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Analysis of Czech agricultural exports based on mirror statistics of Russian imports

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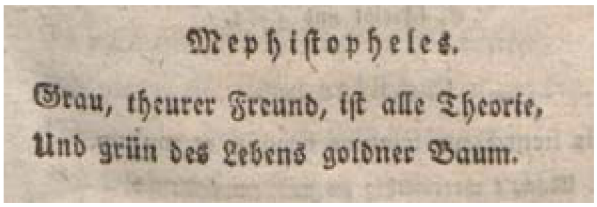
Dedicated to my family...
To all those who were with me, helped and did not interfere...


Mephistopheles.
Grau, theurer Freund, ist alle Theorie,
Und grün des Lebens goldner Baum.

Goethe, Faust. Leipzig, 1790.

Acknowledgments

Abstract

The Russian market is the largest market for agricultural products and foodstuffs (APF) goods among all European countries, including the Czech Republic. Therefore, a practical analysis of the condition, sales conditions and prices of goods exported to the Russian market is in demand and relevant for each country trading with Russia.

Growing barriers to APF trading in the Russian market, especially the currently existing lists of mutual sanctions, including trade restrictions between the EU and Russia on APF, have significantly affected the volume and structure of mutual trade and continue to do so. Against this background, trade and trade policies require regular and comprehensive monitoring, including analysis using traditional tools and statistics, as well as the development of additional methods for identifying and studying emerging problems.

Traditionally, a country's export analysis is based on national statistics. However, the analysis of the same flow based on mirror statistics of the host country in the form of its import is of undoubted practical interest. In general, the mirror statistics are closer to the real conditions of the sales market, since it fixes the cost and quantity of goods for sale on the domestic market of the importing country.

The purpose of the work is to study the possibilities of mirror statistics of Russian imports to analyse and identify problems of Czech APF exports to the Russian market. To achieve the goal, three subtopics are analysed.

The first subtopic considers mirror statistics as an additional source of information and proves the possibility of using statistics on Russian APF imports in terms of methodological standards.

The second subtopic proposes methods of aggregation and disaggregation of FT-indices to further analyse the dynamics of the most important groups of goods and explore the possibilities of recovery and expansion of APF exports.

The third sub-topic presents the results of a quantitative analysis of APF supplies to the Russian market using mirror statistics of Russian imports and FT indices. The study was conducted using benchmarking where in addition to the Czech Republic other V4 countries (Poland, Slovakia and Hungary) were included as a focus group for which the level of trade recovery was compared (achieving pre-crisis trade volumes in 2012-2013) and a leader was identified. The identified leader was the Czech Republic which was the only one among other V4 countries reached the level of pre-crisis APF trading in the Russian market. Then for the Czech Republic APF supplies were analyzed using mirror statistics of Russian imports. The analysis was carried out for the groups of the most important commodities and the top three commodities of trade leaders for which recommendations for the development of trade were formulated. For Czech beer as the leader of trade the problem of re-export not observed by Czech statistics was identified and analyzed. Based on this analysis the proposals to expand the export of Czech beer taking into account the factor of intellectual property were formulated.

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List of Abbreviations

APF – Agricultural products and foodstuffs (ee see appendix A)

EAEU – Eurasian Economic Union;

EU – European Union;

Eurostat – Statistical the Office of the European Union;

FT – foreign trade;

FTI – foreign trade indices;

HS – Harmonized System (HS) code;

ILO – International Labor Organization;

IMF – International Monetary Fund;

IP – Intellectual Property;

OECD – Organization for Economic Cooperation and Development;

PGI – Protected geographical indications;

RCA – Revealed comparative advantage;

SIC – Commonwealth of Independent States;

SITC – Standard International Trade Classification

UNIDO – United Nations Industrial Development Organization

V4 – Visegrád Group (Czech Republic, Hungary, Poland and Slovakia);

WB– World Bank

1 Introduction

1.1 Motivation and relevance

The Russian market is the largest market for agricultural and food products (APF) for almost all European countries, including the Czech Republic. Therefore, a practical analysis of the condition, sales conditions and prices of goods exported to the Russian market is in demand and relevant for each country trading with Russia.

