Quantifying Economic Integration of the European Union and the Eurasian Economic Union: Methodological Approaches

Pelipas, Igor and Tochitskaya, Irina and Vinokurov, Evgeny

EDB Centre for Integration Studies, International Institute for Applied Systems Analysis

2014

QUANTIFYING ECONOMIC INTEGRATION OF THE EUROPEAN UNION AND THE EURASIAN ECONOMIC UNION: METHODOLOGICAL APPROACHES

Eurasian Development Bank

Centre for Integration Studies

Saint Petersburg

2014

IIASA

International Institute for
Applied Systems Analysis
www.iiasa.ac.at

This report emerged as a building block of the multi-year project "Challenges and Opportunities of Eurasian Economic Integration" conducted jointly by the International Institute for Applied Systems Analysis (IIASA), the Eurasian Development Bank, and the Eurasian Economic Commission. Other partners are invited to join. The project consists of a series of high-level round tables, accompanied by multiple research papers and other outputs. Its goal is to discuss and analyse the issues of economic integration in both a truly trans-continental dimension ("from Lisbon to Shanghai", or Greater Eurasia) and within the EU-EEU dimension ("from Lisbon to Vladivostok").

The Eurasian continental integration phenomenon is under-researched. Even the discussion of its basic concepts often faces difficulties. There is a need to conceptualize and understand Eurasia and Eurasian integration in a constructive and comprehensive manner. The mobilisation of Eurasia's gigantic potential in human capital, natural resources, infrastructure development, education and technology could contribute to sustainable economic growth and rising living standards. This is in spite of different political systems, and the existing rivalries and mistrust between major European and Asian actors (nation-states and supranational groupings).

Eurasian integration implies radical advancement of economic, political and social interactions between the regions of the Eurasian supercontinent: Europe, Central and Northern Eurasia, and East, South and Western Asia. It goes beyond liberalized trade in goods and services to the free movement of financial and human capital, visa-free regimes, elimination of NTBs, and to technological and R&D cooperation. In this context, Eurasian economic integration represents a crucial political challenge.

Moving towards a deep economic integration of the EU and the emerging EEU represents one of the key challenges of the Eurasian continental integration.

The project's work plan consists of a series of workshops that are to be held in 2014–2016. The current paper "Quantifying Economic Integration of the European Union and the Eurasian Economic Union: Methodological Approaches" was presented by the EDB Centre for Integration Studies' team as a Background Report for the first workshop held at IIASA on March 6–7, 2014.

TABLE OF CONTENTS

ABBREVIATIONS

CETA – comprehensive economic and trade agreement
CGE – computable general equilibrium
CIS – Commonwealth of Independent States
CU – Customs Union
DCFTA – deep and comprehensive free trade agreement
EDB – Eurasian Development Bank
EDB SIEI – EDB System of Indicators of Eurasian Integration
EU – European Union
EEU – Eurasian Economic Union
EurAsEC – Eurasian Economic Community
FDI – foreign direct investment
FTA – free trade area
IOTs – input-output tables
GDP – gross domestic product
NAFTA – North American Free Trade Agreement
NTBs – non-tariff barriers
OECD – Organisation for Economic Co-operation and Development
OLS – ordinary least squares
R&D – research & development
RTAs – regional trade agreements
TFP – total factor productivity
WTO – World Trade Organisation

Introduction

During the last two decades, there has been increased interest in regional integration. The number of renewed regional trade agreements (RTAs) has increased. As a result, regionalism has become a dominating factor in the development of world trade. It affects countries' economic and political relations. They are faced with the choice of whether or not they should enter various trade blocs, and which form of integration they should select at each specific stage. The answer to these questions required a quantitative assessment of the economic impact of accession to RTAs. It also requires a clear understanding of the possible positive and negative impact on the macro- and micro-levels. This includes the impact on the economy as a whole, on specific industries, large individual companies, the state budgetary and monetary policy, and various population strata. This type of analysis, commonly known as *ex-ante*, also showed whether the current policy requires modification in order to maximise profits and reduce losses. For countries that have already acceded to RTAs, an *ex-post* evaluation is necessary to assess the memberships' efficiency, and how expectations fare against reality.

Since 2010, when the Customs Union (CU) was created, the Eurasian Economic Commission (its primary supranational body) became an official party in negotiations pertaining to trade relations. In 2012 the CU was supplemented with a comprehensive series of agreements establishing the Single Economic Space (SES), which aimed at a full-fledged common market. The member states plan to create the Eurasian Economic Union (EEU) by 2015.

All of this creates a demand for comprehensive estimates of the implications of the various integration scenarios. Obtaining such estimates requires a clear understanding of the precise factors that should be researched (the impact of what?), the possible impact on the economy (impact on what?), as well as how it can be evaluated.

The CU currently leads negotiations with New Zealand, Vietnam, and Israel on establishing subsequent free trade areas (FTAs). FTAs with India and Turkey have also been proposed.

At the same time, the largest trade and investment partner for *all* CU member states is the European Union (EU).

2003 to 2004 was a period of growing interest in economic cooperation and integration of the EU and the Russian Federation. However, this issue receded into the background in the following years. The current political instability in Ukraine has created a negative news flow. Nevertheless, objectively, there is a solid foundation for there being a mutual interest in resurrecting talks on economic integration, this time between the EU and the emerging EEU. This interest is based on: territorial proximity; colossal trade flows; the potential of investment flows, coupled with the transfer of technologies; issues of soft and hard security; common neighbourhoods; the unresolved issues of trans-border transport and energy infrastructure; and so forth. In our view, a comprehensive EU-EEU agreement might become a reality by the 2020s. This is why there is a necessity for researchers to work on the economic assessment and design of the prospective deal.

The below analysis of theoretical and empirical research has a focus on RTA impact assessment. It shows that it is expedient to use various quantitative analysis methods in order to observe the diverse consequences of economic integration, and also to obtain more reliable estimates.

The selection of each method is determined by the tasks being addressed at each specific stage of the study, as well as by the availability of data. To assess at the *ex-ante* stage of the analysis the consequences of a free-trade area being established between the EEU and the EU, it is appropriate to use:

'Simple and informative methods based on index calculations' — These allow the researcher to assess: the value of commercial agreements with future partners; the similarity of the export and import profiles; and the revealed comparative advantages of the trade of EEU member states with the EU and the rest of the world. They also provide for a preliminary ascertainment of the pros and cons of taking part in an RTA, which can be discussed at the initial negotiations.

'More complex methods that include computable general and partial equilibrium models' — These models provide a scenario-based assessment of static effects, both for simple forms of integration and for deeper agreements, which entail the removal of restrictions on the movement of capital and labour force, and the harmonisation of legislation. However, the limitations of these models should be taken into account.

'Gravity models that allow the researcher to extrapolate the effects of various trade agreements between other countries in the RTA under review' — They also estimate the consequences of integration initiatives. These models provide an opportunity to assess the potential that is not being realised due to non-membership in various RTAs.

When analysing the effects of lowering non-tariff barriers (NTBs) on integrating countries' economies, it is desirable to use a combination of methods. These include direct assessments based on company surveys, gravity models and computable general equilibrium models. This approach is necessitated by the difficulty in data collection and quantification of the effects of NTBs.

Our analysis shows that, when used separately, no one method can provide a comprehensive RTA impact assessment. Therefore, if statistics or other relevant information is available, a combination of quantitative analysis methods should be used, with consideration for their strengths, weaknesses, capabilities and limitations.

This report has the following structure. The first section examines the modern understanding of integration issues in the context of their pertinence to the EU and EEU. The second section provides an overview of the analytic literature on the economic impact of integration agreements. The third section demonstrates the capabilities of computable general equilibrium models in analysing the impact of integration agreements. The fourth section examines the role and possibilities of econometric models. The fifth section presents additional approaches to analysing and assessing the impacts of economic integration. The sixth section presents an overview of the basic approaches to assessing the effects of NTBs. In the final section, we set forth the main conclusions and recommendations on the optimal design of quantitative research, which follow from the preceding analysis.

1. A Prospective EU-EEU Agreement

Economic integration can take on different forms depending on the objectives of the member states. There is no single accepted approach to classifying the types of regional economic integration. The World Trade Organization (WTO) distinguishes three types of regional trade agreements: free-trade area, customs union, and economic integration agreement. GATT Article XXIV, Paragraph 8d states that "a free-trade area shall be understood to mean a group of two or more customs territories in which the duties and other restrictive regulations of commerce (except, where necessary, those permitted under Articles XI, XII, XIII, XIV, XV and XX) are eliminated on substantially all the trade between the constituent territories in products originating in such territories." Paragraph 8a of Article XXIV defines a customs union as "the substitution of a single customs territory for two or more customs territories, so that: (i) duties and other restrictive regulations of commerce (except, where necessary, those permitted under Articles XI, XII, XIII, XIV, XV and XX) are eliminated with respect to substantially all the trade between the constituent territories of the union or at least with respect to substantially all the trade in products originating in such territories, and, (ii) ... substantially the same duties and other regulations of commerce are applied by each of the members of the union to the trade of territories not included in the union."[1] Article V of GATT stipulates the economic integration agreement, which also implies the elimination of barriers to the movement of services, as well as labour market integration.[2]

The OECD distinguishes four forms of regional economic integration: free-trade area, customs union, common market and economic union. A common market is understood as a customs union with provisions to liberalise movement of regional factors of production (labour and capital); and an economic union is a common market with provisions for the harmonisation of certain economic policies.

Thus, any classification assumes that regional economic integration can have several levels or degrees of depth, depending on the aims, wishes and interests of the participating countries. Each level implies that certain elements of the common economic space liberalisation are added to the previous level:

- Elimination of tariffs and some non-tariff barriers between countries (free-trade areas or partial/sectoral free-trade areas).
- Establishment of a common customs tariff (customs union).
- Freedom of movement of goods, services and labour force (common market).
- Policy harmonisation with regard to competition, as well as structural, fiscal, monetary, and social policy (economic union).
- Unification of the economic policy and establishment of supranational institutions (economic and political union).

[1] http://www.wto.org/english/docs_e/legal_e/gatt47_e.pdf.

[2] http://www.wto.org/english/docs_e/legal_e/26-gats.pdf.

Currently the forms of economic integration are complex and increasingly more complementary. For example, a free-trade area and customs union can incorporate elements of higher levels of integration such as: *the reduction of non-tariff barriers; the removal of restrictions on trade in services; and movement of capital and labour force*. This comes from the growing understanding that, from the standpoint of economic impact, removing trade barriers alone may lead to considerably fewer positive effects than deep integration.

Deep economic integration is extremely important to the emerging EEU. Firstly, the EU is the largest trading partner of Russia and Kazakhstan, with the EU accounting for over half of Russia's commodity turnover (while Russia is, in turn, the EU's third largest trading partner). Secondly, the EU may play an important role in resolving the CU member states' modernisation problems. The key instrument here is capital flow coupled with transfer of technologies. Thirdly, the emerging Eurasian Union is currently initiating a number of free-trade agreements with smaller partners, ranging from member states of the European Free Trade Association to Vietnam. In this context, deeper economic integration with the EU is the main long-term aim. Fourthly, Ukraine's problem may eventually be resolved only through deep economic cooperation between the EU and the EEU, making this cooperation paramount for developing common neighbourhoods.

However, the EEU is not simply interested in a free-trade agreement, but in a deep and comprehensive agreement with the EU. The reason is straightforward: the current EU-CU trade structure would make it very beneficial for the EU. Losses in the conditions of trade must be compensated by gains in other domains.

The prototypes of potential EU-EEU integration are manifold. They include a deep and comprehensive free trade agreement (DCFTA) as well as a comprehensive economic and trade agreement (CETA). The latter is exemplified by the recent agreement between the EU and Canada. It is also a prototype of the Transatlantic Trade and Investment Partnership (TTIP). We think that *CETA may be the best choice for the EU-EEU deal*. This is particularly the case as, due to the existing trade structure, Russia and Kazakhstan are not interested in a free-trade regime with the EU as such. At the same time, the obvious problems entailed by trade concessions should be compensated by advantages in other areas.

The Presidents of Russia and Kazakhstan have already voiced support for the idea of a deeper economic integration with the EU. Russian President Vladimir Putin suggested putting a free trade zone with the EU back on the agenda during the EU — Russia Summit on January 28th, 2014. On February 5th, 2014, this proposal received explicit support from the President of Kazakhstan Nursultan Nazarbayev.[3]

It is worth noting that the full-fledged EU-EEU negotiations would require all members of the EEU to become WTO members. Hence it is necessary for Russia to support Kazakhstan, and particularly Belarus, in their Geneva negotiations. Essentially, Russia has to become a locomotive of Kazakhstani and Belarusian WTO membership.

The scope of the prospective deal might include dozens of domains and policy areas, and would include:

[3] http://vz.ru/news/2014/2/5/671174.html.

1. Trade in goods
2. Rules of e-commerce
3. Partial eliminations (or, alternatively, streamlining) of NTBs
4. Trade in services
5. Access to financial markets
6. Free movement of capital
7. Regulatory convergence
8. Intellectual property rights
9. Bilateral recognition of professional education certificates
10. Establishing a visa-free regime (including a package of readmission agreements)
11. A bilateral regime for the Kaliningrad Region
12. Policies towards common neighbourhoods
13. Large-scale educational exchanges (such as Erasmus Mundus)
14. Development of cross-border transport infrastructure (automobile and railway corridors)
15. Third Energy Package
16. Establishment of the common electrical power market
17. Mutual access to public procurement
18. Competition rules
19. Mediation and settlement mechanisms.

The majority of these domains need an in-depth quantitative analysis. Therefore, a large-scale and multi-year research project is needed, where experts from both sides would join in.

The tentative research project could be carried out in the following three stages — where the first stage is designed to identify trade barriers, the second is the modelling stage based on the results of the first, and the third stage envisages the development of a set of political recommendations for holding asymmetric negotiations.

