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Socio-economic effects of the development of economic cooperation between Ukraine and the European Union for Poland

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Abstract

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This paper extends the computable general equilibrium model of the liberalization of foreign trade of integrated groups to a rich featuring economic welfare and the sectoral changes in Ukrainian, Polish and the EU economies. The GTAP model is used to explain the patterns of socio-economic effects in Poland when the EU and Ukraine remove barriers to trade. We parameterize the model to match the features of the European economic integration and analyze the changes of economic welfare in the Member States and potential candidate – Ukraine. The welfare measure evaluated is the change in equivalent variation. The results of our simulations suggest that the all analyzing economies will gain from liberalization trade between Ukraine and the EU. Economic welfare will rise by 508.38 million USD in Poland, 621.31 million USD in Ukraine and 6071.65 million USD in the EU.

Introduction

The proper functioning of a competitive economy in an era of globalization requires the state to ensure effective economic integration with the world community. The current development of integration in Europe is a great example of mutual benefits resulting from the liberalization of economic policy that is characterized by stable economic development and a high level of standard of living (welfare) of the EU Member States.

At this stage of its development, European economic integration is characterized by consistency and, therefore, the relations between the EU and its foreign economic partners, in particular Ukraine that is its closest neighbor, are characterized by an increase in the liberalization of economic cooperation. It enables Ukraine to join the common market of the EU and thus to ensure the effectiveness of its relations in foreign trade.

The logical step towards the development of the economic cooperation between Ukraine and the EU would be the creation of a free trade zone. Some preparations to establish such a zone have already begun: the analysis of a joint study regarding the preliminary requirements to develop a free trade zone between Ukraine and the EU has been finished. Some unofficial consultations have also begun.

In the context of the perspective of establishing a free trade zone between Ukraine and the EU, it is interesting to evaluate its socio-economic effects for the countries of Central Eastern Europe that are new members of the EU and, at the same time, the main foreign partners of Ukraine. Due to that fact, they should be most interested in the liberalization of trade with this country.

The priority of the foreign policy of Ukraine is the development of strategic partnership with Poland as one of the countries of Central Eastern Europe. Close connections between the two countries are related to their geopolitical location and important historical, cultural and economic connections. What is more, Poland has been constantly supportive of the Ukrainian candidacy for the EU.

Taking into account all the arguments mentioned above, one should consider the potential losses or benefits for Poland resulting from the establishing of a free trade zone between Ukraine and the EU.

1. Methodological principles for the analysis of the influence of the liberalization of foreign trade on economic welfare

Contemporary empirical studies of the effects of the liberalization of foreign trade of integrated groups are based on the computable general equilibrium models (CGE models) and computable partial equilibrium models (CPE models), and the gravity model of trade as well as econometric analyzes where the advantage of the output result over the deviation result means the benefit for a particular country. Among the large number of studies concerning the potential socio-economic effects of the liberalization of foreign trade, two models based on the method of economic equilibrium are used more often nowadays, namely the computable general equilibrium model (CGE model) and computable partial equilibrium model (CPE model). The major difference between two models lies

in the fact that the GCE model analyzes all production sectors, as well as labor force and capital sectors. CPE models take into account the equilibrium between the input demand and output supply for particular types of products. CGE models can be strongly aggregated or, in other words, they can comprise a few sectors and other types of production. Unlike CPE models that are adequate for the good that is studied in stable macroeconomic conditions, CGE models allow one to evaluate different variants of policy (including prices) in different macroeconomic conditions. CPE models do not take into account the factors comprised by the general equilibrium theory.

Specialist literature dealing with the studies is plentiful. There are numerous states and organizations that have immense experience in such research, namely the USA, Holland, Australia, Germany, France, international organizations such as the OECD, The International Institute for Applied Systems Analysis (in Austria) and others. Out of numerous studies in the field, it is necessary to mention those that are crucial for the establishment of a methodology of research into the influence of integration on the development of national economies, especially those based on the CGE model. This model is very popular in many countries. The Economic Research Service at the US Department of Agriculture designed a 10-sector model of the general policy of equilibrium of the state as well as a 30-sector model of the US agrarian policy. ORANI: a Multisectoral Model of The Australian Economy needs to be mentioned here as well. It has been designed at the University of Melbourne in Australia and it is supported by several state agencies. The model has some particular characteristics that distinguish it from other computable general equilibrium models. The first feature that distinguishes ORANI from other CGE models is its size. In comparison with other CGE models, ORANI comprised 113 sectors of production, 115 categories of products of national economy and the same number of imported goods, nine categories of means of production as well as seven types of arable land. The model was designed at a time when there were no effective programs that would deal with such tasks and, therefore, it was overloaded with a great database whose parameters were impossible to evaluate. The authors of the model themselves pointed to this drawback. However, the experience gained from employing this model was used to develop the biggest contemporary model dealing with foreign trade, namely CTAP (Global Trade Analysis Project).