Growing barriers to APF trading in the Russian market, especially the currently existing lists of mutual sanctions, including trade restrictions between the EU and Russia on APF, have significantly affected the volume and structure of mutual trade and continue to do so. Against this background, trade and trade policies require regular and comprehensive monitoring, including analysis using traditional tools and statistics, as well as the development of additional methods for identifying and studying emerging problems.

Traditionally, a country's export analysis is based on national statistics. However, the analysis of the same flow based on mirror statistics of the host country in the form of its import is of undoubted practical interest.

In general, the mirror statistics are closer to the real conditions of the sales market, since it fixes the cost and quantity of goods for sale on the domestic market of the importing country, which includes the costs of insurance and transportation of goods to the border of the country of destination.

The dissertation thesis is devoted to an actual topic - the analysis of Czech APF exports to the Russian market using mirror statistics of Russian imports.

Into the dissertation thesis the possibilities of usage of Russian imports mirror statistics for analyzing and identifying problems of Czech APF exports to the Russian market were researched, including not captured by Czech statistics. To this end, three interrelated sub-themes were identified and considered in detail.

The first sub-topic considers mirror statistics as an additional source of information and proves the possibility of using statistics on Russian APF imports in terms of methodological standards.

The second sub-topic proposes methods of aggregation and disaggregation of FT-indices to further analyze the dynamics of the most important groups of goods and explore the possibilities of recovery and expansion of APF exports.

The third sub-topic presents the results of the analysis of supplies of Czech APF to the Russian market using mirror statistics of Russian imports from the Czech Republic and FT indices, and also formulated recommendations for the Czech export of APF to the Russian market.

All studies within the framework of the topic of work were carried out for the first time.

1.2 Structure of the thesis

The thesis consists of four sections. First, the literature on the subject was reviewed. Next, we describe the applied methods and techniques of research. Third section presents results of the study, along with discussion. At the end of the thesis conclusions and recommendations are formulated.

As already noted above this study analyzes three sub-topics. Each of the three sub-topics is, to one degree or another, present in the structure of the corresponding section of the work (Literature review, Methodology, Results).

The first sub-topic researches mirror statistics as an information base for analyzing Czech APF exports. Here the accuracy of statistics and the general asymmetry of mirror data from the point of view of acceptability of its values, considering the transport and logistics costs when delivering goods of the exporting country to the market of the consumer's country are discussed. The asymmetry of mirror data on their value is checked for tolerance according to the list of main products and the top three products. The conclusion about the possibility of using statistics on Russian APF imports to analyze Czech exports to the Russian market was made which allowed to use mirror statistics as an informational base of the study.

The second sub-topic is devoted to the consideration of foreign trade (FT) indices as a tool for analyzing changes in foreign trade. The options of usagr FT-indices for the simultaneous analysis of not only the value flows of goods but the quantity of physical supplies and their average prices were studied. The conclusion about the insufficient implementation of the FT-indices by statistics associated with the solution of specific economic problems of analysis was made; in particular for the purpose of analyzing the Czech APF supply to the Russian market. Methods of aggregation and disaggregation of FT-indices with a description of formulas are proposed and economic statements of the problem are considered with the identification of groups of significant goods with different characteristics of changes in value indices, prices and physical volumes of goods.

In the third sub-topic the supply of Czech APFs to the Russian market based on mirror statistics of Russian imports was researched. Here a list of the most important products was defined highlighting the main product groups and the top three products. The dynamics and trends of their trade using FT-indices are analyzed and recommendations are formulated for expanding Czech exports of goods to the Russian market.

