is rapid growth.

Table 2

Gravity model of Ukraine with the inclusion of nominal and real exchange rate

Explanatory variables	FE	PCSE	GMM	FE	PCSE
$LEXP_{uit-1}$			0.53***	0.04**	0.05***
$LGDP_{uit}$	0.04**	0.04***	0.006	-0.33	-0.23
$LPOP_{uit}$	-0.41**	-0.35**	0.024		
$LAREA_{uit}$			-0.00007		
$LDIST_{uit}$			-0.26**		
$CONT_{uit}$			0.2		
$COMLANG_{uit}$			-0.17		
SEA_{uit}			0.11	0.17	0.2*
RTA_{uit}	0.25*	0.27**	0.44***	0.02	0.03
$FISC_{ut}$	0.003	0.019	-0.067	0.04	0.02
$FISC_{ut-1}$	0.03	0.034	0.022	0.03	0.02
$FISC_{ut-2}$	0.02	0.021	0.028	0.04**	0.02*
$FISC_{ut-3}$	0.05***	0.029**	0.013***	0.04**	0.05***
ER_{uit}	-0.037**	-0.04***	-0.04***		
ER_{uit-1}	0.02	0.035*	0.059***		
ER_{uit-2}	-0.019	-0.02	-0.04		
$REER_{uit}$				-0.04**	-0.04***
$REER_{uit-1}$				0.03**	0.04***
$REER_{uit-2}$				-0.03	-0.035**
Const	5.03	3.34	3.76***	3.2	1.33
obs	480	480	480	434	434

* - Statistical significance factor of 10%, ** - coefficient statistical significance at 5%, *** - factor statistical significance at 1%.

The coefficients in Table 2 indicate that the impact of fiscal consolidation on exports operates through the exchange rate. Because of the existence of a J-curve, fiscal deficit reduction

has a negative current effect on exports. However, with a lag of 1-2 years depreciation has a positive impact on exports, which is reflected in the coefficients of $FISC_{uit-1}$, $FISC_{uit-2}$.

Export growth in response to fiscal consolidation can take place in two main forms: extensive and intensive. The extensive form provides access to new export markets and expanding commodity nomenclature of national exports. The basis of intensive growth is the increase in export volumes within the existing trade links and commodity nomenclature.

Extensive diversification of exports is associated with significant fixed costs, the implementation of which is a prerequisite for access to foreign markets. In turn comes the expansionary fiscal consolidation associated with devaluation, the growth of private investment caused by lower interest rates, and uncertainty about future government actions in the area of public finance. Given that access to new export markets requires significant investment, it is expected that fiscal consolidation positively affects an extensive part of exports[4].

In order to detect the effect of fiscal consolidation on export characteristics, it is appropriate to estimate its impact on extensive (L_N_EXP) and intensive (L_V_EXP) margins (Table. 3) separately.

[4]This hypothesis is confirmed by the study *Bista (2014)* for a sample of developed OECD countries.

Table 3

Gravity model for extensive and intensive margins of Ukrainian export

Dependent variables	**L_N_EXP**			**L_V_EXP**		
Explanatory variables	**PCSE**	**PCSE**	**PCSE**	**PCSE**	**PCSE**	**PCSE**
$LGDP_{uit}$	0.007	0.005	0.017***	0.04***	0.03***	0.03**
$LPOP_{uit}$	0.04	0.04	0.04	-0.43**	-0.43**	-0.47**
RTA_{uit}	0.05	0.06	0.03	0.13	0.21*	0.16
$FISC_{ut}$	-0.044**	-0.04**	-0.0003	0.03	0.04	0.044
$FISC_{ut-1}$	0.01	-0.003	0.021	0.04	0.04	0.023
$FISC_{ut-2}$	-0.07***	-0.08***	-0.05***	0.1***	0.1***	0.089***
$FISC_{ut-3}$	-0.01***	-0.02***	-0.019***	0.06***	0.06***	0.04***
ER_{uit}		-0.008			-0.02*	
ER_{uit-1}		0.01			0.01	
ER_{uit-2}		-0.03***			-0.0006	
$REER_{uit}$			-0.003			-0.03**
$REER_{uit-1}$			0.001			0.04**
$REER_{uit-2}$			-0.017***			-0.01
Const	3.48**	3.6**	1.8	0.56	0.94	1.67
obs	484	479	434	484	479	434

* - Statistical significance factor of 10%, ** - coefficient statistical significance at 5%, *** - factor statistical significance at 1%.

Coefficients in Table 3 indicate that fiscal consolidation in Ukraine stimulated intensive export growth, while the extensive margin was under negative impact. The nominal exchange rate does not cause a noticeable effect on export margins or other factors in the models. The picture is slightly different after replacing the nominal exchange rate with REER. The REER behaves similarly to a nominal exchange rate in the model for the extensive margin of export, but clearly demonstrates the J-curve effect in the model for the intensive margin of export.