1. *Deep EU-EEU economic integration: identifying the barriers.* Research of the current state of affairs, including trade barriers and non-tariff measures, regulatory discrepancies, and border issues. Essentially, this is a study of what the problems are currently.
2. *Deep EU-EEU economic integration: quantitative assessment of impact in various scenarios.* This stage, being based on the first stage of the project, will include modelling and a quantitative assessment, based on several methods.
3. *Development of a set of political recommendations for holding negotiations.* Figuratively speaking, the negotiating parties will have a variety of 'chips' in their hand. It is thus necessary to understand the absolute and relative value of these 'chips' in order to find suitable consensus.

The main and most obvious analytical method of this proposal is the computable general equilibrium (CGE) model, which is a thoroughly developed and formalized tool for

solving economic policy issues. In this model, it is preferable for a dynamic aspect to be represented to some degree. In the model selected for analysis, countries can be aggregated in various ways and computations can be carried out for the following groups of countries:

- EU-27 (Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom)
- EEU-3 (Belarus, Russia, Kazakhstan) or EEU-5 (+Kyrgyzstan and Armenia, and possibly also Tajikistan)
- Ukraine and Turkey (these countries should be distinguished due to their importance in the context of EU-EEU relations)
- Other countries.

It is worth noting that although the CGE model is a key analytical tool, the research should go beyond it and make use of other methodological approaches as well to address the specific aims and tasks of the project.

2. Analysis of the Effects of Regional Economic Integration: General Overview

The last few decades are characterised by a growing number of regional trade agreements (RTAs). As of 31 January 2014, the World Trade Organization (WTO) had received 583 notifications about the establishment of RTAs (counting goods and services), of which 377 were in place. For example, the EU alone sent 47 notices of RTAs establishment with other countries and territories, most of which are currently in effect. The USA is a member of 14 RTAs, Japan — 17, Chile — 24, China — 15, and Brazil — 4. The WTO database[4] indicates that most of the world's RTAs are free-trade areas, with only 17 being customs unions,[5] while 119 agreements stipulate trade liberalization for both goods and services.

The regionalism surge has been explained by many factors. In particular, it was linked to the slow progress of the WTO negotiation rounds, especially the Doha Round. In addition, a "domino effect" was observed (Baldwin, Venables, 1995). Countries thought that the costs of remaining outside a newly created or expanding and deepening regional trade/economic agreement/union, such as the EU, may be higher than acceding to these agreements/unions. The aspiration of countries to establish RTAs came generally from their wish to: stimulate economic growth by granting the members improved access to markets; using economies of scale; attracting foreign direct investments to the common market; and technology spillover effects.

RTAs differ by the degree of preferential treatment of the coverage of goods and services, and the depth of integration. However, as a rule, the establishment of any RTA generally envisages the following (Bhagwati, Panagariya, 1996):

- Elimination of tariff and non-tariff barriers, or their transformation to tariff equivalents;
- Adoption of a list of sensitive goods and services that may be exempted from the free-trade regime;
- Adoption of rules to identify a product's origin country;
- Establishment of institutional mechanisms (authorities responsible for administration and compliance with the agreements);
- Elaboration of a trade promotion policy (measures to reduce the export/import costs incurred during transactions, including harmonisation of the customs procedures);
- Creation of a dispute resolution mechanism;
- Development of protective measures (temporary cessation of particular provisions

[4] http://rtais.wto.org/UI/PublicMaintainRTAHome.aspx.

[5] At the same time, only 6 customs unions are functioning, and 3 are comprehensive (the EU, EU-Turkey, and CU-Belarus, Kazakhstan, and Russia). The rest, including MERCOSUR and the Southern African Customs Union, have 30 per cent or more exemptions from the free trade regime.

of the agreement in case increased imports may have an adverse impact on industry);

- Parallel elimination of barriers to the movement of investments and services.

There are many theoretical and empirical works examining the economic effects of RTAs on member states and other countries, both before and after accession (ex-ante and ex-post accession). They consider questions of: the impact of regional integration on trade flows and economic growth; the presence of economic convergence among member states; ascertainment of who the best partners are; and which form of agreement is most effective and preferable.

Recent years have been marked by a tendency of gradual "deepening" of economic integration. This is a transition from simpler forms envisaging simple trade barrier elimination, to RTAs providing for the removal of NTBs, and restrictions of trade in services and movement of capital and labour force. At the same time the RTA would harmonise environmental protection regulations and legislation. As a result, both theoretical and empirical studies have been devoting increasingly more attention to analysis of the effects of deep integration. This is instead of simply assessing whether an RTA leads to greater welfare, and whether or not it pushes more efficient producers out of the market (assessment of the static trade creation and trade diversion effects[6]).

At the same time, assessing the impact of the static effects made it possible to detect the factors that result as a consequence of a country's membership in an RTA. The likelihood of diversion occurring after an RTA's establishment, with more effective producers being pushed out from the market, is reduced given:

- a higher relative share of the bilateral and intra-industry trade (Wonnacott, Lutz, 1989; Krugman, 1993) and complementary trade of member states, as well as a diverse structure of comparative advantages (Venables, 2003);
- similar sizes of countries' economies (GDPs) (Baier, Bergstrand, 2004) and their geographical proximity (Egger, Larch, 2008);
- lower external import tariffs at the time the RTA is concluded, or if the tariffs are imposed such that the RTA's establishment does not affect trade with other countries (Kemp, Wan, 1976; Panagaria, 2000) (in the latter case, diversion will not occur at all);
- liberal rule of origin (Cadot, et al., 2005);
- a connection between trade liberalization within the trade agreement and changes in countries' domestic policies (for example, the agricultural subsidy policy) (Burfisher, et al., 1998).

Empirical investigations of the impact of static effects on the welfare of member states are based on general and partial equilibrium models, as well as econometric estimates. As a rule, such investigations interpret that a higher creation effect, compared to the diversion effect, is an indication of a country's gain.

[6] Trade creation arises when, as a result of the removal of an RTA barrier, import from the partner state displaces less effective (incurring greater costs) domestic suppliers. Trade diversion arises when more efficient import from beyond the customs union (or free trade area) is pushed out by the partner country's products due to the distorting influence of tariffs.

At the same time, the impact of an RTA is not limited to its influence on trade flows and production structure. It can also affect the investment opportunities, competition, specialisation and cooperation, economy of scale, transfer of knowledge and technologies, and migration. For example, research has shown that Brazil's tariff reduction under MERCOSUR has resulted in Argentinian companies' increased technological and innovation-related costs (Bustos, 2011). Regional integration also has a positive impact on technological spillover (Jinji, et al., 2012). Also eliminating migration restrictions is more profitable than lifting trade barriers, since the costs incurred due to restrictions on the movement of the labour force between countries and regions exceed the costs of restrictions in commodity trade (Walmsley, Winters, 2005).

As the spectrum of RTAs accession impact is quite broad, besides addressing static effects, the literature on economic integration also traditionally distinguishes dynamic effects. These characterise the impact of membership in a trade bloc on productivity and growth in partner states. The methods used to research these effects range from theoretical models to econometric estimations.

However, as noted by Tarr and Michalopoulos (1997), the growth-related effects are still difficult to characterise and even more difficult to measure due to the complexity of dynamic effects, in contrast to static effects. The complexity stems from a number of reasons, which are usually subdivided into two categories: 1) those related to rising volumes of manufactured goods as a result of growth of inputs, and 2) those related to total factor productivity growth due to accelerated technological progress within the bloc. The source of growth may also include specialisation, economy of scale, convergence of the member states' incomes, and the previously mentioned technological spillover effect. It is difficult to capture using just one model this entire diversity of reasons through which an RTA can impact growth in a trade bloc's member states.

One direction of studying the dynamic effects of regional integration was to examine its influence on total factor productivity (TFP). This proved empirically that, from the standpoint of technology transfer, the import of equipment and intermediate goods can have a positive impact on growth. In analysing the factor productivity growth rate in OECD member states, and in some developing countries, Coe and Helpman (1995) used the index of total knowledge capital, which they developed, based on R&D investments. Their assumption was that, in the process of trading, countries receive access to "knowledge capital" (investments accumulated in R&D) proportionally to how high-tech their import is.

The results of RTAs research, particularly in North and Latin America, showed a high correlation between total factor productivity growth and access to foreign knowledge capital. When analysing the consequences of the accession of Bolivia, Columbia and Ecuador to the Andean Pact using growth accounting methodology, Madani (2000) demonstrated that the import of intermediate goods from the rest of the world facilitates economic growth, whereas import from the member states does not. Schiff and Wang (2003) assessed the impact of Mexico's NAFTA membership on the total factor productivity due to technology transfer via trade. They showed that trade with the agreement partners (USA and Canada) has a statistically significant impact on the country's TFP

(5.6–7.5%, which can result in a 1.2–1.6% GDP growth), while trade with other OECD countries does not.

A number of similar estimations were carried out for transition economies. Hoekman and Djankov (1997a; 1997b) researched the interrelation between the geographic direction of trade flows, the change in the export structure, and competitiveness of the manufactured goods. They used Central and Eastern European countries as an example. The analysis confirmed that these changes depend significantly on the import of high-tech factors of production arriving from the EU. In turn, Shepotylo (2011) applied the gravity model to study trade diversification of CIS and Eastern European countries' export basket. The export diversification of Eastern European countries was found to be close to what the model predicted. It was much higher than the CIS countries, which specialised primarily in supplying raw materials to foreign markets. One explanation for this may be the fact that Eastern European countries were involved in intra-industry trade with developed countries, and took part in the international division of labour (World Bank, 2005).

Thus, explicitly or implicitly, most studies of the dynamic effects of RTAs pose the question of: how decisive is the extent of the partners' economic development to an agreement's success, and its positive influence on the member states' economic growth? A number of studies establish that in the case of RTAs concluded between developed and developing countries (South-North), the R&D spillover exceeds the TFP primarily in knowledge-intensive industries, whereas in the case of RTAs between developing countries (South-South), it affects TFP growth only in low-tech industries. This means that South-South RTAs may not facilitate a structural change of the member states' comparative advantages, and the appearance of knowledge-intensive goods (Schiff, et al., 2002).

Another argument in favour of North-North and South-North agreements is that RTAs between developing countries (South-South) may not facilitate income convergence, whereas in the first two cases it is likely to occur (Venables, 1999). At the same time, recent research shows that at the end of the day, it is difficult to ascertain which type of the above agreement (North-South or South-South) is preferable for developing countries, and countries with emerging markets. There is no doubt that potential advantages of North-South RTAs include technology transfer and productivity growth. At the same time, South-South agreements may result in a significant increase in mutual trade, as well as political and economic integration, which will also have a positive impact on growth (Behar, Cirera and Crivill*e*, 2011).

When considering the effects of regional integration, one of the issues worth addressing is the connection between RTA membership and the ability to attract FDIs. The empirical literature generally examines questions of whether RTA membership results in FDI inflow, or precisely which agreements within a regional bloc provide the greatest stimulus to the inflow of investments. These agreements include: liberalisation of trade in goods or services; harmonisation of legislation; protection of intellectual property rights; dispute resolution mechanism; and legal and regulatory provisions pertaining to investments.

Usually, spatial gravity models are used for this purpose. However, the existing studies do not yet provide a clear explanation of whether there is a connection between the form

of regional economic integration and the FDI inflow, and why certain RTAs are more successful than others in attracting FDIs. It is also important to be aware of the fact that RTA membership does not necessarily result in FDI inflow. RTAs that include legal and regulatory provisions pertaining to investments are more attractive to foreign investors, and countries with larger economies are more likely to gain FDI inflows (Velde, Bezemer, 2006).

Thus, the inflow of investments from beyond an RTA is determined by: how large or small the RTA member states are; and the principle upon which the agreement is based from the standpoint of the member states' economic development (North-North, North-South or South-South). In North-South agreements, FDI inflow is typically associated with intraregional investments, for example from developed countries (North) to developing countries (South) for purposes of cutting costs. For South-South RTAs, an important determining factor of overall FDI inflow is the market size, as well as the education level and financial stability of the member states (Jaumotte, 2004).

A number of researches show that an RTA facilitates an inflow of market-seeking FDIs, especially if the RTA includes not only obligations applicable to trade in goods, but also, for example, protection of intellectual property rights and trade in services (Dee, Gali, 2005). At the same time, the impact of RTA membership on the inflow of efficiency-seeking FDIs, i. e. ones that use economy of scale and earn a profit by cutting costs, using high-quality physical infrastructure and human capital, are insignificant, especially for South-South regional blocs (Velde, Bezemer, 2006).

Estimations on RTAs such as MERCOSUR show that if an RTA facilitates FDI inflow, it is unevenly distributed among the member states. As a rule, it is concentrated in countries with the greatest advantages. As noted by a number of authors, such as Blomstrom and Kokko (1997), in each specific case this depends on whether accession to the RTA results in a change of the economic climate, and whether the advantages associated with the location of companies and industries manifest in the member states.

3. Computable General Equilibrium (CGE) Models

3.1. General overview

Computable general equilibrium (CGE) models are used extensively, both by the governments of individual countries and by international organisations such as the World Bank, OECD, WTO. The European Commission uses them for trade policy impact assessment. They are an effective analytical tool enabling complex ex-ante modelling of the consequences of exogenous policy changes (Bohringer, Rutherford, Wiegard, 2003). Nevertheless, there are some constraints and drawbacks associated with the CGE modelling apparatus.

One of the most frequently mentioned strengths of these models is their theoretical logic and consistency. This allows them to be guided by a "theoretically correct" understanding of how the economy functions in the economic policy decision-making process. In addition, "general equilibrium" also shows that there is a clear interdependency between economic variables, and that any economic policy change affects a variety of elements in an economy (Piermartini and The, 2005).

CGE models are used extensively to assess the impact of a country's or group of countries' membership in RTAs, since they enable:

- an analysis of the costs and benefits of various integration scenarios, providing a quantitative assessment of the impact on trade, economic growth, production, employment, budget, and household incomes;
- determining winners and losers, both at the level of individual economic sectors and economic agents — households, governments and companies — as well as the elaboration of compensatory measures, or a trade policy adjustment programme;
- the elaboration of a trade negotiation strategy.