For a Czech beer as a leader of trade the additional analysis of the mirror statistics of natural supplies (in liters) was conducted which made it possible to identify re-export flows unaccounted by Czech statistics (i.e., beer supplies to the Russian market through other countries). The possible reasons for such trade are considered and recommendations for the growth of Czech beer exports are formulated at the micro level (for business – take into account the risks of re-export and parallel imports when expanding international sales) as well as at the macro level – for statistics (recording of re-export) and trade policy level (active usage of the IP[1]-labeling factor, primarily including PGI Czech beer)

1.3 Purpose and particular questions of the research

The purpose of the study is to determine the possibilities of mirror statistics of Russian imports to analyze and identify problems of Czech agricultural exports to the Russian market, including unobserved by Czech national statistics.

Achieving the purpose involved solving the following research tasks:

– to study the problems of using mirror statistics to analyze foreign trade of goods, as well as specifically make sure of the admissibility of using mirror statistics of Russian APF-imports from the Czech Republic to analyze Czech APF-exports to Russia;

– to study the international methodology and practice of maintaining FTI statistics in order to identify new opportunities for using FT indices "value-quantity-price" for an expanded analysis of the dynamics and structure of foreign trade in goods of countries, as well as to propose a set of algorithms for calculating FTI using

[1] IP – Intellectual Property; PGI – Protected geographical indications *(see list of abbreviations)*

methods of aggregation and disaggregation by groups of selected goods (for subsequent analysis of statistics of Czech APF-exports to the Russian market);

– conduct an extended analysis of the supply of Czech APF goods to the Russian market with a selection of the list of main products, as well as groups of active goods and the three leading products;

– to study the dynamic characteristics of the growth of goods taking into account value, price and quantity indices, assess the state of trade and formulate recommendations on expanding the presence of Czech goods on the Russian APF market, surrounded by similar imported goods from other countries;

– to make an additional comparison of the mirror data of the natural deliveries of the Czech trade leader - beer, analyze possible causes of data inconsistencies (asymmetries) and develop practical recommendations on expanding trade for business, statistics and trade policy.

The main research questions are:

– is it permissible to use mirror statistics as an information base for foreign trade research and what are the real methodological standards for data discrepancy in mirror statistics?

– is it possible to use mirror statistics to analyze Czech exports of APF to the Russian market?

– what is the international methodology for calculating statistics of foreign trade indices (FTI) and what are its features of use in Russia?

– is it possible to additionally calculate FT indices for groups of selected goods for research using statistical methodology and methods of aggregation and disaggregation?

– what is the list of the main Czech APF products on the Russian market in the mirror of Russian import statistics and what is the dynamics of the trade indices of the main Czech products in terms of "value-quantity-price"?

– is it possible to study the positions of Czech goods on the Russian market surrounded by similar imported goods?

– what are the possibilities for assessing the quantitative asymmetry of mirror data and the difficulties in interpreting the results, including for re-exports and parallel imports?

– can the results of the study of quantitative asymmetry be used to develop practical recommendations for the development of APF trade in the Russian market?

2 Literature review

In this section the main issues and their coverage in the scientific literature for the first two sub-topics listed in section *1.2 Structure of the thesis* will be reviewed – these are the problems of mirror statistics and foreign trade indices (FT-Indices).

So, in subsection 2.1 within the framework of the first subtopic, various aspects of studies of mirror trade statistics are considered from the point of view of a comparative analysis of the relevant data and the study of the factors of their asymmetry (data mismatch). Here we will dwell in more detail on the methodology of customs statistics as the main cause of asymmetry in order to assess the possibilities of using mirror statistics for the subsequent analysis of exports based on imports which we will continue in sections 3 and 4. Also for the sake of completeness we will list the main publications that consider the applied problems of emerging asymmetries in statistics associated with undeliberate and/or deliberate errors and data distortion when mirror statistics allow us to estimate the size of real economic losses. Since these problems are not included in the number of research tasks and will not be considered in the future by us in the dissertation thesis we will not consider them in details but will only outline them.

In subsection 2.2 the second subtopic is considered which is devoted to foreign trade indices as tools for analyzing the dynamics of indicators of foreign trade in goods. It provides an overview of the applied aspects of using the well-known Laspeyres, Paasche and Fischer formulas in the national statistics of countries, indicating the methodological publications of international organizations and experts (UN, IMF, WB, etc.) and also indicates new possibilities of using the FT-Indices in the analysis of foreign trade in goods which will be described in details in Section 3.

