Sergii Kvasha[1], Oksana Ryabchenko[2], Oleksandr Zhemoyda[3]
TRADE DENSITY FOR EXTERNAL MARKET EVALUATION

The article shows that both Ukraine's accession to the WTO in 2008 and the processes of the EU enlargement have created additional challenges for trade development at the continent. Special attention is paid to historical and geographical aspects of trade development in Europe. Prospects of free trade areas, beneficial both for Ukraine and the EU, are studied in detail. Trade density in the EU is analyzed using the mathematical methods. Such aspects as tariff policy, non-tariff barriers import duties are considered separately. Agricultural markets were taken for this analysis due to their high importance for Ukraine.
Keywords: European Union; Ukraine, trade density; free trade area.

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ГУСТОТА ТОРГІВЛІ В АНАЛІЗІ ЗОВНІШНІХ РИНКІВ

У статті показано, що як вступ України до ВТО у 2008 р., так і процеси розширення ЄС створили нові виклики для розвитку торгівлі на континенті. Особливу увагу приділено історичним та географічним аспектам розвитку торгівлі в Європі. Перспективи існування зон вільної торгівлі, вигідних як Україні, так і ЄС, вивчено в деталях. Густоту торгівлі в ЄС проаналізовано математичними методами. Окремо досліджено такі аспекти торгівлі як тарифна політика, позатарифні бар'єри в торгівлі та імпортні мита. Для аналізу обрано ринки сільськогосподарської продукції, оскільки вони представляють для України значний інтерес.
Ключові слова: Європейський Союз; Україна; густота торгівлі; зона вільної торгівлі.
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ПЛОТНОСТЬ ТОРГОВЛИ В АНАЛИЗЕ ВНЕШНИХ РЫНКОВ

В статье показано, что как вступление Украины в ВТО в 2008 г., так и процессы расширения ЕС создали новые вызовы для развития торговли на континенте. Особое внимание уделено историческим и географическим аспектам развития торговли в Европе. Перспективы существования зон свободной торговли, выгодных как для Украины, так и для ЕС, изучены в деталях. Плотность торговли в ЕС проанализирована математическими методами. Отдельно освещены такие аспекты торговли как тарифная политика, внетарифные барьеры в торговли и пошлины на импорт. Для анализа выбраны рынки сельскохозяйственной продукции, так как они представляют для Украины особый интерес.
Ключевые слова: Европейский Союз; Украина; плотность торговли; зона свободной торговли.

1. Introduction

After the WTO accession in 2008, Ukraine faced a new challenge in trade relationships with traditional partners. Due to the integration processes in Europe, the importance of structural changes in relationships between the European Union and Ukraine is significant. The EU has enlarged to 28 member states, with Poland, Slovakia, Hungary and Romania all directly bordering Ukraine. At the same time, Ukraine is coming back to the leading positions at the world agrifood markets.

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Being a non-member state, Ukraine is one of the biggest agricultural producers in Europe. As opposed to the EU tendencies, the level of farm support has gradually increased in Ukraine in the last years and is now comparable with the level of support in the new EU member states. Obviously, Ukraine will strive to find new opportunities at the EU markets.

However, several questions arise in this respect. First of all, is Ukraine able to succeed at European agrifood market by supplying products of a high quality and reasonable price? Furthermore, how the trade inside the EU (density of trade relations) is integrated and depends on historical and geographical features? Finally, does Ukraine have a potential to be competitive at European food markets?

In order to answer these questions, the current paper aims to analyse the level of agrifood trade density inside the EU and evaluate the trade perspectives for Ukraine. We focus on historical and geographical features of European market due to well-known and useful classification of integration levels. Following B. Balassa, A. Rytko, S. Kvasha we create the scheme of countries, accordingly to the level of economic integration.
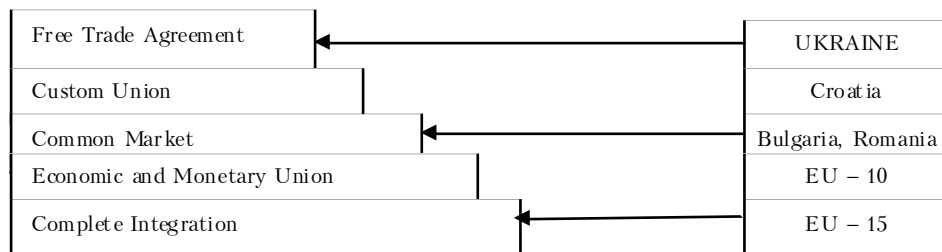
Free Trade Agreement	UKRAINE
Custom Union	Croatia
Common Market	Bulgaria, Romania
Economic and Monetary Union	EU – 10
Complete Integration	EU – 15