In addition, modern CGE models are more in line with real life and can be used to assess the economic impact of a trade policy, including regional trade integration, for developing countries and transition economies. This is because they are not based solely on Walras' perfect competition model or its modification — the Arrow–Debreu model, but also include elements of imperfect competition, such as, for example, price determination and increasing returns to scale (Francois, 1998). Table 1 presents the economic impact of RTAs, which can be quantitatively assessed with the help of CGE models.

Despite the popularity of CGE models, they are subject to serious criticism, which particularly points out their limitations and the need to approach the results with caution for the following reasons.

- One important limitation of the model is its comparative static approach, which makes it possible to identify the impact of trade policy changes on the endogenous variables. However, it assumes that the factors being compared are the initial

Table 1. RTA effects estimated using CGE models

Effects		Assessment
Impact on welfare	yes	Assessment using equivalent or compensating variation
Impact on production	yes	Aggregated and disaggregated
Impact on factor returns	yes	Impact on skilled and unskilled labour and capital
Impact on prices	yes	By sector, terms of trade
Impact on trade volume	yes	Aggregated and disaggregated, imports and exports, changes in trade balance
Impact on custom income	yes	
Impact on dynamic variables	depends on the model	Some models may include economies of scale, imperfect competition, changes in capital flows, FDI, productivity spillovers

Source: Plummer, Cheong, Hamanaka (2010).

and final equilibrium, without accounting for the costs and benefits of the transition process. This, in turn, leads to overestimation or underestimation of the impact of the trade policy changes (Piermartini, The, 2005). In addition, the model does not provide an accurate estimation of the duration of the transition to the new equilibrium.

- The model's calibration and specification require advanced programming skills and depend on the modeller's experience and intuition. Due to this, CGE models are often perceived as a "black box". They are also often criticised for errors in their numerical specification. In this connection, efforts have been undertaken to increase the accessibility of CGE analysis by creating a more user-friendly interface, one that could be understood by users other than modelling specialists (Bohringer, Rutherford, Wiegard, 2003).
- Statistical data have varying degrees of reliability. For example, commodity trade statistics are more reliable than trade in services statistics, as it is more difficult to measure capital than labour. The available information on non-tariff barriers and subsidies is limited, and its use in models depends on the choice made by the researcher.
- The elasticities used in the models are often taken from other models without modification, or are partially modified due to the complex and labour-consuming econometric estimates (Hazledine, 1992).
- The models are very sensitive to Armington elasticities, which are very important to determining the trade policy impact. Measuring these elasticities is a difficult task. Most disputes regarding the measurement of Armington elasticities arise due to the structural discrepancy between the econometric models used to measure them, and the simulation models used to evaluate the trade policy (McDaniel, Balistreri, 2001).[7]

Overall, we can draw the conclusion that quantitative estimates of the results of economic/trade policy changes, obtained using CGE models, are valuable not so much from the standpoint of specific numerical figures, but for the degree of the impact of these changes on the economy of the country, or group of countries. This provides a better understanding of which scenario of economic/trade policy is the most preferable, for example, when

[7] A description of problems associated with the use of CGE models can also be found in Grassini (2009).

considering various options of participation in regional trade agreements.

The main software used today for solving CGE models are: GEMPACK (General Equilibrium Modelling Package); GAMS (General Algebraic Modeling System); and a special module of the latter — MPSGE (Mathematical Programming System for General Equilibrium Analysis).

The most commonly used tool to analyse the impact of trade policy changes, particularly those related to RTA membership, is the GTAP Model, developed by Thomas Hertel (Hertel, 1997).

The standard GTAP Model is a multi-region, multi-sector CGE model, with perfect competition, constant returns to scale, and application of the Armington assumption. The current GTAP Version 8 data base contains data on 129 regions[8], which include both individual countries and groups of countries, as well as 57 standard sectors. The previous version included 113 regions. The model presents data for two reference years: 2004 and 2007 (for further detail on the difference between GTAP 8 and previous versions, see Narayanan, Aguiar, McDougall, 2012). Before the user begins modelling, the data has to be aggregated to the required level using GTAPAgg (or FlexAgg), and then GTAP or GTAP in GAMS used to assess the impact of trade policy changes and RTA membership globally, or for several countries. There is also an option to extract a social accounting matrix for a particular country for the data base, and perform computations for this country alone.

The standard GTAP model is implemented with the use of the GEMPACK software, and therefore a GEMPACK license is required to modify the standard GTAP Model. The standard model can be extended and modified, for example, by incorporating elements such as imperfect competition, technology spillover, and the agricultural goods market. It is also extended to enable assessment of dynamic effects using the GDyn model (Narayanan, Aguiar, McDougall, 2012). This model can be used to determine how changes in policy, technology, population and factor endowments can affect the path of economies over time. Another extension of the standard model is GMig2, which makes it possible to track labour migration and evaluate immigrants' monetary transfers.

However, when using the GTAP Model to compute the consequences of countries' membership both in the EEU and in RTAs established between this union and other countries, as well as unions of countries, it is necessary to keep in mind that in GTAP 8, the reference year for Belarus and Kazakhstan is 2004, while for Russia it is 2003. Thus, the model incorporates these countries' social accounting matrices, which are based upon near decade-old intra-industry balance data and input-output tables.

3.2. Empirical RTA Studies Based on CGE Models

A number of studies have been carried out to assess the consequences of a possible EU-Russia free trade area using CGE models — namely, GTAP models. The earliest works include Manchin (2004) and Sulamaa and Widgren (2005). The analyses relied on the GTAP 5.4 and GTAP 6 data bases, with 2001 as the reference year. The baseline sce-

[8] In GTAP 8.1 Data Base (February 2013) the number of regions was increased up to 134.

nario examined in both works was the accession of the EU-10 to the EU-15 customs union. The first study also modelled the doubling of gas prices for Russian industrial consumers as part of Russia's WTO accession, which was viewed as a separate scenario. In Manchin's work (2004), there are three possibilities for the creation of a free trade area (FTA): a FTA for industrial goods only, a FTA for industrial and agricultural goods and liberalisation of trade in services (a "broad FTA"), and a broad FTA along with removal of non-tariff barriers. The results obtained in the study are not particularly interesting today since they were significantly affected by the economically unsound and unrealistic assumption of doubled gas prices for Russian consumers. At the same time, a number of hypotheses presented by the authors are of interest, particularly those relating to: the tariff equivalence of non-tariff measures in trade in services (55% for Russia and 5% for the EU); and technical barriers to trade in agricultural goods and a number of industrial goods (5% for export from Russia to the EU and 2% for export from the EU to Russia).

Sulamaa and Widgren (2005) examined three scenarios of an EU-Russia FTA: elimination of import tariffs and export subsidies; creation of a common market by doubling the elasticity of substitution (the Armington elasticity) between the EU-25 and Russia; and a factor productivity increase of 6% in Russia. In this regard, it is worth noting that the authors did not provide an economic justification for their premises. The results obtained in the study are interesting since they show that from the standpoint of GDP growth and welfare, an FTA with the EU will not be very profitable for Russia if it is confined to the removal of tariffs and export duties. A tangible economic impact will occur only by the creation of a common market and labour productivity growth in Russia. The results of this study correspond to Kaitila (2007), where one of the scenarios examined is a 1% factor productivity increase in Russia, in contrast from the 6% growth hypothesised in the Sulamaa and Widgren (2005) study. In Kaitila (2007), Russia's benefits from creating an FTA become apparent only with factor productivity growth in the country. As noted earlier, one of the distinguishing traits, and at the same time, one of the drawbacks of the three works cited above, is the complete lack of any economic grounding for the supposed scenarios.

A study by Tochitskaya and de Souza (2008) also examines the consequences of a Russia-EU-25 FTA and its impact on other CIS countries. The work uses the GTAP model with the Version 6.2 data base, with 57 sectors of the model aggregated to 35 and the number of regions/countries — to 48 (as compared to 87 countries in the data base). Estimations were made for two scenarios: the first envisages a complete elimination of tariff barriers to trade in industrial goods; the second envisages the elimination of all tariffs, including those on agricultural goods. The results of computations for both scenarios show insignificant GDP growth, both for Russia and other CIS countries, as well as deterioration of the terms of trade. This corresponds to the results obtained in other studies, according to which an FTA that provides merely for the elimination of customs barriers is not particularly advantageous for Russia.

Among the studies of the impact of a Russia-EU FTA, one interesting work was carried out by CEFIR. A CGE model was constructed to assess the industry-specific and regional effects of foreign trade agreements between Russia and other countries (CEFIR, 2007). The study relied on the GTAP Version 6.0 data base, along with a data base of

social accounting matrices of seven federal districts of Russia. It enabled an analysis of not only the industry-specific effects for 25 industries, but also the regional effects. The study modelled the elimination of import tariffs in Russia and the EU. The results indicate that there are winning and losing industries, although the same is not true for regions, and that the predominant effect in trade will be redistribution in favour of the EU.

One notable study conducted recently by Jarocinska, Maliszewska and Scasny (2010) was carried out in accordance with the recommendations of the European Commission on assessing these types of agreements, i.e. it also examines the ecological and social effects of the FTA (European Commission, 2006).

The model is a modification of the Multiregional Trade Model developed by Harrison, Rutherford and Tarr, i.e. it is a standard static CGE model. The data was obtained from the GTAP 7 data base, where the reference years are: Russia — 2003, and the EU countries — 2004. The effects of trade policy changes were assessed assuming the increasing returns to scale in certain sectors and the long-run impact, i.e. a capital stock is adjusted in response to changes in a return to capital. The baseline scenario is Russia's WTO accession, since it must necessarily precede the establishment of an FTA. According to this scenario, the average tariff on export from the EU and the rest of the world will be reduced by 9–5%, although in some sectors, such as transport equipment, and timber and paper products, the reduction may reach 70%. This scenario also presupposes a 25% reduction in barriers to trade in services.

The study envisages the creation of a deep free trade area. It assumes a reduction in costs associated with border crossing due to a reduction in the time required for customs procedures. It also assumes an improved quality of these procedures resulting from harmonisation of legislation, and the practice of conducting customs procedures. The work suggests that the border crossing costs will be reduced by 50%, which is the level that existed in Bulgaria and Romania at the time of their EU accession. The costs were estimated as twice those of Ukraine, which are 14% of the total export volume. The presumption is that they will be reduced to 7% in the short-term, and then by another 25% in the long-term.

Another result of establishing an FTA is the reduction of technical barriers to export to the EU. To quantify these barriers for Russia, data was used from a survey of Ukrainian companies on the costs of EU standards compliance in various industries (the percentage of the production costs). These costs are expected to be reduced to the level of Central and Eastern European countries in the early 2000s. For example, in Poland and the Czech Republic, they were twice as low as in the Ukraine. The authors assume that they will be reduced by 25% for Russia in the short-term and by 50% in the long-term. The work also envisages a reduction of barriers to trade in transport services, communications services, as well as insurance and financial services, and a 25% reduction of barriers to investments due to WTO accession, and then another 50–75% as a result of a deep FTA. Due to reduced corruption and increased competition, which are achieved via wide-ranging flanking measures as part of legal harmonisation, the price of capital is expected to be reduced by 2.5%.

The study examined two scenarios of creating an FTA for the short-term (5–10 years),

and the long-term (10–15 years). In the first scenario, following the WTO accession, tariffs on industrial goods were reduced to zero, and by 50% for agricultural goods, while other trade barriers followed the pattern described earlier. In the second scenario, tariff reduction remained the same, while technical barriers, border crossing costs, and barriers to trade in services are reduced to a greater extent.

The results of the estimations show that Russia can gain a significant welfare boost only in the long-term (10–15 years). This is after creating a deep FTA, where the FTA includes: a significant reduction of non-tariff barriers and implementation of flanking measures, especially in the realm of competition; protection of intellectual property rights; reduced corruption levels; and promotion of Russia's image as an attractive FDI destination.

In the context of a quantitative assessment of the impact of possible Ukraine regional integration options, i.e DCFTA with EU vs. CIS, an interesting study was carried out by Movchan and Giucci (2011). This work relied on the modified static model of Jensen, Rutherford and Tarr (2007), which was used to assess three scenarios: 1) a simple FTA with the EU (elimination of tariff barriers); 2) a deep and comprehensive FTA with the EU (elimination of tariff barriers, a 2.5% reduction in dead-weight costs on exports and imports to/from the EU associated with improved customs procedures and harmonisation of the legal and regulatory framework); and 3) increased customs tariffs vis-à-vis the EU and the rest of the world to the level of the common customs tariff of the customs union. The results of the computations showed that Ukraine will benefit most by creating a deep and comprehensive FTA. Estimations of this scenario indicate a 4.3% increase in welfare in the medium-term and 11.8% in the long-term. These results are comparable to the estimates obtained in earlier studies (CEPS, 2006; CASE, 2007), which indicate that Ukraine will experience the greatest gains by establishing a deep and comprehensive FTA with the EU.

All of the computations cited above, which were conducted to assess the effects of a Russia-EU FTA, are grounded on standard static models. However, in recent years, dynamic general equilibrium models are becoming more popular for analysing the impact of RTA membership (for example, see Zhang, Lu, Ya-xiong, Feng, 2012). These models have a number of strengths. Particularly, they provide a better assessment of long-term effects. Furthermore, these models also allow for capital to shift not only within the intra-regional sectors, but also between the GTAP regions, enabling investments to be distributed depending on the rates of return in the regions. In addition, the profitability is adjusted over time, whereas in standard models this happens instantly, without delays. GTAP-Dyn makes provisions for a lag of the profitability adjustment, which is more realistic. The movement of capital also depends on the difference between the investors' expectations vis-à-vis the rate of return and the actual rates. Their expectations may differ (i.e. be erroneous) in the short-term, while still matching the actual rates in the long-term (Ianchovichina, McDougall, 2001). At the same time, it must be noted that due to the dynamic models' complexity, their results are not always of acceptable quality.

4. Econometric Models

4.1. Gravity Models

4.1.1. General overview

Modern gravity models, which are widely used to analyze international trade flows, are based on studies published in the 1960s by Tinbergen (Tinbergen, 1962) and Linneman (Linneman, 1966). Interest in gravity models has been revived over the last decade (Bergeijk, Brakman, 2010). Most papers on the use of the gravity model mention that it is a "workhorse" for analyzing international trade, providing quite accurate estimates of bilateral trade flows. In addition, the economic literature also notes that the gravity model is one of the most stable empirical relationships in an economic analysis (for example, see Porojan, 2001).