2.1 Mirror statistics as an information base for the analysis of foreign trade

As is known, international trade between two countries is simultaneously monitored and registered by the customs services of these countries. The result is a two-sided display of trade data, which is commonly referred to as *mirror statistics*. Theoretically, in the mirror statistics, export of goods of country A to country B should be equal to the import of country B from country A, whereas import of country B from country A should be equal to export of country A to country B. In practice, however, the mentioned trade volumes usually differ, and sometimes significantly.

In studies, these differences in mirror data in trade between countries are usually denoted by the term “asymmetry” or, more precisely, “bilateral asymmetry”, emphasizing that the comparison of data refers to trade between two countries. (see, for example, documents of the UN Department of Statistics Guidelines on Analyzing and Reducing Bilateral Asymmetry (UNSD-Guidelines, 2019)).

In general, experts associate the presence of differences or asymmetry in the data of mirror statistics with two large groups of factors (Fig. 2.1): 1) the customs methodology for fixing flows (first of all, these are different prices of accounting for the value of exports and imports) and 2) various errors in determining the customs value of goods - unintentional and intentional.

We presented the structure of possible causes of asymmetry in mirror data in Figure 2.1, where we marked with ovals the three areas that were explored in this thesis. Let's consider these reasons in more detail.

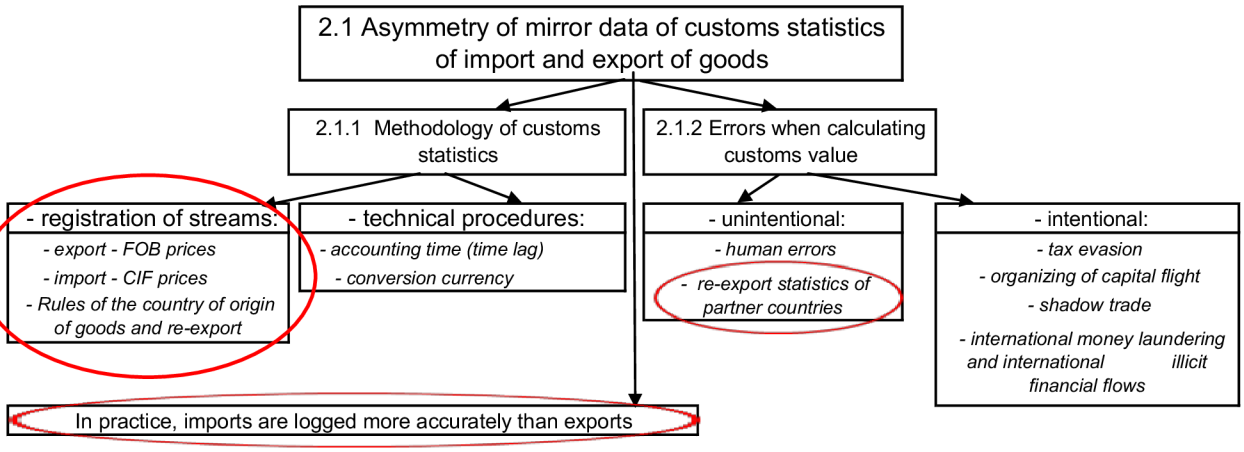


Figure 2.1. The main causes of asymmetry in mirrored data
Source: author
Note. We have placed an enlarged version of this table in the Appendix D.

2.1.1 Asymmetry of mirror data and features of the methodology of customs statistics

CIF prices and FOB prices. First of all, the asymmetry of the data is associated with the difference in the prices of the recorded flows. As is known, according to customs statistics methodology [IEMD, 2018], the value of exporting goods of country A to the market of country B is represented by statistics of a country A in FOB prices, while imports of goods from country A to country B are represented by statistics of country B at CIF prices, which additionally include the costs of insurance and transportation of goods. Thus, the main and always present reason for the asymmetry of mirror data is associated with the methodology of customs statistics when registering export and import flows of foreign trade of goods. Then the following question arises:

What is considered normal asymmetry of mirror flows? According to the IMF, the global average CIF/FOB used in calculating the balance of payments is 1.06

[DOTS, 2018; Bogdanova, 2010], although the earlier studies used a coefficient of 1.10 [EIFRF, 2003; DOTS, 2011].