Therefore, the assumption regarding the positive impact of fiscal consolidation on the extensive margin of Ukraine's exports can be rejected. This result corresponds to the findings of

Besedes (2011) with the conclusion that for developing countries, the intensive channel is the main factor of total exports growth (*Egger, 2005*).

The estimations give reason to conclude that fiscal consolidation in Ukraine does not provide a sufficient incentive for exporters to invest in access to new foreign markets and the development of new export products. One possible reason is an inflexible capital market, where interest rates do not respond to fiscal consolidation. The cost of credits remain high and business is unable to attract the funds needed to cover the sunk costs of exports.

On the other hand, the prevalence of intensive growth in Ukrainian exports can be attributed to weak commodity and geographical diversification. The basis of national exports are products with low added value, whose quality characteristics don't effectively compete with substitutes from competitors. This feature automatically limits the geographical diversification possible by entering new export markets. The low technological level of most export goods and their non-compliance with the world market standards increase the cost of a switch to an extensive growth of national exports versus intensive ones. As a result, it's more beneficial for Ukrainian exporters to expand exports within the existing range of commodity and geographical structures. The result is a positive impact of fiscal consolidation on the intensive growth of exports.

Discussion of results and conclusions

The common view in economic literature is that the positive effect of discretionary fiscal policy on exports is due to the positive expectations of economic agents (*Bista, 2014*), devaluation of the national currency, and a reduction of labor costs (*Tagkalakis, 2014*). As in several previous studies, we concluded that fiscal austerity with a lag of 1-2 years has a positive effect on exports (*Borys, 2014; Beetsma, 2005*). Based on the results of our research, the exchange rate is one of the powerful channels of fiscal policy influence on the exports of Ukraine. The overall picture in our interpretation is that fiscal policy affects exports due to fluctuations in the nominal exchange rate and the balance of prices. Another important finding is that monetary variables (nominal exchange rate, the real effective exchange rate) have a negative immediate impact on exports. By 'negative impact', we mean statistically significant coefficients, indicating a fall in exports in times of depreciation or growth in the real effective exchange rate, when the terms of trade are becoming better for Ukraine. The stimulating effect of the exchange rate appears with a lag of one year, which leads us to the conclusion of the presence of a J-curve effect in the economy of Ukraine. Such a reaction of the trade balance of Ukraine on the real exchange rate fluctuations was detected in other studies. *Nikolaichuk (2014)* using a SVAR-approach for quarterly data of Ukraine for the period of 2001-2012 found that the positive effect of the real devaluation of the trade balance is not instantaneous. According to simulation results, the response of the trade balance to nominal shock

in the first quarter is close to zero, and the median of responses is less than zero. However, the long-term impact of the real devaluation on demand and the state of trade balance is positive. This indicates the presence of a J-curve effect in Ukraine (*Beck, 2011*). A similar conclusion was made in *Bereslavska (2009)* based on analysis of the dynamics of foreign trade and exchange rate in the years 1993-2008 (*Beetsma, 2005*).

The study of the influence of fiscal consolidation on the extensive and intensive margin of exports separately shows that in Ukraine a positive effect related to intensive growth of exports. This is at odds with the conclusions of *Bista (2014)*, who detected the positive impact on the extensive margin of exports for the group of developed countries. This finding explains the low competitiveness of Ukrainian export goods and the reluctance of exporters to take risks associated with expansion into new markets. In response to fiscal consolidation, exporters do not form optimistic expectations about the long-term positive effects on prices and interest rates. In fact, these findings identify the deep structural problems in Ukraine's economy and impose restrictions on the use of fiscal consolidation and exchange rate as instruments to stimulate economic growth. For Ukraine, these instruments are effective for the temporary maintenance of a current account with no qualitative changes in the structure and diversification of exports. In other words, hope for fiscal consolidation in the long run leads to the conservation status of Ukraine as an exporter of goods with low value added (raw material appendage).

For policymakers, an important conclusion is that rigidity in the formation of the nominal exchange rate reduces opportunities to influence exports not only for monetary but also for fiscal policy. The results are another argument not only in favor of a flexible exchange rate regime, but also in favor of switching Ukrainian monetary policy to control domestic prices. A comparison of the gravity model with inclusions of nominal and real exchange rates indicates that the balance of internal and external prices also has a significant impact on exports.

If we look at fiscal policy in isolation from the exchange rate regime, it can be argued that tight fiscal policy with a lag of several years demonstrates positive impact on the dynamics of foreign trade, despite the initial negative effect. This means that not only can the special budget programs of export support, which lead to budget losses, be instruments of stimulation, but also overall fiscal discipline. Due to the inefficiency of most special fiscal measures to stimulate the Ukrainian economy, because of corruption and distortion of the economic interests of recipients of the benefits, consolidating fiscal policy, in our opinion, is the best choice for the government. Fiscal discipline, as shown in this article, will have a positive impact on the export activity in the medium-run, but will not resolve the problem of the structural weakness of Ukrainian exports.

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