One of the most important traits of the gravity model is its ability to assess and predict the impact of FTAs on the shift of trade flows between separate countries or groups of countries. It is notable that the gravity model enables not only an analysis of the impact of the existing FTAs, but also an assessment of the impact of proposed agreements based on retrospective data on the existing state of affairs. Among econometric methods, gravity models are the main tool for modelling trade flows.

The gravity model is founded on Newton's law of universal gravitation, whereby trade between two countries depends on the size of their economies and the distance between them. While the gravity model was initially a simple stable empirical relationship describing trade flows, without any theoretical grounding, in later years it was supported with appropriate theoretical foundations (Anderson, 1979; Anderson, Wincoop, 2003; Bergstrand, 1985; Helpman, Krugman, 1985; Deardorff, 1998).

In applied research, gravity models are used to resolve a broad range of problems in the economics of trade, with economic policy issues occupying an important position. These issues include the creation of various integration and currency unions, as well as the assessment of the corresponding effects. These models are used to obtain econometric estimates of the relationship between foreign trade and economic growth, and the influence of foreign trade on the environment.

The use of gravity models to solve the above-mentioned problems is popular for a number of reasons. Firstly, they are quite precise (from the econometric standpoint) in explaining mutual trade flows between countries. Secondly, they are a sufficiently simple tool to assess the influence of various factors on the dynamics of international trade, besides the standard variables for the basic gravity model. The explanatory capability of the variables of a standard gravity model supports the supposition that the statistical significance of additional variables included in the model (in particular, variables characterising the effects of integrative agreements) attests to their actual significance for a country's for-

eign trade and its economy as a whole. For the purposes of studying various economic policy measures, gravity models use not only variables, characterising the effects of the presence or absence of tariffs, but also additional variables reflecting countries' various political and institutional characteristics, which may affect international trade. In addition, gravity models are also used to analyse the trade flows of goods and services (Kimura, Lee, 2006).

The gravity model can be estimated with the use of both cross-section data (data for one year or the average of several years for each pair of countries), and panel data (data for several years for each pair of countries). Most modern studies that apply gravity models use panel data. Currently, studies that use cross-section data are quite rare. Excluding time — an important source of variation– from the analysis may lead to inconsistent econometric results (Matyas, 1997). Therefore, gravity models based on cross-section data may produce unstable results (Ghosh, Yamarik, 2004). In addition, the use of panel data enables the consideration of the interconnections between the variables in time and the individual effects between trade partners (Nowak-Lehmann et al., 2007).

Kepaptsoglou, et al. (2010) analyse over 50 papers with the use of the gravity model. The authors conclude that despite some criticism during the initial years of this tool›s application to analyse trade flows and the impact of regional trade agreements, over the last decade it has become one of the main research tools. The main areas of this approach›s development were focused on improving the model›s theoretical grounds and the econometric methods of estimation.

GDP, GDP per capita, and distance between pairs of countries are the most commonly used indicators in gravity models to characterise the supply and demand (the variable-masses and proximities). Variables such as a common language and border are commonly used as dummy variables, which are often useful to assess the effect of various regional trade agreements, customs unions and currency unions.

In terms of econometric methodology, lately OLS in its pure form is used extremely rarely to estimate the gravity model. Commonly used models include fixed and random effects, which enable the consideration of countries› interaction in space and over time. At the same time, the choice of the model depends on the aim of the study, the qualities of the data being analysed and the theoretical reasoning upon which the model is based. In this regard, Egger (2002) notes that the fixed effects model is more suitable for short-term forecasts. The random effects model can also be used provided this approach is adequate given the available data and the aim is to assess the effects of constants over time. Overall, however, most empirical studies rely on fixed effect gravity models.

Although gravity models are widely used to assess the effects of RTAs, the results obtained with their help do not provide a well-defined result vis-à-vis the creation and diversion effects (Baier, Bergsrtand, 2007; Kepaptsoglou, et al., 2010). At the same time, research shows that RTAs lead to a significant increase in trade between member states, often at the expense of countries that are not included in such agreements (Carrere, 2006). Baier and Bergsrtand (2007) attempted to shed light on the impact of creating FTAs while considering the theoretical foundations of this issue and modern econometric research, viewing the FTA as an endogenous factor. The results showed that FTAs indeed have a

significant impact on the development of trade. It is notable that the consideration of possible endogeneity, when assessing the impact of FTAs in the gravity model, is an important area in the studies and applied analysis of the consequences of integration agreements.

Although the gravity model is a traditional and universal tool to analyse trade flows and the effect of regional integration agreements, lately some authors have criticized the econometric methodology and its estimations. Zwinkels and Beugelsdijk (2010) pose the question of whether the "workhorse" is actually a Trojan horse due to its inadequate econometric methodology when assessing the gravity model. In their work, the authors focus on three main problems: 1) non-stationarity of data used to assess the gravity model, and the problems that arise due to not considering this circumstance, 2) overestimated coefficients of the gravity model in case inadequate econometric methodology is used, and 3) methods of estimating the gravity model for non-stationary data.

The problem of non-stationary variables conceals a hazard when using the gravity model since ignoring this fact and using econometric analysis methods that are inadequate to the situation results in an incorrect specification of the model. If the first differences of non-stationary variables are used, making them stationary, then in the case of a gravity model, we are faced not only with the loss of important information pertaining to the long-term, but also the impossibility of considering the effects of various integration initiatives reflected by the dummy variables, which are stationary variables.

Zwinkels and Beugelsdijk (2010) demonstrate that the use of an adequate econometric methodology to assess the gravity model, as compared to the traditional approach, results in a lower statistical significance of model coefficients and a lower absolute effect of most of the model's variables. It is clear that overestimated coefficients in the traditional gravity model may provide mistaken reference points for economic policy. In connection with this, it is sensible to revisit the previously obtained estimates of gravity models as a whole, and vis-à-vis the impact of variables characterising the effects of RTAs. Thus, despite the enormous popularity of gravity models, paying attention to the dynamic properties of data and using an adequate method of econometric analysis are of utmost importance. Otherwise, researchers risk their gravity model becoming a Trojan horse instead of the tried-and-true "workhorse" of empirical analysis.

The problems of non-stationary variables, the possibility of their co-integration and the use of gravity model estimation methods adequate to the given situation are also examined in a number of other works (see, for example, Fidrmuc, 2009; Gomez, Tamarit, 2011; Camarero, Gomez, Tamarit, 2013). However, these works are still the exception rather than the norm in the plethora of publications relying on the gravity model.

4.1.2. Merits and drawbacks

As a whole, the gravity model is a tool of ex-post analysis, which is both its strength and weakness. On the one hand, the researcher is working with an empirically stable relationship that is based on a large amount of statistical data and having sound theoretical support. On the other hand, the gravity model cannot provide answers to many questions that arise when analysing the possible consequences of RTAs, and it also cannot reflect

the effects on the change of the main macro-economic indicators and the dynamics of welfare.

It is worth noting that the gravity model nevertheless enables the researcher to "look into the future," despite its pronounced ex-post character. Considering the existent effects of various free trade agreements in other countries and their blocs, the possible effect on other countries can be extrapolated and the consequences of integration initiatives can be evaluated. In addition, the gravity model enables an evaluation of the potential that is unused due to non-membership in various integration unions.

When using the gravity model, as with any other econometric method of analysis, the quality of the statistical data and the ability to adequately reflect economic policy related variables are of great importance. In addition, the econometric methodology must be used adequately when assessing the gravity model, considering the possible non-stationarity of the main variables and the presence of long-term linkages between them. Accounting for the fixed and random effects during modelling is important as well, as is the problem of exogeneity of the variables included in the model. Therefore, to obtain high-quality results when using a gravity model, the researcher must be familiar with the latest research developments and their use in applied analysis.

In the presence of good proxy variables characterising economic policy measures, the gravity model can be used for counterfactual experiments, which enable a simulation of the consequences of various economic or political decisions in the realm of regional integration. Since the gravity model is not suitable for assessing the impact of integration on the dynamics of the main macroeconomic indicators and welfare, CGE models should be used for this purpose. At the same time, the gravity model serves as an important analytical tool for conducting a complex assessment of the effects of non-tariff barrier removal. This will be discussed in the respective section.

4.2. Other econometric methods

The gravity model is the main econometric tool to analyse the economic effects of regional integration agreements. However, other methods of econometric analysis can be used for this as well.

One interesting approach is related to the gravity model, but instead of using it alone, it incorporates it into a system of simultaneous equations along with the FDI data (Mitze, 2012). At the same time, the system uses export, import, and FDI inflow and outflow data. In this case the determination of exogenous variables and econometric methods of assessing the system of equations are of great importance.

To assess the impact of RTAs on the main macro-economic variables, a wide range of econometric models may be used to account for the effects of regional integration by including the appropriate dummy variables in the model. Both vector autoregressions, and vector autoregressions with an error correction mechanism, may be used, along with various types of production functions that account for both short-term and long-term aspects of economic dynamics. These types of models can be built for a separate country or a group of countries using panel data and the respective econometric meth-

odology. Overall, they will inherit all of the characteristics that were noted during the analysis of the possibilities of applying gravity models to assess the effects of RTAs.

Various types of econometric model enable a comprehensive analysis of regional integration processes, without being limited to just international trade. They take other aspects into account as well, such as economic growth, total factor productivity, FDI, and migration flows. As with the gravity model, when using them it is important to consider the specifics of the analysed data, and to apply adequate econometric methods that correspond to these specifics.

5. Other Methods to Assess the Effects of Regional Trade Agreements

Besides using general equilibrium models to assess the economic impact of creating an RTA, **partial equilibrium models** can be used as well. They allow the researcher to analyse the static effects of membership in a RTA on a sector that is particularly important to the economy, for example — agriculture (Naanwaaba, Yeboah, 2012). They assess the effects of various measures stipulated in the agreement (elimination of tariffs, reduction of non-tariff barriers, and application of the country of origin rule) (Fetzer, Rivera, 2005). These models are simpler than general equilibrium models since they do not require an interrelation between various markets. Michalopoulos and Tarr (1997) used the partial equilibrium model to examine the static effects of membership in the CIS Customs Union[9], which has a lower tariff than the CU. The conclusion drawn from assessing the impact of a common foreign tariff on these countries was that membership in this preferential trade agreement leads to diminished welfare in these countries.

Models based on **input-output tables (IOTs)** represent another possible tool for ex-ante analysis of various integration effects. This approach is well developed in Russia and Ukraine. There is certain positive experience in assessing integration effects among CIS countries, particularly for analysing the impact of Ukraine's accession to the Customs Union. An overview of this method and the practical results of its application to assess the impact of regional integration on CIS countries and the Customs Union are presented in the EDB report (Centre for Integration Studies, 2012), "Comprehensive assessment of the macroeconomic effects of various forms of deep economic integration of Ukraine and the CU member states".[10] In Russia the recognised expert in input-output modeling is the Institute of Economic Forecasting of the Russian Academy of Science.

This model enables simulation estimations to be made based on a complex of intra-industry macro-economic models of an agreement's member states. Analogously to general equilibrium models, various integration scenarios can be developed.

OECD and WIOD constructed a system of balances for all EU countries, developed and developing countries (including Russia). Besides, there exists an integrated inter-industry balance of the world economy. The data series cover 1995–2009.

Despite this method's significant analytical potential, it has certain limitations when used to assess the economic effects given various scenarios of interaction between the EEU and the EU, especially a deep and comprehensive free trade area:

- This approach does not provide an assessment of a number of important aspects associated with progress toward increasingly complex forms of integration. These aspects include, importantly, the consideration of the impact of non-tariff barrier

[9] This refers to the Belarus, Kazakhstan and Russia's Customs Union, which was established in 1995. Kyrgyzstan acceded in 1996, followed by Tajikistan.

[10] See http://www.eabr.org/r/research/centre/projectsCII/ukraine/.

reduction/elimination and the movement of labour. The latest studies show that precisely these effects may have the greatest impact on integrating countries.

- It is important to show which impact an RTA would have on RoW (e.g., main trade partners of the EU and EEU), including not only trade, but also general economic and sectorial effects. IOT method does not allow providing such estimates.

Various indices are used to assess the consequences of countries' membership in RTAs as well. Such indices allow an assessment of the following (Mikic, Gilbert, 2007):

- How dependent a country is on trade, including regional trade (its openness to foreign trade, i.e. export and import vis-à-vis the GDP; the import penetration index showing which portion of the internal demand is satisfied by import, including from partner states; marginal propensity to import, i.e. how much import changes as a result of GDP growth; the trade concentration index by goods and services; and the intra-industry trade index);
- Which commodity/sector is developing most rapidly and growing both within the region and in trade as a whole (export trade structure, goods export growth rates);
- What the export basket looks like to partner countries and non-member states of the RTA from the standpoint of the revealed comparative advantages (indices of the revealed comparative advantages for separate commodities and groups of commodities, both for export to RTA member states and non-member states);
- Is the growth of intraregional trade related to supply to one specific country, or is it equally distributed among member states (the specific weight of separate RTA member states in the import and export);
- How intense is trade within the regional trade agreement (trade intensity index, adjusted regional export share, i.e. the correlation of the intraregional export share to the share of the region's export in world trade);
- How complementary is trade within the trade agreement (trade complementarity index);
- Is trade undergoing a geographic shift after a country's accession to the RTA?

These indices can be useful for both ex-ante and ex-post estimations. In the ex-ante case, they are able to quickly provide information on: the state of trade agreements with future partners; the similarity of the export and import profiles; and countries' revealed comparative advantages in trade with potential member states and the rest of the world. This allows a preliminary estimation of the pros and cons of acceding to a given RTA at the initial negotiations stage.