In research by IMF staff (Marini, Dippelsman & Stanger, 2018) and OECD (Miao& Fortanier, 2017) it was showed that the average cost of transport and insurance costs are now esti-mated at 6% of total trade. It means that the value of exports is equal to the value of imports from the partner divided by a correction index of 1.06, and the value of imports is equal to the value of exports from the partner multiplied by a correction index of 1.06. This index can be used as a criterion for understanding what difference between mirror data can be economically justified.

Currently, the transformation coefficient from CIF to FOB prices applied by the Bank of Russia in mirror data comparisons for non-CIS countries and CIS countries it was estimated to be equal to 5.88% and 10.2%, respectively. These coefficients is an average for the total volume of imports, while for certain countries and merchandise groups it may vary significantly from factual data. (BOP-C, 2018).

We also note that the permissible differences in the estimates depend on the specifics of the goods and are determined by the amount of expenses not only for transportation and insurance, but also during transportation losses, as well as calendar differences in sending and receiving goods.

Thus, we can conclude that in general, the permissible discrepancy in estimates CIF/FOB for trade is usually taken equal to 6–10%. In the future, when assessing the acceptability of the asymmetry of value flows, we will focus on the indicated values.

Re-export. Another important topic that touches both the methodology of customs statistics and the topic of the causes of asymmetry in mirror statistics is re-export. It is generally accepted here that if the export of a country can be divided into the export of domestic goods and the export of foreign goods, the latter is usually called re-export.

As it has been noted by United Nations Industrial Development Organization (UNIDO) experts "a new emerging problem requires urgent attention, namely re-export. The growth rate of re-export volumes outpaced the growth of merchandise exports" (Dong Guo, 2009, p. 24). In the period 2000-2012 the average annual growth in re-exports exceeded 10%, while global exports grew by 6% (WTO, 2014). At present, the trend of growth in re-exports in world trade continues.

Re-export and peculiarities of its registration in statistics. A more detailed definition of re-exports is contained in the methodology of international trade statistics: "Re-exports are exports of foreign goods in the same state as previously imported; they are to be included in the country exports. It is recommended that they be recorded separately for analytical purposes. This may require the use of supplementary sources of information in order to determine the origin of re-exports, i.e., to determine that the goods in question are indeed re-exports rather than the export of goods that have acquired domestic origin through processing" (UN-ITS, 2020).

To register exports separately from re-exports and determine the "economic nationality" of goods, the international methodology of the Rules of the country of origin of goods from the Manual on International Merchandise Trade Statistics (IMTS, 2011; IMTS-CM, 2013) is used, according to which only imported goods can be considered the national goods of the country , which has undergone significant processing in the country, and all other imported goods intended for further export from the country are re-exported. As noted in the Manual: "when dealing with trade data, it is essential to subtract re-exports from normal total exports to arrive at the final value of exports. This is necessary because re-exports do not undergo any value-added processes, so cannot be counted towards a nation's exports" (IMTS, 2011). Experts also note that "The need to establish rules of origin stems from the fact that the implementation of trade policy measures, such as tariffs, quotas, trade remedies, in various cases, depends on the country of origin of the product at hand" (IMTS, 2011).

For this reason, the rule of the country of origin primarily affects the import of goods, where the customs authorities, in order to implement trade policy measures, need to clearly know which country is the producer of the imported goods and which country is the intermediary of trade. To do this, in accordance with the international methodology of international statistics (IMTS, 2011; IMTS-CM, 2013), the country of departure and the country of origin of the goods with the corresponding codes must be indicated in the customs declaration. Then, when importing into a country, the country of production of the goods is determined by the barcode of the goods and the corresponding indicators of value and quantity are included in the import of the receiving country, as well as in the export volume of the country from which the goods were imported, regardless of which country is indicated as the country - the sender of the goods. Modern computer technology makes it possible to carry out all these procedures in an automatic mode based on the data of customs declarations and barcodes of goods, where the country of their production is indicated.