Figure 1. **Countries by the level of integration**

Also it is very important to evaluate the influence of geographical location for trade intensity. And here we propose to use the following classification: "Old" Europe: France, Germany, United Kingdom, the Netherlands, Belgium, Austria, Ireland, and Luxemburg; "Mediterranean" Europe: Italy, Portugal, Spain, Greece, Cyprus, and Malta; "Nordic" Europe: Sweden, Finland, Denmark, Estonia, Latvia, and Lithuania; "Post-Warsaw Agreement" Europe: Bulgaria, Poland, Czech Republic, Slovakia, Slovenia, Hungary, Romania, and Croatia.

The main changes inside the integration process for the European Union for new members, associated countries as well as for neighboring countries are represented by lower tariffs and increased market access. Welfare gains from tariff reduction are the sum of gains to consumer and producer surpluses net of revenue loss.

According to R.J. Wonnacott we can argue that forming a FTA may increase welfare for both participants (Ukraine and the EU members). The accepted definition of diversion (i.e., the European Union member switching its original import purchase from Ukraine (as the outside country) to Ukraine (as the member of FTA) excludes the associated Meade-Gehrels-Lipsey efficiencies (R.G.Lipsey, 1957) due to the EU increased imports from Ukraine by including them as trade creation. Since the effect of diversion is thus apparently limited to the Viner's terms-of-trade loss from purchasing from a more expensive source, it seems that trade diversion is welfare-

decreasing by definition. Not necessarily: even under this definition, trade diversion may, in broad sense, increase welfare for both the diverting country and, more remarkably, the world as a whole. To see why, look beyond diversion's traditional supply switching effect to recognize that it also triggers of trade liberalization between partners in which standard effects of increased competition, specialization, and trade over the FTA domain may reduce a partner's costs enough to make it the lowest-cost source and increase the world welfare by lowering the cost of producing goods. Consider the following points:

1) W.M. Corden (1972) and others, including even J.Viner (1950), have recognized how economies of scale can reduce costs in an FTA. The point here goes beyond this: when a member of the EU diverts its import purchases to an FTA partner (Ukraine), increased production in Ukraine may lower its costs enough to make it the lowest-cost world source.

2) Larger more competitive markets – even in a heavily diverting FTA may reduce technical inefficiencies and put pressure on profit margins enough to reduce partners' costs similarly.

3) Moreover, without the above two efficiencies, the elimination of internal FTA tariffs on Ukraine's inputs may similarly reduce its costs. True, insofar as Ukraine uses exportables as inputs, its costs (and diversion damage to the EU) increase at first. But this is not a symmetrical offset because, if strong enough, it will make Ukraine uncompetitive, ending diversion and its costs altogether.

4) Ukrainian costs may be reduced by increased investment at a lower supply price as Ukraine becomes a more attractive, perhaps because of its new preferential access to FTA wide markets, the FTA's discipline over Ukrainian domestic policies, or an announcement effect eliminating any unjustified past disadvantage of Ukraine in attracting foreign investments. Moreover, such investment may bring world-class technology that further reduces Ukrainian costs.

5) Diversion may also trigger favourable changes in a diverting country – the EU member. As M.Richardson (1993) argues, increased FTA competition facing EU import-competing industries may reduce their size and political influence and, hence, their ability to resist erosion of their MFN (Most Favorable Nations) tariffs against outsiders. If this erosion is sufficient the EU may switch its import purchases and more back to the low-cost outside country. Thus, any Vinerian terms-of-trade loss disappears as diversion is transformed into welfare – increasing trade creation with original outsider, Ukraine.

2. Methodology and data sources

The research reliability is determined by the applied mathematical methods and accuracy of the input data.

Regression analysis. We have applied the three-step model for estimating of European Union Trade Relation Density (EUTRD) with the software "Wolfram Mathematica". Initially, the whole array of data was synced in order to preserve the cause-and-effect relationships between input and output.

Next, the regression analysis was performed using the semilinear and multiple correlation coefficients followed by the evaluation of the mean square errors.

With the help of the semilinear correlation coefficient (1) was measured the density of relations between two vectors: import and export groups.

$$r_{x,y} = \frac{\sum_{i=1}^{n}(y_i - \bar{y})(x_i - \bar{x})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}}, \tag{1}$$

where:

x – factor variable (export/import of the country);

y – the resultant variable (export/import of the other country).