Indices can also be used to assess the creation and diversion trade effects in ex-post analysis. For example, Yeats (1997) proposed a method that involves comparing the trade intensity index to the revealed comparative advantage index. The first index shows how the intensity of trade between countries corresponds to their global export and import positions. The second index enables an assessment of whether a country has comparative advantages in trading in specific goods, both in the markets of RTA member states and non-member states. Comparing these two indices indicates whether increasing the trade intensity is in line with improved comparative advantages, or in other words,

whether a country is able to export the given type of commodity to markets of "the rest of the world" with the same success. A negative answer is an indication of trade diversion.

In analysing regional economic connections and assessing the regional integration potential, the EDB System of Indicators of Eurasian Integration (SIEI) (Vinokurov 2010) is of particular interest. It is a tool to monitor and evaluate integration processes in the post-Soviet space, and a comprehensive system comprised of a number of indices covering various aspects of economic, political and social integration. This monitoring system has been recognised by the international expert community as one of the best regional integration monitoring systems, on par with the EU and ASEAN.

SIEI includes nine main indices and two integrating indices aimed at assessing integration in the region and covering various aspects of the regional integration process. SIEI also includes the following blocs: market integration in the realm of trade and labour migration, as well as interaction in key functional areas (agriculture, education and energy); the convergence of the main characteristics of post-Soviet countries' economies; and quality characteristics of the functionality of integrative groups in the CIS region based on an exert survey. The results obtained are relevant both for assessing the integration process over the recent decade, and for revealing the potential of integrative cooperation between countries. SIEI includes a broad spectrum of indicators reflecting both the interaction between pairs of countries, and integration in the post-Soviet space as a whole and in its separate sub-regions.

One example of how the SIEI can be applied to assess the potential of regional economic integration is Libman and Vinokurov (2011), which examines regional economic connections between Central Asian and CIS countries. The authors answer whether regionalisation in Central Asia is more pronounced than the connection between these countries and the rest of the CIS countries and whether there is a valid reason to view Central Asia as a natural integration region on its own. The econometric analysis, based on SIEI data, allows the researchers to conclude that Central Asia does not represent an independent integration zone. Instead, it is an inherent part of the CIS regionalism. Perhaps the field of such instruments' application to analyse integration processes can be extended.

Approaches to assess economic growth and the productivity function are also used to assess dissemination of new technologies through trade and investment. The focus is to evaluate the impact of trade-related effects and technological dissemination on the total factor productivity (Schiff, Wang, 2003). This type of analysis enables an assessment of the influence of increasing openness of the less developed countries' economies on the dissemination of technological innovations from more developed countries. This allows the researcher to detect the impact of economic openness on economic growth, and total factor productivity, through the influence of new technologies.

6. Assessing Effects of Non-Tariff Barrier Reduction

Most studies of the effects of creating RTAs analyse the consequences of trade policy changes through the prism of import tariffs (elimination of tariffs between the RTA member states, and establishment of a common tariff). However, in recent years, especially following multilateral trade liberalisation under the WTO, non-tariff barriers (NTBs) are becoming a serious obstacle to the movement of goods and services. Although this topic has been discussed in economic studies, there are few works that, in analysing RTA effects, examine both the influence of NTBs on the economies of integrating countries, and the influence of their reduction or removal. This is related to the complexity and difficulty of the topic of NTBs. A versatile approach is required to their definition, classification and inventory taking, as well as their quantitative assessment.

It is worth noting that for a long time there was no single definition of NTBs. One of the first definitions of NTBs was presented by Baldwin (1970), who said that NTBs are any measures (public or private) that lead to the distribution of international flows of goods and services, as well as resources used to produce these goods and services, such that the potential real world income is reduced. According to the OECD glossary, 'non-tariff barriers' refers to all barriers to trade that are not tariffs.[11] At present the most popular definition is UNCTAD's, which says that non-tariff measures (NTMs) are policy measures, other than ordinary customs tariffs, that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both (UNCTAD, 2010). It is notable that UNCTAD's definition does not include services.

The lack of a clear definition of NTBs has led to various approaches to their categorisation and classification (Laird, Yeats 1990; Laird, Vossenaar, 1991;[12] Deardorff, Stern, 1997). In 1994 UNCTAD unified the classification proposed by Laird and Vossenar and supplemented it with its own developments, creating the Trade Analysis and Information System (TRAINS), which includes a system of NTB coding and classification. At the same time, in 2007–2012 UNCTAD continued working on the description and systematisation of non-tariff barriers, which resulted in a new classification and received the approval of a number of international organisations (MAST — Multi-Agency Support Team; this group includes FAO, OECD, UNCTAD, UNIDO, IMF, World Bank, ITC and WTO). Here NTBs are categorised into three broad areas, having a tree/branch structure — technical and non-technical measures pertaining to import and export. Then each area is divided into chapters, which are further differentiated into several subgroups. In total, the classification encompasses 16 NTB chapters, designated by the letters A — P, covering every possible area of non-tariff regulation, including, besides standard technical, sanitary and phytosanitary measures, such NTBs as finance measures, those measures affecting competition, trade-related investment measures, distribution restrictions, post-sales services, government procurement restriction measures, rules of origin, and

[11] http://stats.oecd.org/glossary/detail.asp?ID=1837.

[12] A description of this classification can also be found in Bora, Kuwahara, Laird. (2002).

protection of intellectual property rights. Each individual chapter is divided into groupings with depth up to three levels (one, two and three digits, following the same logic as the Harmonised System classification for products; for further details, see UNCTAD, 2012). This classification is presently being used by UNCTAD to collect information and create an NTB database.

Collecting information on NTBs and producing an adequate inventory is in itself a laborious and sometimes impossible task. Even if this endeavor succeeds, unlike tariffs, NTBs are not values that can be measured directly, thus requiring the use of certain methods to facilitate their quantitative expression.

Besides classification, the important questions to be discussed are the quantification of NTBs, and the assessment of their effects on countries' economies. This problem was examined in works by Deardorff and Stern, (1997), Bora et al. (2002), Kee, Nicita and Olarreaga (2009), Ferrantino (2006), as well as other authors who developed several methods to measure NTBs and assess their impact. The most widely used of these methods are frequency-type measures, price gap, i. e. price of tariff equivalents of NTBs, price-based and quantity-based econometric methods, and simulation methods. However, despite the broad range of cited methods, some NTBs are still difficult to measure in the quantitative sense.

The difficulties of measuring NTBs in turn make it problematic to assess their economic and sectoral effects. As noted by David Hummels (Hummels, 2001), "non-tariff barriers of various sorts and structural impediments are less obvious and perhaps more interesting, but also much more difficult to directly measure. As a consequence, researchers rely primarily on indirect methods: positing a model of bilateral trade flows and correlating flows with proxy variables meant to represent trade barriers." The most commonly used NTB proxy variables are dummy variables, frequency and coverage ratios, ad valorem equivalents and computable variables (including various types of indices). At the same time, their use to calculate a proxy variable can significantly affect the results of estimations of NTB impact on economy and trade. For example, dummy variables are a quite rough NTB approximation, in contrast to, for example, design variables and partially indices. However, the latter are usually difficult to link to trade policy or any other policy, and accordingly, their influence on trade and economy is also difficult to assess.

In the most general sense, it is customary to assume that NTBs exert an influence either by raising the costs of running a business, or by restricting the market access. Therefore, another important question is which quantitative methods should be used to assess these effects. At present, the most popular methods for assessing NTB influence are econometric models and CGE models. Gravity models are widely used to assess the influence of NTBs on trade and investment. However, general economic and sectoral effects of NTBs can be evaluated only with the help of CGE models. The specified methods are complementary, and in addition, the results obtained using gravity models are often used in CGE models.

Considering the above problems that pertain to defining, classifying and assessing NTBs, until recent times they were not considered sufficiently when analysing the effects of RTAs. However, over the last decade this problem has drawn more attention from re-

searchers. For example, in assessing the impact of establishing a free trade area between Japan and Singapore, Hertel, Walmsley and Itakura (2001) examined the effect of lowering NTBs, namely, reducing the customs-clearing costs. The results of the computations showed that taking measures to encourage trade can lead to an annual $9 bln welfare growth. Fox, Francois and Londono-Kent (2003) used GTAP to study the economic consequences of the costs and border crossing time between the USA and Mexico. The calculations showed that reducing these figures would lead to increased bilateral trade and welfare both in Mexico and the USA.

NTBs are so complex and difficult to eliminate that experts elaborate a stand-alone methodology for *streamlining NTBs* as a viable, even if suboptimal, alternative to scraping them away (Cadot, Malouche, Saez, 2013).

Among the latest studies of the effects of NTBs, some notable works examine the influence of non-tariff measures on trade and investment between the EU and USA as part of creating a common transatlantic market (Ecorys, 2009), and between the EU and Japan (Copenhagen Economics, 2010). Overall, both works have similar methodological foundations.

The study presented by Ecorys (2009) is based on an erroneous analysis of literature on this issue (the authors note that over 40 experts took part in this study), and a unique survey of USA and EU companies (with 5500 respondents, representing 23 economic branches, and covering over 60% of their turnover). Gravity models and CGE were used to assess the effects of NTBs. In addition, interviews were held and problems were discussed with representatives of over 100 business associations and industrial federations, as well as numerous regulation and legal experts. The authors note that the complexity of researching the impact of NTBs on trade requires the use of various analytical methods and information sources. Therefore, a complex approach was applied allowing the NTB problem to be examined from various perspectives.

The NTB index was calculated based on the company survey, and the index was then used to assess the influence of NTBs on trade and investment between the USA and the EU within the framework of gravity models. It is assumed that given the NTB index, the ratio will be negative since higher regulatory measures (a higher NTB index) impede trade and investment. This effect is assessed on the backdrop of other factors, which facilitate/impede trade and investment, in particular, GDP size and the distance between the countries. The authors of the research make use of various approaches to build gravity models, depending on the branch of the economy: trade in goods, services and investments. The analysis, which relies on gravity models, allows the authors to determine the extent to which the trade costs and investment-related costs can be reduced in each sector as a result of NTB unification among the countries being examined (integration unions).

In order to evaluate how lowering NTBs affects the economy of the EU, USA and other countries from the standpoint of costs and benefits, both in the short- and long-term, the work used CGE models. Various scenarios were used in these models to determine how lowering NTB affects GDP, welfare, wages in the high-paid and low-paid areas, as well as trade flows.

The study of the influence of NTBs on trade and investment between the EU and Japan (Copenhagen Economics, 2010) is based on two surveys. The first is a survey of 120 European companies exporting to Japan, and working in its seven key sectors. The aim of this survey was to measure the importance of the list of NTBs for running business, and assessing their impact on company costs. The seven key sectors covered the EU's main export to Japan (automotive industry, pharmaceuticals, medical equipment, food products, transport equipment, telecommunications and financial services). The second survey is a global survey of companies to evaluate the EU's trade costs. It was conducted in 2009 by Ecorys for EU countries (involving 40 countries, and a 100-point scale characterising the limitations faced by countries exporting to the EU).

In the next study, like in the previous one, the survey data was used to assess quantitative NTB measures and was incorporated in gravity models as individual variables. To assess the influence of NTBs on macro-economic figures and welfare, CGE models were used.

The studies reviewed above have a sound theoretical foundation, and a clear empirical analysis methodology. Therefore, in our opinion, this approach should be used as a basis when analysing the effects of NTBs between the EEU and the EU.

One recent study on NTB assessment was carried out by CEPR (2013) to analyse the effects of the possible conclusion of a transatlantic trade and investment agreement (creation of a FTA) between the USA and the EU. This study, using the GTAP CGE model, examines how the removal of tariff barriers and reduction of NTBs between the EU and USA would affect: GDP; production volumes in economic sectors; bilateral trade; wages; and movement of labour. The model computations were carried out using two scenarios. The first envisages a 10% reduction of NTB-related costs and a nearly full elimination of tariffs. In the second scenario, NTB-related costs were reduced by 25%, while the tariffs were eliminated. In the NTBs reduction scenarios, the authors assumed that these barriers cannot be removed completely, and according to the Ecorys 2009 survey, only 50% of NTBs can be eliminated with the help of various measures and procedures. Therefore, the second scenario supposed that these barriers would be removed halfway, with the total NTB reduction being 25%. The NTBs' influence was evaluated, in the model, through a rise in costs, or through an additional markup on goods, and in the case of rent-seeking NTBs by restricting market access. The influence of these two types of NTBs was distributed in a 60:40 proportion.

According to the results of the analysis, for both scenarios the reduction of non-tariff barriers had a greater effect on GDP and exports than tariff elimination. On the sector-specific level, reducing NTBs to goods and services also had a significant impact on the production volume. For example, eliminating tariffs would have a negative impact on the production of motor vehicles in the EU, while lowering NTBs would result in growth in this sector.

The study also assessed the influence of NTBs on the labor market and FDI inflow. The results of the calculations indicated significant positive effects, both for the USA and for the EU. Overall, one of the key conclusions of the study is that lowering NTBs is very important for a transatlantic free trade area.

Conclusions and Recommendations

It is expected that the Eurasian Economic Union (EEU) will be successfully established in 2015. Against this background, international interest in this integration bloc is noticeably rising. In our opinion, EU-EEU deeper economic integration will become an important part of the international agenda in the years to come, and may result in a comprehensive agreement in the 2020s.

Therefore, researchers and analysts are tasked with elaborating detailed estimates of the possible consequences of such integration, and creating a forward-looking agenda for future negotiations. In obtaining such estimates, it is worth noting that it is in the genuine interest of the EEU member states to push for a deep and comprehensive integration with the EU, not a shallow free trade agreement (since a mere FTA would be counterproductive due to an existing EU-EEU trade structure).

In our opinion, a large-scale study of the effects of economic integration could proceed in three stages:

1. *Deep economic integration between the EU and the EEU: identifying the barriers.* Research of the current state of affairs, including trade barriers and NTBs, regulatory differences, and borderline issues. Essentially, this is a revision of the existing obstacles to economic integration.
2. *Deep economic integration between the EU and the EEU: quantitative assessment of the effects under various scenarios.* This stage is based on the first stage of the proposal. It includes modelling and a quantitative assessment (static CGE models, preferably with dynamic elements, complemented by other methodological approaches).
3. *Development of a set of political recommendations for holding asymmetric negotiations.* Figuratively speaking, the negotiating parties will have to bargain with a variety of 'chips' in their hand. It is therefore necessary to understand the absolute and relative value of these 'chips' and how they can be traded in order to find suitable consensus.