For example, Czech beer which is exported first to Germany and then to Russia will be shown in Russian statistics as import of beer from the Czech Republic using the rule of the country of production of the goods (Czech beer). In accordance with the methodology Czech statistics should adjust the results of bilateral trade taking into account re-exports and increase export volumes to Russia by the amount of German re-exports while German statistics should reduce national exports by the amount of re-exports of Czech beer to Russia. Data for such an adjustment can be found both in the Russian import statistics and in the German statistics if it shows the re-export of beer produced in the Czech Republic.

Re-export errors and misrepresentation of bilateral trade statistics. It should also be noted that in practice, due to the lack of statistical registration of re-exports, the results of bilateral trade between countries may be misinterpreted.

As noted above, when re-exporting goods are being delivered first to one country, then (without changing the initial state of the goods) to another country (and, possibly, further to other countries) with reflection of this flow in statistics as the corresponding export of the country of transshipment of the *goods*. This can lead to double counting with erroneous growth in the export volumes of countries if the statistical authorities do not pay sufficient attention to such operations and do not allocate the volume of re-exports in the intermediate statistics of the country according to the rules of the country of origin of goods, referring them to the export of only the first country.

As shown in (Lankhuizen & Thissen, 2019) trade flow distortions through re-exports can lead to misinterpretations of reality and erroneous trade policy decisions. As an example the authors cite US trade policy with NAFTA countries where incorrect accounting of re-export flows distorted the result of trade and showed persistent deficits. Since the main goal of the US administration's trade policy is to reduce trade deficits with countries the US administration considered the persistent deficit to be the result of unfair trade practices and the US withdrew its membership from the Trans-Pacific Partnership (TPP). In fact, as shown by calculations using the gravity model (Lankhuizen & Thissen, 2019) the statistics were wrong (at that time, if we exclude re-export, the US had a surplus in trade) which led to incorrect decisions in economic policy (Lankhuizen & Thissen, 2019, p. 401).

2.1.2 Asymmetry due to various errors in customs value calculations

As already noted above, usually mirror data do not coincide with the regular ones. This can be caused by many reasons, both methodological (rules of customs statistics when displaying exports and imports in FOB and CIF prices) and others associated with unreliable (erroneous with intent or without intent) indication of the

customs value of goods (Figure 2.1 - Block 2.1.2). Therefore, increasing the reliability of international statistics by identifying the causes of asymmetry in mirror data and reducing the volume of discrepancies is a significant topic of research by international organizations, national statistical services and independent researchers of international trade problems.

Recall that the IMF is the curator of the statistics of the countries that are members of this organization (currently, there are 190 member countries of the IMF). (IMF-G, 2021). The governments of the countries which are members of the IMF commit themselves to use and maintain international standards of statistics in the framework of the implementation IMF's recommendations. To this end the IMF's statistical services advise countries during expert missions, identify problems in national statistics and formulate specific recommendations the implementation of which is monitored by the IMF and, if necessary, provides technical assistance (financial and methodological) to eliminate deficiencies and improve statistics. Statistical monitoring of the IMF member countries is carried out on an ongoing basis and the implementation of the recommendation of statisticians is one of the conditions for the success of negotiations on the provision of financing to the country through the IMF.

Let us note publications on the main areas of research in block 2.1.2 (Fig. 2.1).

Improving the reliability of statistical data due to errors in customs value calculations. The bulk volume of publications on mirror statistics are devoted to the topic of increasing the reliability of data at the level of the world economy and international trade between the leading countries. Within the framework of the designated theme the IMF, as the curator of international trade statistics, recommends all countries to follow the principle "Think globally, act bilaterally" and guide researchers' efforts to bridge global divergences, including by encouraging countries to

work more closely with their major cross-border trade and investment partners to reduce bilateral asymmetries (IMF-A, 2015).