The linear correlation coefficient ranges from -1 to 1. The equality coefficient 0 indicates the absence of linear relationship. Equality factor "-1" or "1" indicates the presence of a functional connection. The sign "+" indicates straight connection, the sign "-" – the reverse link.

Multiple correlation coefficient was used to establish the tightness a linear relationship in pairs of export-import and import-export between countries.

In Mathematica, this correlation was made according to the ratio (2):

$$R = \frac{(a-b)(Conjugate[x] - Conjugate[y])}{\sqrt{(a-b)(Conjugate[a] - Conjugate[b])}\sqrt{(x-y)(Conjugate[x] - Conjugate[y])}} \tag{2}$$

Multiple correlation coefficient ranges from 0 to 1. Its zero indicates no linear relationship, respectively, 1 indicates the absolute functional connection. The coefficient does not indicate the direction.

Mean square error for a pair of linear correlation coefficient is calculated by the formula:

$$\sigma = \frac{1 - p^2}{\sqrt{n}}, \tag{3}$$

where:

p – the aggregate correlation coefficient;

n – the sample size.

As a result of calculations, quasi-modal matrices were created.

Finally, the density in the selected country groups was determined. For this one the correlation matrices were used based on the previous results.

Data sources. This study is based on a time series data set for Euro Trade according to the Ukrainian Commodity Classification for Foreign Economic Activity (Harmonized commodity description and coding system) over the period 2002–2012, monthly.

We have created a General Model of EUTRD based on the natural and monetary values of agricultural products exports and imports by 24 commodity groups including 195 sub-groups within the 28 countries of the European Union. All the data are continuous. The source of information is the State Statistics Committee of Ukraine.

3. Historical preview

Ukraine. Ukraine has signed free trade agreements with each of the former Soviet republics (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Turkmenistan, and Uzbekistan), excluding Tajikistan and Baltic Countries. These treaties cover customs duties, but not VAT or excise tax, with the exception of the treaty with Belarus. In December 1997, Russia and Ukraine agreed on mutual VAT exemption. In addition, Ukraine participates in the Black Sea Cooperation Council, along with Albania, Armenia, Azerbaijan, Bulgaria, Georgia,

Greece, Moldova, Romania, Russia and Turkey. Currently, negotiations are under-way for the establishment of a customs union with neighboring Moldova, as well as discussions for a Baltic-Black Sea Cooperation Agreement.

Ukraine signed the trade agreements with 31 countries (Algeria, Argentina, Belgium, Bosnia & Herzegovina, Brazil, China, Canada, Croatia, the Czech Republic, Cuba, Egypt, Finland, Guinea, India, Indonesia, Iran, Israel, Jordan, the Korean People's Democratic Republic, Japan, Liechtenstein, Malaysia, Mongolia, Serbia & Montenegro, Macedonia (FTA), South African Republic, South Korea, Switzerland, Tunisia, Turkey, the United Arab Emirates, the US, and Vietnam) which grant on a reciprocal basis most favored nation status to export-import operations with the countries concerned. Ukraine benefits via these agreements from tariff con-cessions made by its partner countries which are WTO members without binding its own tariffs.

After the EU enlargement all previous bilateral agreements between Ukraine and some European countries (Austria, Belgium, Bulgaria, the Czech Republic, Cyprus, Denmark, Estonia, France, Germany, Great Britain, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Switzerland, Sweden) was removed under the aegis of the European Union operational conditions.

Although a legal framework has been developed, many administrative practices remain unchanged. Thus, although Ukrainian law allows customs authorities to con-duct post-entry audits to verify compliance with customs and tax legislation, in prac-tice officials are still exercising almost all customs control during the initial clearance of goods.

European Union. The European tariff policy changes more dynamically and can be described in the following chronology (for details see Annex 1):

1) Shuman Plan (Founding Member States: Germany, France, Italy, the Netherlands, Belgium and Luxembourg) (1952) and Rome Agreement (1957) – the European Economic Community was established [2; 12; 13];

2) The European Free Trade Association (3 May 1960) as a trade bloc-alterna-tive for European states who were either unable to, or chose not to join the then-European Economic Community (EEC) (now the European Union (EU)) [2; 14].

3) Agreement on the Custom Union (CU) and enlargement of the European Union (eventual joining of Denmark, Ireland and the United Kingdom) [2; 15];

4) Maastricht Treaty (1993), come into force on January 1, 1994. European Economic Association (allowance of the FTA access into the Single European Market) [2; 16].

5) Amsterdam Treaty (1997) – the freedom of people's movement (Schengen Agreement as the attachment), also fostering the EU fight against unemployment; to preserve, protect and improve the quality of the environment; and to improve con-sumer protection [2; 17].