When assessing the effects of a deep and comprehensive free trade agreement between the EEU and the EU, it is worthwhile to use various quantitative analysis methods. This enables the researchers to examine the diverse consequences of economic integration and obtain more reliable estimations.

The choice of each method will depend on the tasks being addressed at each specific stage of the study, as well as the availability of data. Particularly, at the earliest, preliminary stages of the research, it is advisable to use simple and informative methods of analysis — namely, index calculations, which make it possible to assess:

- how dependent the EEU member states are on trade with the EU (openness to foreign trade, i.e. export and import vis-à-vis GDP; the import penetration index showing which portion of the internal demand is satisfied by import, including from the EU; marginal propensity to import, i.e. the degree to which import from

the EU changes as a result of GDP growth; the trade concentration index by goods and services; and the intra-industry trade index);

- which commodity/sector is developing most rapidly and growing both within the EEU and in trade with the EU (export trade structure, export growth rates);
- what the export basket of EEU member states to the EU and the rest of the world looks like from the standpoint of the revealed comparative advantages (indices of the revealed comparative advantages for separate commodities and groups of commodities);
- how intense is trade within the CU and between the CU and EU (trade intensity index, adjusted regional export share, i.e. the correlation of the intraregional export share to the share of the region's export in EU export);
- how complementary is trade between the EEU and the EU (trade complementarity index).

For *ex-ante* assessment, more complex methods should also be used, in particular, CGE models. These facilitate a scenario-based assessment of the static effects, both of simple forms of integration (removal of tariff and non-tariff barriers) and of deeper agreements involving the removal of restrictions including on the movement of capital and labour, and regulatory convergence. However, when using such models, their limitations should be taken into account. Therefore, quantitative assessments of economic/trade policy changes obtained using CGE models *are valuable not from the standpoint of specific numerical values, but in terms of the degree of the impact of these changes on the economy of a country or group of countries. This facilitates an understanding of which option of economic/trade policy is preferable*.

Despite their existing limitations, CGE models are currently an indispensable tool for ex-ante analysis. They enable simulation modelling of various scenarios and forms of regional integration, and an assessment of their impact on: the economy as a whole; individual sectors and trades; the population's income; movement of labour; and ecology.

To assess the consequences of creating a FTA between the EEU and the EU, the best tool to use is the CGE model implemented with the help of the General Algebraic Modeling System (MPSGE/GAMS). Dynamic models have a number of strengths compared to static models. They enable a better estimation of long-term effects, and envisage the movement of capital between regions. However, due to the complexity of these models, they do not always produce results of acceptable quality. Using MPSGE/GAMS may be better than using standard GTAP models implemented with specialized GEMPAC software. This is because the social accounting matrices included in the latest GTAP data base rely on input-output tables for the reference years 2004 and 2007 (base year), which do not fully reflect the current trends of the EEU member states' economic development. One of the strengths of CGE models implemented with MPSGE/GAMS is the ability to use up-to-date information as the reference year, particularly the latest available input-output tables, both for each individual country and aggregated for three countries.

Input-output models (IOTs) can serve as another possible tool for *ex-ante* analysis. This approach is particularly developed in several CIS countries, notably Russia and Ukraine.

These models enable simulation computations based on a set of intra-industry macro-economic models of the involved countries. Various integration scenarios can be developed, similarly to general equilibrium models. There is certain positive experience in assessing integration effects among CIS countries, particularly for analysing the impact of Ukraine's accession to the Customs Union. Despite this method's significant analytical potential, it has certain limitations when used to assess the economic effects given various scenarios of interaction between the EEU and the European Union, especially a deep and comprehensive free trade area. We analyse these constraints in Section 5.

Partial equilibrium models can also be used to assess the impact of an EU-EEU FTA on individual sectors at the ex-ante analysis stage. However, when using such models, the researcher must also note that they have the same weaknesses as general equilibrium models.

Gravity models also enable the researcher to look forward to some extent. Considering the already manifest effects of various free trade agreements in other countries and their blocs, the possible effect on the researched countries can be extrapolated and the consequences of integration initiatives can be computed. In addition, the gravity model enables an evaluation of the potential that is unused due to non-membership in various integrative unions. In this context, the gravity model can be used for ex-ante analysis of the impact of an EU-EEU deep free trade area.

When using the gravity model, as with any other econometric method of analysis, the quality of the statistical data and the ability to adequately reflect variables related to economic policy are of great importance. In the presence of good proxy variables characterising economic policy measures, the gravity model can also be successfully used for counterfactual experiments. These allow the simulation of the consequences of various economic or political decisions in the realm of regional integration.

NTBs can have an enormous impact on the economies of integrating countries, and it is difficult to assess this impact. It is therefore expedient to apply a combination of various interrelated methods, as elaborated below.

1. Direct trade costs estimates, based on data from surveys of EEU and EU companies (previously available data from EU surveys can probably be used for this purpose). The surveys should be carried out for the most important branches of the economy.
2. Gravity models that incorporate variables (NTB indices) calculated based on these surveys.
3. CGE models enabling the assessment of the short- and long-term effects of lowering NTBs on the main macro-economic indices and welfare.

Such a study should be founded on a list of NTBs. At the same time, not all problems designated in the survey of business representatives and decision-makers are considered NTBs. Therefore, the list should be based on four primary criteria:

- Impact: an assessment of the problem's impact on trade
- Problem: a clear definition of the problem upon which the NTB is founded
- Problem's resolvability: certainty that the problem can be resolved
- Tools: definition of the tools for eliminating the NTB

The company survey assumes that initial and direct information on the existing NTBs will be obtained for the main economic branches. Overall, these surveys allow an assessment of NTBs' influence on various links of the supply chain, from the product's manufacture to its purchase by a consumer. It is expedient to use a ten-point scale of restrictions, and to assess the NTB's importance relative to other trade limiting factors (e.g., language differences, taxes, labour costs, cultural differences, consumer preferences, the price and availability of land, and tariffs). Next, a quantitative assessment of the NTB should be made. In particular, the trade cost equivalents should be estimated, along with the impact of NTBs translated to a tariff equivalent on trade (the price rise percentage resulting from the NTB).

Gravity models are a traditional tool used to analyse the impact of NTBs on trade. There are two possible approaches to using them. First, gravity models may be used without additional survey data. As a rule, this approach uses a gravity model of global trade flows for sectors over several years among all trade partners. This approach is expedient to use for economic sectors (for example, the services sector) in cases when there is a shortage of available data on trade, and there is no company survey data. Secondly, there are gravity models that include survey data (NTB indices).

It is worth noting that when using gravity models to assess the influence of NTBs, problems related to these models' specification should be taken into account (non-stationarity of data, the possibility of co-integration between them). This is elaborated in the above section on gravity models. In addition, an NTB as an individual gravity model variable can be endogenous. Therefore, when assessing the model in this case, the respective econometric methodology should be used.

CGE models are used to model the impact of NTBs on macro-economic indicators and welfare, and to carry out scenario-based computations. At the same time, various scenarios include a pronounced long-term element. They allow an estimation of the potential effect of lowering NTBs and regulatory unification between countries (integration unions), for example, for a ten-year period. In this context, CGE models serve as a very important element for analysing the impact of NTBs on trade.

Thus, the above analysis of the applied methods shows that, when used separately, none of them allows a comprehensive assessment of the impact of an EU-EEU deeper economic integration. A combination of these methods should therefore be used based on their strengths, weaknesses, capabilities and limitations. In addition, a limiting factor to the use of any given method is the availability of the required quantitative or qualitative data (for example data on NTBs, and restrictions to the movement of labour and capital). If the required information is available, it is best to utilise all of the above methods since the combination facilitates an analysis of the various aspects of the multi-faceted regional integration phenomenon. In this case, quantitative methods of analysis will not compete, but will complement one another. It is important to note that these methods are being actively developed. Therefore, when using them, new scientific developments presented in the economic literature should be used in the applied analysis. This will ensure the most high-quality and reliable results.

REFERENCES

Anderson, J. E. (1979) A theoretical foundation of the gravity equation, *American Economic Review*, 69, 106–16.

Anderson, J. E., van Wincoop, E. (2003) Gravity with gravitas: a solution to the border puzzle, *American Economic Review*, 93, 171–92.

Armington, P. S. (1969) A theory of demand for products distinguished by place of production, *International Monetary Fund Staff Papers*, 16, 159–76.

Arrow, K. J., Debreu, G. (1954) Existence of an equilibrium for a competitive economy, *Econometrica*, 22, 265–90.

Bacchetta, M. et.al. (2012) A practical guide to trade policy analysis, UN and WTO.

Baier, S., Bergstrand J. (2004) Economic determinants of free trade agreements, *Journal of International Economics*, 64, 29–63.

Baier, S.L, Bergsrtand, H. (2007) Do free trade agreements actually increase members' international trade? *Journal of International Economics*, 71, 72–95.

Baldwin, R. (1970) Non-tariff Distortions in International Trade, Brookings Institution, Washington DC.

Baldwin, R. (1992) Measurable dynamic gains from trade, *Journal of Political Economy*, 100, 162–174.

Baldwin, R., Venables, A. (1995) Regional Economic Integration. In Grossman, G., Rogoff, K., (eds.) *Handbook of International Economics, vol. III,* Amsterdam, North-Holland.

Behar, *A*., Cirera i Criville, L. (2011) Does it matter who you sign with? Comparing the impacts of North-South and South-South trade agreements on bilateral trade, *Policy Research Working Paper No. 5626*, World Bank.

Bergeijk, P. A. G., Brakman, S. (2010) Introduction: The comeback of the gravity model. In Bergeijk, P. A. G., Brakman, S. (eds.), *The gravity model in international trade: Advances and Applications*, Cambridge University Press.

Bergstrand, J. H. (1985) The gravity equation in international trade: Some micro economic foundations and empirical evidence, *Review of Economics and Statistics*, 67, 474–481.

Bhagwati, J., Panagariya, A. (1996) The theory of preferential trade agreements: Historical evolution and current trends, *American Economic Review*, 86, 82–87.

Blomstrom, M., Kokko, A. (1997) Regional integration and foreign direct investment: A conceptual framework and three cases, *Policy Research Working Paper* 1750, World Bank

Bohringer, C., Rutherford, T., Wiegard, W. (2003) Computable general equilibrium analysis: Opening a black box, *Discussion Paper 03–56*, Center for European Economic Research.

Bora, B., Kuwahara, A., Laird, S. (2002) Quantification of Non-Tariff Measures. UNCTAD. *Policy Issues in International Trade and Commodities Study Series No. 18*.

Brada, J. C., Mendez, J. A. (1988) An estimate of the dynamic effects of economic integration, *Review of Economics and Statistics,* 70, 1, 163–168.

Burfisher, M., Robinson S., Thierfelder K. (1998) Farm policy reforms and harmonization in the NAFTA, *Agricultural Economic Report No. 771*, U.S. Department of Agriculture, Washington, D.C.

Bustos, P. (2011). Trade liberalization, exports, and technology upgrading: Evidence on the impact of MERCOSUR on Argentinian firms, *American Economic Review* 101 (1), 304–340.

Cadot, O., Carrere, C., de Melo J., Portugal-Perez, A. (2005) Market access and welfare under free trade agreements: textiles under NAFTA, *World Bank Economic Review*, 19, 379–405.

Cadot, O., Malouche, M., and Saez, S. (2013) *Streamlining Non-Tariff Measures. A Toolkit for Policy Makers*. World Bank: Washington, D.C.

Camarero, M., Gomez, E., Tamarit, C. (2013) EMU and trade revisited: Long-run evidence using gravity equations, *The World Economy*, 36, 1146–1164.

Carrere, C. (2006) Revisiting the effects of regional trade agreements on trade flows with proper specification of the gravity model, *European Economic Review*, 50, 223–47.

CASE (2007) *Global Analysis Report for the EU-Ukraine TSIA*. Ref: TRADE06/D01. Concept Global Analysis Report prepared by ECORYS and CASE.

Centre for Integration Studies (2012) *Comprehensive assessment of the macroeconomic effects of various forms of deep economic integration of Ukraine and the member states of the Customs Union and the Common Economic Space*. Report no.1. Eurasian Development Bank: St. Petersburg.

CEPR (2013) *Reducing Transatlantic Barriers to Trade and Investment: An Economic Assessment*. Project Report prepared by Francois, J., Manchin, M., Norberg, H., Pindyuk, O., Tomberger, P. under implementing Framework Contract TRADE10/A2/A16.

CEPS (2006) *The Prospect of Deep Free Trade Between the European Union and Ukraine*. Report prepared by the Centre for European Policy Studies (CEPS), Brussels, Institut fur Weltwirtschaft (IFW), Kiel; International Centre for Policy Studies (ICPS), Kyiv. CEPS: Brussels.

Cipollina, M., Salvatici, L. (2010) Reciprocal trade agreements in gravity models: A meta-analysis, *Review of International Economics*, 18, 63–80.

Coe, D.T., Helpman, E. (1995) International R&D Spillovers, *European Economic Review*, 39, 859–887.

Copenhagen Economics (2010) *Assessment of Barriers to Trade and Investment between the EU and Japan,* (TRADE/07/A2), Report prepared by Francois, J.F., Sunesen, E.R and Thelle, M.H. for the European Commission, Directorate-General for Trade, Reference: OJ 2007/S 180–219493.

Deardorff, A., Stern, R. (1997) Measurement of Non-Tariff Barriers, *OECD Economics Department Working Papers*, No. 179, OECD Publishing.

Deardorff, A.V. (1998) Determinants of bilateral trade: Does gravity work in a neoclassical world? In Frankel, J. (ed.), *The regionalization of the world economy*, Chicago University Press, Chicago.

Dee, P., Gali, J. (2005) The Trade and Investment Effects of Preferential Trading Arrangements, *NBER Working Paper Series*, Cambridge.

Djankov, S., Freund, C. (2000) Disintegration and Trade Flows Evidence from the Former Soviet Union, *Policy Research Working Paper,* World Bank, 2378.