The standard GTAP model, designed by T. Hertel and M. Tsigas in 1997, is a static computable general equilibrium model where interregional relations are defined by patterns of bilateral trade (Hertel 1997). In this model, the prices are determined under conditions of perfect competition and the consumer products differ according to the region. Regional diversification of consumer products allows the model to analyze internal trade. In order to obtain empirical results, GTAP was adapted to work under GEMPACK software (General Equilibrium Modelling PACKage) designed by the Center of Policy Studies (CoPS) at Monash

University in Autralia (Harrison, Pearson 2000). The GTAP model has an aggregated database of countries and economic sectors created by GTAPAgg. It also makes use of the simulations program RunGTAP. The most recent version of the database GTAPAgg contains data about 87 regions and 57 sectors of economy.

The basic elements of the model were determined according to the equilibrium indexes between consumption (including individual demand, investment needs, state demand) and production. The function of representative factor use is described by the Cobb-Douglas function, whose elements include each aggregated good of a certain type that includes both domestic products and imported goods. It is agreed that elasticity in the consumption of domestic and imported goods of a particular type is constant and final.

Individual consumption is shaped by the goods according to the constant difference of elasticity (CDE). The properties of a given function were determined by T. Hertel and M. Tsigas. Like the factors of production, both domestic and imported goods are characterized by the constant elasticity of substitution/the constant dynamics of change. Imported goods are characterized by the constant elasticity of substitution/the constant dynamics of change according to their origins.

In the GTAP model, regional investments and savings are handled separately. The investment function is based on the Leontief Production Function (the increase in the financial outlays for test geological works does not replace the financial outlays for the purchase of drilling equipment). Regional savings depend on particular decisions about expenditures, whereas regional investments depend on investment decisions made on the basis of expected profits.

As in the case of investment consumption, the aggregate consumption function of the state is shaped on the basis of on the Leontief Production Function. The whole amount of state consumption in the model is treated as a constant part of the region income. According to the Cobb-Douglas function, the demand for certain goods is constant. The division of national consumption of both domestic and imported goods was determined in the same way as individual consumption. Production in the GTAP model was described by the transformation of the economy stages function. The production process in each of the economic sectors is divided into the goods produced for consumption in a particular region and the goods for export. For the enterprise, the elasticity of substitution of these two types of products is final.

The production function in the GTAP model was depicted on a scheme where the demand for the factors of production comprises two types, namely the goods and primary factors such as labor, land and capital. In each sector, the choice of the factors of production consists in the reduction of loss at a given production stage. The choice of the factors of production is limited by a three-stage production technique. According to Leontief's assumptions, in the first stage the primary factors of production and the goods are in a particular relation to each other or the

elasticity of substitution equals zero. Then the primary factors of productions are analyzed on the basis of the production function CES (constant elasticity of substitution), which means that the elasticity of substitution of labor, land and capital is constant. Respectively, each group of products is also analyzed on the basis of the constant elasticity of substitution of both domestic and imported goods. In the third stage, the number of imported goods in each group of products is determined on the basis of the CES function, where the elasticity of substitution of goods from different regions is also constant.

The demand for primary factors for production is determined on the regional level and thus they are not the subjects of international trade.

Apart from determining the equilibrium between consumption and production, there are two other important elements of the GTAP model, namely international trade and economic welfare.

International Trade. T. Hertel and M. Tsigas use in their model the methodology of partial substitution of goods, proposed by P. Armington (Armington 1969). Such methodology allows them to include diversity in the quality of a product as well as other subjective features. This means that consumers evaluate the products according to their place of origin. In the GTAP model, the state import is presented according to V. Geraci and W. Prewo's formula (Geraci, Prewo 1982):

$$m'_r = \left[\sum a_{ir} x_{ir}^{(\sigma_r - 1)/\sigma_r}\right]^{\sigma_r/(\sigma_r - 1)} \quad \text{for } r,\ i = 1, 2, \ldots, n, \tag{1}$$

where:

m'_r – the index of total import to region r,
x_{ir} – the size of import to region r from region i,
a_{ir} – coefficient,
σ_r – elasticity of substitution of any two products which two products imported from different countries ($\sigma > 0$),
n – the total number of countries.

Economic Welfare. In the GTAP model, the economic welfare is discussed on the basis of Cobb–Douglas Function (for a consumer the increase in the amount of each product in the goods group increases the utility of this particular group) and it is described by the "equivalent variation." The equivalent variation is the change of household expenditure in the region that is the result of the establishment of a new post-simulation level of utility and it is determined in current prices. The formula for EV in the GTAP model is as follows:

$$EV(r) = u(r) \times INC(r) / 100, \tag{2}$$

where:

$u(r)$ – the change of the percent of the region utility,
$INC(r)$ – the income of region r before the development of the model.

2. The results of the development of the model of socio-economic effects of the establishment of a free trade zone between Ukraine and the EU

The results we obtained after the analyses based on the GTAP 6.0 model indicate the positive effects of the increasing economics welfare of Poland as a result of the establishment of a free trade zone between Ukraine and the EU. As it was stated before, the equivalent variant is the basic index of the evaluation of economic welfare used by the GTAP model. On the basis of this index (Table 1), the potential change in the economic welfare of the countries participating in the European integration can be evaluated.