6) Agenda 2000 – Reform of the Common agricultural policy (CAP) that goes on absorbing an enormous percentage of the whole Union budget. It is no surprise that this reform unleashed protests among the affected peasants. It also conducts reform of the financial framework of the Union. Some of the richest countries, like Germany, complain about the imbalance between their contribution to the

Community (around 28,2% of the total) and what they receive back via Structural Fund and CAP. Poorer countries refuse to reconsider these contributions [2; 18].

7) The termination of the Economic and Monetary Union in 2002. After their launch on 1 January 1999, Euro has plummeted against USD. The strength of the North American economy was the main reason for this evolution, seen with mixed feelings at European markets and the European Central Bank [2; 19].

8) Enlargements of the first (2004 — Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia) and the second (2007 — Romania and Bulgaria) and third (2013 — Croatia) waves [2].

4. Research and discussion

4.1. General aspects. The problems of changes in commodity and financial flows in consequence to changes in trade terms and conditions caused by possible joining Free Trade Agreement usually cover the following aspects:

— do changes in tariff policy (according to the decrease in the new FTA frame) follow positive transformation for both sides (the EU and Ukraine)?

— what will be the influence of non-tariff barriers and quality standards after the FTA coming into force?

— does FTA increase or decrease welfare (production costs, consumers expenditures, taxes and duties) in Ukraine and become the necessity for the EU?

To answer these questions we have to describe shortly different possibilities in the development of trade relations between both sides of FTA (Ukraine and the EU).

In fact, the fiscal and protective roles of tariff policy are to some extent two competing policy objectives. The revenue implications of ad valorem import duty are maximized in the cases when its impact on trade flows and welfare is minimized. Technically, these are the sectors with low price elasticity of import demand where the tax base (or the value of imports) does not deteriorate by much as a result of higher import duty. If price elasticity is high, demand for imports would fall significantly, thereby hampering or even overturning the impact of an increase in the tax rate. If imports are price inelastic, the change in tariff does not affect imports, and increases in tariff rates will translate fully into higher revenues. It has to be pointed out that in this simple framework there is no a trade-off between trade and welfare objectives. A given tariff imposed on a low import demand elasticity product will result in a small welfare loss and a small reduction in imports as compared to an equivalent tariff imposed on a price elastic product.

Another reason for being less pessimistic about diversion and FTA is that any diverting country of the EU members is also diverted in other products, acquiring export benefits when its partner(s) divert purchases to it. While the EU may also benefit from the investment necessary to supply these exports, future multilateral liberalization or FTA expansion may transform such investments into sunk cost.

Basing on Kowalski, P. (2005), we can observe, that in general, both in Ukraine and in the EU, tariffs tend to be higher on imports of agricultural products as compared with industrial products. The agricultural sector also suffers from a higher incidence of tariff peaks. The modality for cuts agreed in the Uruguay Round converted non-tariff barriers into tariff barriers which often resulted in setting high initial rates (WTO, 2003e). It has to be pointed out that assessment of protection levels in the agricultural sector is further complicated by the presence of tariff rate quotas (TRQs) with differential tariff rates inside and outside the quotas as well as specific duties.

In this research we analyze the density of trade relations under the EU agricultural market (Figure 2) accordingly to the "historical" part of the hypothesis. As the result, the level of trade density for the integrated countries (the EU-15) is almost twice higher, than for the new member states (EU-10) — Figures 1 (a) and (b) respectively.
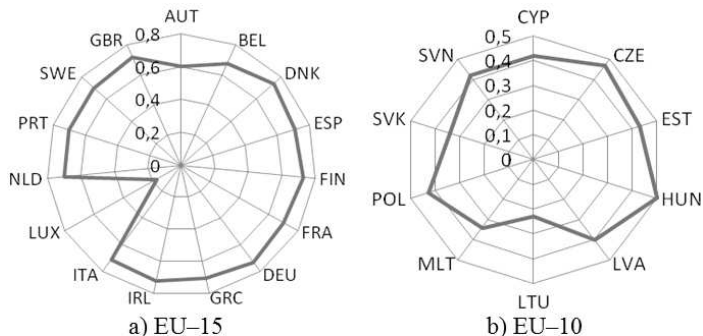

a) EU–15   b) EU–10

Figure 2. **Density of trade relations at the EU agricultural market**

We can explain such results by historical reasons, deep integration, and strong trade and production links between all European countries. The Luxemburg example can be interpreted by the relatively low volume of agrifood trade turnover. In contrast to the EU-15 trade we have the results for the EU-10 group. Here it is shown on Figure 2 (b).