Ecorys (2009) *Non-Tariff Measures in EU-US Trade and Investment — An Economic Analysis*. Report prepared by Berden, K., Francois, J. F., Tamminen, S., Thelle, M. and Wymenga, P. for the European Commission, Reference OJ 2007/S180–219493.

Egger, P. (2000) A note on the proper econometric specification of the gravity equation, *Economics Letters*, 25–31.

Egger, P. (2002) An econometric view on the estimation of gravity models and the calculation of trade potentials, *The World Economy*, 2002, 25, 297–312.

Egger, P., Larch, M. (2008) Interdependent preferential trade agreement memberships: An empirical analysis, *Journal of International Economics* 76, 384–399.

European Commission (2006) *Handbook for Trade Sustainability Impact Assessment*.

Faruqee, H. (2004) Measuring the trade effects of EMU, *IMF Working Paper*, WP/04/154.

Ferrantino, M. (2006) Quantifying the Trade and Economic Effects of Non-Tariff Measures, *OECD Trade Policy Working Paper* No. 28, TD/TC/WP (2005)26/FINAL, OECD, Paris.

Fetzer, J., Rivera, S. (2005) *Modeling modifications in rules of origin: A partial equilibrium approach*. Paper prepared for the 8th Annual conference on global economic analysis, 9–11 June, Lubeck, Germany.

Fidrmuc, J. (2009) Gravity models in integrated panels, *Empirical Economics*, 37, 435–446.

Fox, A., Francois, J., Londono-Kent, P. (2003) *Measuring border costs and their impact on trade flows: the United States-Mexican trucking case*, https://www.gtap.agecon.purdue.edu/resources/download/1492.pdf.

Francois, J. (1998) Scale Economies and Imperfect Competition in the GTAP Model. GTAP Technical Paper No. 16

Fratianni, M. U., Marchionne, F., Oh, C. H. (2011) A commentary on the gravity equation in international business research, *The Multinational Business Review*, 19, 36–46.

Geldi, H. K. (2009) Trade effects of regional integration: A panel cointegration analysis, *Economic Modelling*, 29, 1566–1570.

Ghosh, S., Yamarik, S. (2004) Are regional trading arrangements trade creating? An application of extreme bounds analysis, *Journal of International Economics*, 63, 369–395.

Gomez, E., Tamarit, C. (2011) The Euro effect on trade: evidence in gravity equations using panel cointegration techniques, *WP–EC 2011–07*, Valencian Institute of Economic Research.

Grassini, M. (2009) Rowing along the computable general equilibrium modelling mainstream. *Studies on Russian Economic Development*, March 2009, 20 (2): 134–146.

Grossman, G., Helpman E. (1995) The policy of free-trade agreements, *American Economic Review*, 85,680–690.

Hazledine, T. (1992) A critique of computable general equilibrium models for trade policy analysis, *Working Paper 92–4*, International Agricultural Trade Research Consortium.

Helpman, E., Krugman, P. (1985) *Market structure and foreign trade*, MIT Press, Cambridge, MA.

Henderson, D.J., Millimet, D.L. (2008) Is gravity linear? *Journal of Applied Econometrics*, 23, 137–172.

Hoekman, B., Djankov S. (1997b) Determinants of export structure of countries in Central and Eastern Europe, *World Bank Economic Review*, 11, 3, 471–487.

Hoekman, B., Djankov, S. (1997a) Trade reorientation and productivity growth in Bulgarian enterprises, *Policy Research Working Paper*, World Bank, 1707.

Hummels, D. (2001) Time as a Trade Barrier, *Working paper, Purdue University*.

Ianchovichina E., McDougall R. (2001) Theoretical structure of dynamic GTAP, *GTAP working paper*, 17, Edition 1.1, 1–74.

Jarocinska, E., Maliszewska, M., Scasny, M. (2010) Modeling economic, social and environmental implications of *a* free trade agreement between the European Union and the Russian Federation, *CASE Network Report*, 93/2010.

Jaumotte, F. (2004) Foreign direct investment and regional trade agreements: The Market size effect revisited, *IMF Working Paper*, WP/04/206.

Jensen, J., Rutherford, T., Tarr, D. (2007) The impact of liberalizing barriers to foreign direct investment in services: The case of Russian accession to the World Trade Organization, *Review of Development Economics*, 11, 482–506.

Jinji, N., Xingyuan, Z., Shoji, H. (2012) The Effect of Regional Trade Agreements on Technology Spillovers Through International Trade. *Discussion Paper Series, Kyoto University, Graduate School of Economics Research Project Center.*

Kaitila, V. (2007) Free trade between the EU and Russia: Sectoral effects and impact on Northwest Russia, *ETLA Discussion Paper*, 1087.

Kee, H., Nicita, A., Olarreaga, M. (2009) Estimating Trade Restrictiveness Indices, *Economic Journal*, 119, 172–199.

Kehoe, P., Kehoe, T. (1994) A primer on static applied general equilibrium models, *Federal Reserve Bank of Minneapolis Quarterly Review* 18, vol. 2.

Kemp, M., Henry, W. (1976) An elementary proposition concerning the formation of customs unions, *Journal of International Economics*, 6, 95–98.

Kepaptsoglou, K., Karlaftis, M.G., Tsamboulas, D. (2010) The gravity model specification for modeling international trade flows and free trade agreement effects: A 10-year review of empirical studies, *The Open Economics Journal,* 2010, 3, 1–13.

Kimura, F., Lee, H.H. (2006) The gravity equation in international trade in services, *Review of World Economics*, 142, 92–121.

Krugman, P. (1993) Regionalism versus multilateralism: Analytical note. In de Melo J. and Panagariya A. (eds) *New Dimensions in Regional Integration*, Cambridge, Cambridge University Press.

Laird, S., Yeats, A. (1990) Quantitative Methods for Trade Barrier Analysis, Macmillan, London, and NUUP, New York.

Laird, S., Vossenaar, R. (1991) Why We Should Be Worried About Non-Tariff Measures, *Informacion Comercial Española*, Special Issue on Non-tariff Barriers, November, 31–54.

Libman, A., Vinokurov, E. (2011) Is it really different? Patterns of regionalisation in post-Soviet Central Asia, *Post-Communist Economies*, 23, 469–492.

Linneman, H. (196) An econometric study of world trade flows, North-Holland Publishing, Amsterdam.

Zhang, L. Y., Lu, D. W., Ya-Xiong, Z., Feng, C. S. *The impact of EU-Korea FTA on China's economy and trade: Based on the dynamic GTAP model*. Available at https://www.gtap.agecon.purdue.edu/resources/download/5671.pdf.

Madani, D. (2001) South-South regional integration and industrial growth: The case of the Andean Pact, *Policy Research Working Paper* 2614, World Bank.

Manchin, M. (2004) The economic effects of a Russia-EU FTA, *Tinbergen Institute Discussion Paper*, TI 2004–131/2.

Mancini-Griffoli, T., Pauwels, L. (2006) Is there a Euro effect on trade? An application of end-of-sample structural break tests for panel data, *IHE Working Papers*, 04/2006, The Graduate Institute of International Studies, Geneva.

McDaniel, C., Balistreri, E. (2002) *A discussion on Armington trade substitution elasticities*, U. S. International Trade Commission, Office of Economics Working Paper, 2002–01-A.

Meade, J. (1955) *The Theory of Customs Unions*, Amsterdam: North-Holland.

Michalopoulos, C., Tarr D. (1997) The Economics of Customs Unions in the Commonwealth of Independent States, *Post-Soviet Geography and Economics*, 38, 125–143.

Mikic, M., Gilbert J. (2007) Trade statistics in policymaking: a handbook of commonly used trade indices and indicators, *Studies in Trade and Investment*, Trade Policy Section, Trade and Investment Division, UNESCAP.

Mitze, T. (2012) Trade-FDI linkages in a simultaneous equations system of gravity models for German regional data, in Mitze, T. (ed.) *Empirical Modelling in Regional Science*, Springer.

Mitze, T., Alecke, B., Untiedt, G. (2010) Trade-FDI linkages in a simultaneous equations system of gravity models for German regional data, *International Economics*, 122, 121–162.

Movchan, V., Giucci, R. (2011*) Quantitative assessment of Ukraine's regional integration options: DCFTA with European Union vs. Customs Union with Russia, Belarus and Kazakhstan*, German Advisory Group, Institute for Economic Research and Policy Consulting, PP/05/2011.

Matyas, L. (1997) Proper econometric specification of the gravity model, *The World Economy*, 20 363–368.

Naanwaaba, C., Yeboah, O. (2012) The impact of NAFTA on agricultural commodity trade: A partial equilibrium analysis. Paper prepared for the Southern Agricultural Economics Association Annual Meeting, Birmingham, AL, 4–7 February.

Nowak-Lehmann, F., Herzer, D., Martinez-Zarzoso, I., Vollmer, S. (2007) The impact of a Customs Union between Turkey and the EU on Turkey's exports to the EU, *JCMS: Journal of Common Market Studies*, 45, 719–743.

Paltsev, S., Rutherford, T., Zemnitsky, A. (2000) *Assessment of marginal excess burden of taxation based on a CGE model*, Department of Economics, University of Colorado, mimeo (in Russian): http://web.mit.edu/paltsev/www/docs/tax_russian.pdf.

Panagariya, A. (2000) Preferential Trade Liberalization: The Traditional Theory and New Developments, *Journal of Economic Literature*, 38, 287–331.

Piazolo, D. (1998) *Investment Behavior in Dynamic Computable General Equilibrium Models for Transition Countries*, Kiel Institute of World Economics, Working Paper 879.

Piermartini, R., Teh, R. (2005) Demystifying modeling methods for trade policy, *WTO Discussion Paper*, 10, Geneva: World Trade Organization.

Plummer, M., Cheong, D., Hamanaka, S. (2010) Methodology for impact assessment of free trade agreements, Asian Development Bank.

Plummer, M. G., Cheong, D., Hamanaka, S. (2010) *Methodology for impact assessment of free trade agreements*, Asian Development Bank.

Porojan, A. (2001) Trade flows and spatial effects: the gravity model revisited, *Open Economies Review*, 12: 265–80.

Pyatt, G., and Round, J. I., eds. (1985) *Social Accounting Matrices: A Basis for Planning*, Washington, World Bank.

Schiff M., Wang Y., Olarreaga M. (2002) *Trade-related technology diffusion and the dynamics of North-South and South-South integration*, Policy Research Working Paper Series 2861, The World Bank.

Schiff, M., Wang, Y. (2003) Regional integration and technology diffusion: The case of the North American free trade agreement, *World Bank Policy Research Paper* 3132.

Shepherd, B. (2013) *The gravity model of international trade: A user guide*, ARTNeT Gravity Modeling Initiative, UN.

Shoven, J. and Whalley, J. (1984) Applied general equilibrium models for taxation and international trade: An introduction and survey, *Journal of Economic Literature* 22 (3).

Shoven, J. and Whalley, J. (1992) *Applying general equilibrium*, New York: Cambridge University Press.

Sulamaa, P. and Widgrén M. (2005) Economic effects of free trade between the EU and Russia, *ENEPRI Working Paper* No. 36/May 2005.

The World Bank (2005) *Global Economic Prospects 2005: Trade, Regionalism, and Development,* Washington DC.

Tinbergen, J. (1962*) Shaping the world economy*, Twentieth Century Fund, New York.

Tochitskaya, I., de Souza L. V. (2008) Trade Relations between an Enlarged EU and the Russian Federation, and its Effects in Belarus, *Economic Changes and Restructuring*, Vol. 42, No. 1–2, pp. 1–24.

UNCTAD (2010) Non-tariff Measures: Evidence from Selected Developing Countries and Future Research Agenda, *Developing Countries in International Trade Studies.*

UNCTAD (2012) *Classification of Non-Tariff Measures,* UNCTAD/DITC/TAB/2012/2.

Velde, D. W., Bezemer, D. (2006) Regional integration and foreign direct investment in developing countries, *Transnational Corporations*, 15, 42–69.

Venables, A. (1999) Regional Integration Agreements: A force for convergence or divergence? *Policy Research Working Paper*, World Bank.

Venables, A. (2003) Winners and losers from regional integration agreements, *Economic Journal*, 113,747–761.

Viner, J. (1950) *The Customs Union Issue*. New York: Carnegie Endowment for International Peace.

Vinokurov E. et al. (2010) *EDB System of Indicators of Eurasian Integration*. Eurasian Development Bank: Almaty.

Vinokurov E., Libman A. (2012) *Eurasian Integration: Challenges of Transcontinental Regionalism*. Basingtoke: Palgrave Macmillan.

Walmsley T., Winters A. (2005) Relaxing the restrictions on the temporary movement of natural persons: A simulation analysis, *Journal of Economic Integration*, 20, 688–726.

Walmsley, T. L. and Strutt, A. (2010), *Trade and Sectoral Impacts of the Global Financial Crisis: A Dynamic CGE Analysis*, Paper presented at the 13th Annual Conference on Global Economic Analysis, Bangkok, Thailand. Available at https://www.gtap.agecon.purdue.edu/resources/download/4673.pdf.

Wonnacott P., Lutz M. (1989) Is there a case for free trade areas? In Schott, J. (ed.) *Free trade areas and U.S. trade policy*, Washington, D. C.: Institute for International Economics.

World Bank (2005) *From Disintegration to Reintegration: Eastern Europe and the Former Soviet Union in International Trade*, Washington, DC: World Bank Publications.

Yeats, A. (2000) Does Mecosur's trade performance raise concerns about the effects of regional trade arrangements? *Policy Research Working Paper* 1729, World Bank.

Zwinkels, R. C. J., Beugelsdijk, S. (2010) Gravity equations: Workhorse or Trojan horse in explaining trade and FDI patterns across time and space? *International Business Review*, 19, 102–115.

APPENDIX 1. CGE MODELS: THEORETICAL FOUNDATIONS

Most modern computable general equilibrium (CGE) models are a numerical analogue of traditional general equilibrium models for two sectors. Such models have been used to study the effects of, for example, changes in taxes and tariffs. They were popularised in the 1950s-1960s by James Meade, Harry Johnson and Arnold Harberger (see Shoven, Whalley, 1984).