Table 1. The influence of abolishing trade tariffs on the economic welfare of the countries of Central Eastern Europe and the EU (millions of USD)

Region	Equivalent variation
Poland	508.38
Ukraine	621.31
EU-27	6071.65
NAFTA	–287.05
ASEAN	–190.04
Rest of the world	–4022.75

Source: calculated on the basis of *GTAP 6.0*.

These data confirm that after abolishing trade restrictions all the interested sides (Ukraine, the EU and Poland) will observe an increase in economic welfare.

Regarding this positive result, the development of economic cooperation within the boundaries of a free trade zone between Ukraine and the EU is effective for Poland, in spite of the fact that in each particular case the effectiveness points to the difference between profit and loss for the society and it does not include the interests of each group of people employed in some sectors of state economy. In order to evaluate the distribution of profits and losses for different sectors of Polish economy, a factor of value added should be examined. On the basis of value added indexes of a particular sector of industry, one may identify those sectors that have gained profits and those that have incurred losses (Table 2).

Table 2. The influence of the establishment of a free trade zone between Ukraine and the EU on production in Poland

Industry sector	Poland
Agriculture	1.05
Wood processing	–1.46
Coal mining	–0.81
Oil and gas industry	–2.85
Chemical industry	–1.18
Textile industry	–0.40
Metal processing	–0.06
Mechanical engineering	0.12
Electrotechnology	–0.70
Services	0.06

Source: calculated on the basis of *GTAP 6.0.*

The figures above indicate that the value added produced by different sectors of Polish industry will have a direct influence on the distribution of incomes obtained as a result of the establishment of a free trade zone between Ukraine and the EU. Table 2 indicates that the decrease in production in agriculture that is feared by the Polish side is not going to occur, but it is going to be the other way round – the production is going to increase. At the same time, there may be a decrease in other sectors of the Polish economy. These may include wood processing, coal mining, the chemical industry or oil and gas industry.

The change in export and import prices will be a very important result of the establishment of a free trade zone between Ukraine and the EU (Table 3).

Table 3. The influence of the establishment of a free trade zone between Ukraine and the EU on export and import prices in Poland

Industry sector	Poland	
	Import price	Export price
Agriculture	–3.19	7.23
Wood processing	8.71	10.72
Coal mining	–3.88	9.58
Oil and gas industry	11.97	8.79
Chemical industry	8.70	10.50

Tab. 3. (cont.)

Industry sector	Poland	
	Import price	Export price
Textile industry	9.61	10.15
Metal processing	7.84	10.51
Mechanical engineering	8.66	10.35
Electrotechnology	1.84	10.75
Services	10.00	10.97

Source: calculated on the basis of *GTAP 6.0.*

As a result of new prices, the trade corridors will be changed, which will also influence the distribution of incomes (Table 4).

Table 4. The influence of the establishment of a free trade zone between Ukraine and the EU on export and import in Poland

Industry sector	Poland	
	Import	Export
Agriculture	30.48	54.14
Wood processing	3.93	–1.37
Coal mining	33.17	2.60
Oil and gas industry	–3.03	–32.46
Chemical industry	3.08	1.92
Textile industry	1.94	1.86
Metal processing	6.57	6.06
Mechanical engineering	3.91	3.91
Electrotechnology	23.28	–3.06
Services	1.60	–2.08

Source: calculated on the basis of *GTAP 6.0.*

To sum up, the results obtained from the analyses it stands to reason to say that the establishment of a free trade zone between Ukraine and the EU may bring potential benefits. This conclusion is supported by the positive indexes of equivalent variation.

The research into the change of the general equilibrium of the Polish economy in the aftermath of the establishment of a free trade zone between Ukraine and the EU indicates that the liberalization of trade in order to achieve higher economic welfare, consumption and increase in state export is justifiable. It has to be mentioned

that, owing to the establishment of a free trade zone between Ukraine and the EU, the economic welfare of both the EU-27 and Ukraine will increase, which points to the mutual benefits resulting from the integration of Ukraine with the EU.

Due to the positive results of the analyses, the establishment of a free trade zone between Ukraine and the EU should be speeded up. Poland can play a very significant role in this process, since the benefits of liberalization of trade with Ukraine are self-explanatory.

Conclusions

As the model predicts, Poland stands to gain from joining Ukraine into a free trade zone with the European Union. The respective gain – 508.38 million USD – is to accrue yearly in terms of smaller distortions from taxes and an appreciation in the value of investment goods.

Import prices in agriculture and coal mining would decrease because removing common external tariffs in the EU on imports from Ukraine, but export prices for all industries would increase due to trade reorientation of Ukraine on Polish commodities.

The creation of a free trade zone between Ukraine and the EU also will have positive consequences for economic welfare of both partners.

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