This part of experiment confirms our hypothesis about the dependence of trade density on the level of integration (including production links, standards, trade accession to markets and consumer habits). Another part was about "regional" dependencies in trade density of agrifood items.
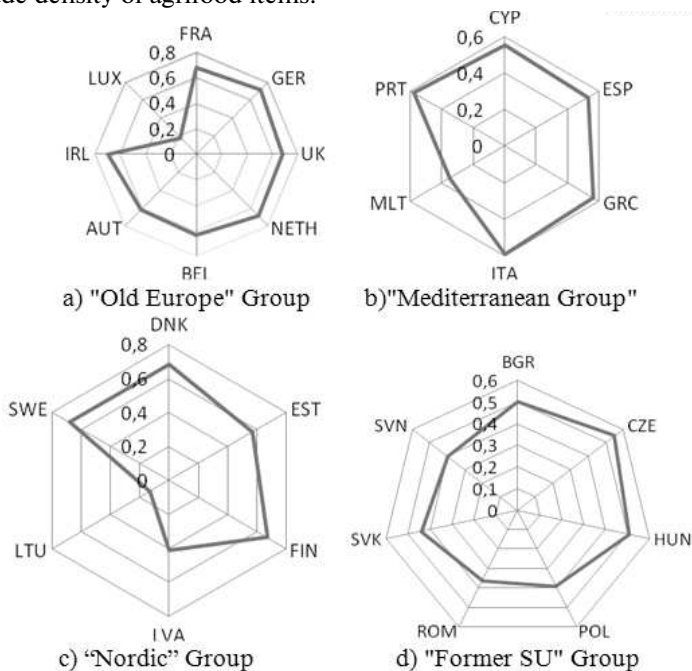

a) "Old Europe" Group   b)"Mediterranean Group"

c) "Nordic" Group   d) "Former SU" Group

Figure 3. **Density of trade relations at the EU agricultural market**

As we can see from Figure 3, "geographical" position for each country is the strong motivation for trade. Only Luxemburg, Malta and Lithuania show low trade density inside the group. This antimony could be explained by the nearness of huge capacity markets (predominantly from "Old Europe"). In the group of the countries of "Warsaw Agreement" we can observe the middling level of trade density, Bulgaria, Czech Republic and Hungary demonstrate higher levels of integration. The main reasons here is the higher level of industry development.

Conclusions

This research reveals that between different approaches the level of trade density demonstrates the depth of integration inside the EU. We prove that even inside the common market, with common monetary and trade policy the one of the most important factor is the geographical disposition of trading countries, closeness of markets as well as the historical aspect of integration. In our further research we are going to analyze the opportunity for Ukraine in agrifood trade productions and evaluate the potential market shares for particular markets.

Acknowledgements

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Annex 1

Table 1. **Development of the European Union and Common Tariff Policy**

Time	Period	Events
1945-1959	The beginning of cooperation	Schuman Plan (integration of Western Europe's coal and steel industries). In 1957 the ECSC 6 members decided to pool other areas of their economies. They signed the Treaties of Rome, creating the European Atomic Energy Community (EURATOM) and the European Economic Community (EEC). The members began to remove trade barriers to form a "common market".
1960-1969	The period of economic growth	In 1967 the institutions of the 3 European Communities – EEC – were merged. A single European Commission, Council of Ministers and European Parliament were created.
1970-1979	The growing community	Denmark, Ireland and the UK joined the EU. In 1979 the first direct elections to the European Parliament were held – citizens of the member states were able to vote for candidates, who previously were drawn from national parliaments.
1980-1989	The fall of the Berlin Wall	The Single European Act set out the timetable for the creation of the Single Market by 1993. Greece joined the EU in 1981, with Spain and Portugal joining in 1986.
1990-1999	Europe without frontiers	The creation of the Single Market brought about the world's largest trading area and the free movement of goods, capital, people and services. It took time for the member states to remove all barriers to trade. The term "European Union" was introduced by the Maastricht Treaty in November 1993. The Treaty established new areas of cooperation on defense, justice and home affairs. The Maastricht Treaty also set out a timetable for economic and monetary union and the introduction of a single currency. In 1995 Austria, Finland and Sweden joined the EU. In 1999 the Treaty of Amsterdam extended the power of the European Parliament.
2000-today	The decade of further expansion	On 1 January 2002, the euro was introduced in 12 EU countries. The Treaty of Nice, which came into force in 2003, set out new rules about the size of EU institutions and the way they work, paving the way for a much larger EU. The EU welcomed 10 new countries in 2004: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia. Bulgaria, and Romania were joined in 2007. Croatia joined in 2013.

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