CGE models became widely used to study the impact of trade policy changes. These changes, particularly accession to regional trade agreements, affect the distribution of resources and returns, the structure of production and trade, and total factor productivity. That is, they have a complex influence on a country's economy. CGE models enable a formalised description of the above-mentioned effects, with consideration of the interaction between markets of goods, factors of production, as well as households, corporations, the government and the rest of the world (other countries).

Such models are implemented with the help of various computation methods. They are based on a number of assumptions related to general equilibrium: the demand is equal to the domestic and foreign supply; and the total costs are equal to the returns, which are determined by the factor returns, which are in turn equal to the spending power of households. One of the strengths of these models is that they can be used to track the influence of external shocks, or economic (including trade) policy changes, on the endogenous variables of: prices, production, consumption, export, import and welfare. Thus, despite being a simplified description of the reality, these models are sufficiently complex to characterise the main aspects of the economy. At the same time they are sufficiently simple to be solvable for purposes of using the results to assess the implemented policy (Khoe, Khoe, 1994).

CGE models used to assess the impact of trade policy changes differ depending on the aim of the study. The models may be constructed for several countries or one country; they may assess the effects of the trade policy changes alone, or the effects of various economy policy aspects; constructed primarily for developed or developing countries, as well as transition economies (for example, see Piazolo, 1998). In addition, CGE models can be: static — comparing the initial and final static states; or dynamic — assessing the impact of changes in factor productivity, technological innovations and capital stocks on the transition from the initial to the final equilibrium.

One of the most frequently mentioned strengths of these models is their theoretical logic and consistency. This allows them to be guided by a "theoretically correct" understanding of how the economy functions in the economic policy decision-making process. In addition, "general equilibrium" also shows that there is a clear interdependence between economic figures (see Figure 1) and that any change in the economic policy affects the elements of the economic system (Piermartini and Teh, 2005).

The database used for CGE models is the Social Accounting Matrix (SAM). It is built upon several sources of economic information about a specific country: input-output tables describing resource flows between the main economic sectors; the national account-

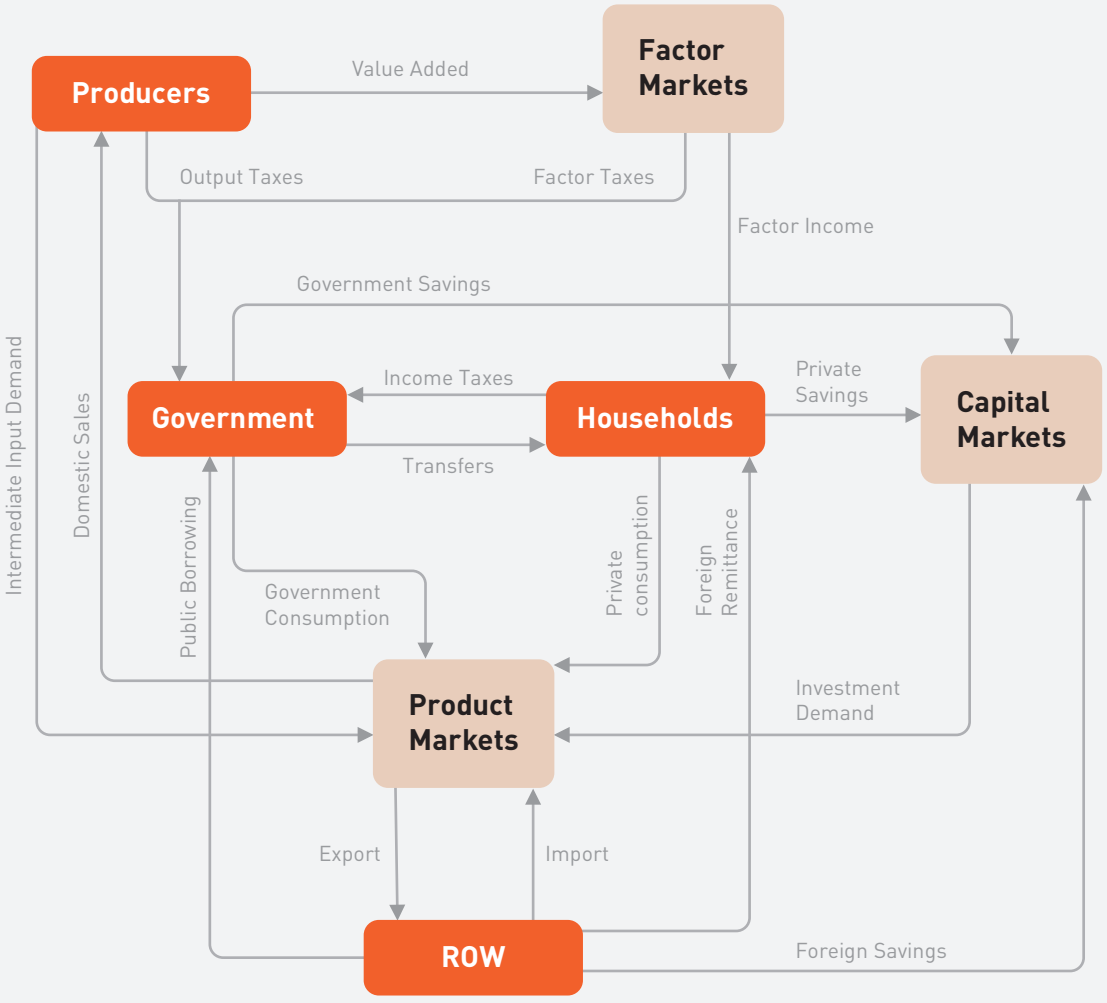

Figure 1. Simplified structure of a CGE model

Source: Inter-American Development Bank

ing system; balance of payment and foreign trade statistics; and income tax data. SAM must be balanced by rows and columns for example: the supply should be equal to the demand for all product and factor markets; the tax inputs should be equal to the tax outputs; the production should bring zero economic profit (given equilibrium prices); the consumer spending amount should be equal to the amount of income from factor ownership and transfers received; and the amount of returns from tax should be equal to the amount of transfers (Paltsev, Rutherford, Zemnitsky, 2000).

Besides the development of a social accounting matrix, the process of building a general equilibrium model includes the model's calibration (so the endogenous variables' values coincide with the statistical values for the reference periods), specification of the scenarios and elasticity values, achievement of counterfactual equilibrium given a new variant of economic/trade policy, and comparison of the counterfactual state with initial equilibrium (Shoven, Whalley, 1992).

With regard to trade, a number of assumptions are applied in CGE models. Countries are viewed as small open economies, unable to impact the global prices. Goods of the same type are differentiated by consumers according to the country of origin (the Armington assumption).

The following are some of the most well-known CGE models used to analyse trade policy changes on the level of many countries.

1. The Michigan model of world production and trade is one of the earlier global trade models. It was developed by Alan Deardorff and Robert Stern to assess the impact of the Tokyo Round on the employment rate. It was also used to analyse the effects of the US-Canada Free Trade Agreement, NAFTA, and scenarios of trade liberalisation leading up to the Uruguay Round. Initially including 18 industrialised countries, the model was later expanded to include an additional 16 developed and developing countries. Afterward the model was extended to include features of the New Trade Theory: imperfect competition, increasing returns to scale, and product differentiation.
2. The MIRAGE (Modeling International Relationships in Applied General Equilibrium) Model, developed by CEPI, also has imperfect competition and makes a particular emphasis on FDI and trade barriers (based on the MAcMap data base). This model is used by the European commission, WTO, and the UN Economic Commission for Africa.
3. The GEMAT (General Equilibrium Model for Asian Trade) Model, which is a modification of the LINKAGE model, developed by the World Bank and used by the Asian Development Bank, as it focuses on Asian countries.
4. The GTAP model, developed by Thomas Hertel (Hertel, 1997), is the most widely used model for analysing the impact of trade policy changes, particularly those pertaining to regional trade agreement membership.

APPENDIX 2. GRAVITY MODELS

The main gravity model variables are usually expressed in (natural) logarithms. The most general form of the gravity model can be presented as follows (see, for example Shepherd, 2013)[13]:

$$\ln X_{ij} = b_0 + b_1 \ln GDP_i + b_2 GDP_j + b_3 \ln \tau_{ij} + \varepsilon_{ij}, \quad (1)$$

where X_{ij} is the export from country i to country j; GDP_i and GDP_j is the gross domestic product (GDP) in country i and j, respectively; τ_{ij} is the costs of trade between countries i and j (with the geographic distance between the countries/their centres used as a proxy); ε_{ij} is the random regression error; b_0 is a constant; and b_1, b_2, b_3 are regression coefficients. The regression coefficients are elasticities, where the assumption is that $b_1 > 0$, $b_2 > 0$ and $b_3 < 0$.

It is worth noting that the gravity model's name comes from the non-linear form of the equation (1), which is similar to Newton's law of universal gravitation (the logarithm in (1) is used to linearise this function). The export value is directly proportional to the two countries' "economic mass" values (the GDP) and reversely proportional to the distance[14] between the countries. In other words, the presence of gravity means that larger pairs of countries should be involved in more trade with each other, while countries situated farther away from each other will engage in less trade due to greater trade costs.

Equation (1) is a basic gravity model, which is a useful starting point for analysing international trade. However, this model has certain limitations. For example, countries i and j can accede to preferential trade agreements, which will lower tariffs on certain goods. According to economic theory, this can affect trade in a third country — k, which may not even have any part in the trade agreement. The concept of the creation and diversion effects is an example of such influence. However, the basic gravity model will not reflect this situation and will not account for the reduction of trade costs.

As shown by theoretical research, bilateral trade is not merely a function of the distance between two countries, but also the distance from the pair of countries to other countries. In connection to this, the term "multilateral trade resistance" was added to the scientific vocabulary to designate the distance between a pair of countries and the rest of the world (Anderson, Wincoop, 2003). At the same time, the higher the multilateral trade resistance, the more this pair of countries will trade with each other, and vice-versa. The concept of multilateral trade resistance can be applied in the gravity model by supplementing the basic model with a set of variables characterising the fixed effects for country i (MRT_i) and j (MRT_j). Fixed effects are binary variables showing whether or not an observation applies to a certain country. If yes, then the variable assumes a value of one, and if not, then its value is zero.

When assessing the effects of preferential trade agreements, free trade agreements and various integration initiatives, additional variables are incorporated into the gravity

[13] Besides the GDP values, the basic gravity model can include other values as well, such as the population or GDP per capita as the quantitative measure of a country's economic development (productivity), and the exchange rate figures.

[14] The distance squared is used in the corresponding physical law.

model. For example, to assess the creation and diversion effects resulting from free trade agreements, two dummy (indicator) variables are included in the gravity model. The first dummy variable (*TC*) is assigned a value of one for observations where both countries are members of the free trade agreement for the period of time *t*, and a value of zero in all other cases. The second dummy variable (*TD*) is assigned a value of one in cases when the importing country is a member of the free trade agreement for the period of time *t*, while the exporting country is not. In all other cases the dummy variable is assigned a zero value.

Considering the above, when applied to panel data, the gravity model (1) appears as follows (see, for example, Plummer, et al. (2010)):

$$\ln X_{ij}^{t} = b_0 + b_1 \ln GDP_i^t + b_2 GDP_j^t + b_3 \ln \tau_{ij} + b_4 MRT_i + b_5 MRT_j + b_6 TC + b_7 TD + \varepsilon_{ij}^{t}. \quad (2)$$

The assumption in model (2) is that the *TC* variable, characterising the creation effects, will have a positive coefficient, while the *TD* variable, characterising the diversion effects, will have a negative coefficient.

The Ordinary Least Squares (OLS) method is often used to evaluate coefficients in the gravity model. However, studies note that this method has some methodological drawbacks, with the premises of most empirical studies not corresponding to the initial theoretical model (Henderson, Millimet, 2008). Therefore, along with OLS, a number of other methods are used to evaluate gravity model coefficients: the Non-linear Least Squares Method, Generalised Method of Moments, maximum likelihood and the Poisson distribution, models with fixed and random effects, and other econometric techniques.

If a dependent variable and several independent variables in a gravity model are non-stationary and have a common trend, then in applying the standard econometric methodology they will always have a statistically significant relation, which has been termed an "spurious regression." A common trend is a possible source of spurious regression. However, the connection between variables with a common trend can be completely real if the variables are co-integrated. In this case, the gravity model should be evaluated with the help of specially developed methods.

Let us use equations (1) and (2) to demonstrate the essence of the approach presented by Zwinkels and Beugelsdijk (2010). At the first stage, potentially non-stationary variables are tested for a unit root or stationarity using the appropriate panel tests. If the hypothesis of non-stationarity is not rejected, then the variables being considered are tested for the presence of co-integration, which is also done using the respective panel tests. If the tests confirm that there is co-integration, i. e. a long-run equilibrium relationship between the variables, then regression of type (3) is evaluated using the appropriate econometric methodology:

$$\ln X_{ij}^{t} = b_0 + b_1 \ln GDP_i^t + b_2 GDP_j^t + \varepsilon_{ij}^{t}. \quad (3)$$

In this case, for example, a fully modified OLS or dynamic OLS is applied to panel data, or another, analogous estimation method is used. This allows the researcher to obtain a non-biased and consistent estimate of the long-run relationship and the respective standard errors of the regression coefficients.

In the second stage, the residuals of equation (3) (which are a stationary in the presence of co-integration between the variables being considered) are used as a dependent variable in the following regression:

$$\varepsilon_{ij}^{t} = a_0 + a_1 \ln \tau_{ij} + a_2 MRT_i \varepsilon_{ij} + a_3 MRT_j + a_4 TC + a_5 TD + u_{ij}^{t}. \quad (4)$$

Thus, all variables in equation (4) are stationary, which allows it to be estimated using methods that are traditional for such cases. Combining the results of the first and second stage of the gravity model's estimation produces the required result. The result has a balanced regression (essentially, it is a model with an error correction mechanism), which includes two aspects of economic dynamics: long-run equilibrium relationships between non-stationary variables, and short-run dynamics of stationary variables.