Taking into account IMF recommendations, we note the following publications (Dong Guo, 2010; Ferantino & Wang, 2008), in which the authors analyze the asymmetric structures of international trade statistics between the lead countries of world trade (China and its five main partners, the USA, Great Britain, EU countries) and come to the conclusion that "while it is difficult to find a systematic way to correct asymmetries in international trade statistics among countries, by focusing on a specific country and time period, it is possible to determine the reasons for such asymmetry." (Dong Guo, 2009, p. 23) .

In the similar vein highlighting analysis of trade between countries and their main trading partners research's are carried out at the UK Statistical Office (ATD, 2017). This publication (ATD, 2017) provides a brief summary of UK Trade Asymmetries in a global context with a description of known reasons for asymmetries, ongoing work and future plans to reduce the asymmetries.

The topic of assessing bilateral asymmetries in countries' trade is also discussed in many publications. For example this (Markowicz & Baran, 2019, 2020) publication is dedicated to assessment of asymmetry and ranking of EU countries by the quality of intra-EU trade statistics. Methodological aspects of assessing bilateral asymmetry and actions to improve data quality are discussed in this (Javorsek, 2016) publication using statistics from the Pacific region for the 10 most active participants in international trade - Cambodia, China, India, Indonesia, Japan, Malaysia, the Philippines, Republic of Korea, Singapore, and Thailand. These 10 countries together represent approximately 71% of total exports and imports of the region. Similar issues were studied in (MASR, 2015) for Montenegro statistics and (SFTG, 2008) for Ukraine.

There is also an extensive list of publications by authors from the CIS countries on the topic of mirror statistics.

First of all, we note the publications of the Central Bank of Russia, where, as part of the balance of payments, tables of mirroring the data of the main trade partners of Russia are published on an ongoing basis (BOP, 2019; BOPR-C, 2018; BOPR-CMD, 2019). In addition, we also note the scientific publications of researchers of the Russian Academy of Sciences, in which a wide mirror comparison of the value results of Russia's trade at the level of the country's trading partners is carried out, including a mirror comparison by product groups, and sometimes by individual products (Troshina, Kislitsyna, 2008 ; Korolev, Zhukovskaya, Trofimova, Chertko, 2007; EIFRF, 2003; Seltsovsky, 2004, 2009). All these publications are rather of an applied statistical nature and make it possible to track the inconsistencies of mirror data in dynamics both in the context of product groups and countries.

Estimating budget losses. In addition to the above areas of research, it should be noted that there are applied publications in which mirror statistics are used as a tool for assessing budget losses due to evasion of tariffs and taxes by understating the customs value of goods (see, for example, Mantusov & Tibekin, 2015; 2016; Bartokova, 2019; Valiev, 2016; CCSKR, 2014; Borak & Vacek, 2018; Ferto, 2018). In these publications, the volume of asymmetry (mismatch) of mirror statistics is interpreted as an unaccounted volume of shadow trade and is used to assess the fiscal losses of the budget. As a part of this direction of assessing budget losses we also note a wide study of the results of foreign trade of Kyrgyzstan using mirror comparison of data. This research was carried out within the framework of the project "Promoting budget transparency in the Kyrgyz Republic" (CCSKR, 2014) by independent experts from Precedent Partners Group and funded by USAID and UNDP. Expert calculations showed that a potential loss of budget revenues could lead to a 1.5-fold increase in public sector wages. According to experts, this level of budget losses indicates the need for their significant reduction, including through the adoption of serious adequate political decisions.

Capital flight, international money laundering and international illicit financial flows. There are also a number of publications on the use of mirror data to identify potential fraud, capital flight and terrorist financing schemes (see, for example, Grigoriou, 2019, 2020; Gara, 2019; Spanjers, 2017; Carrère & Grigoriou, 2014; Cantens,, 2015; CCiK, 2018; Kvasha, 2019; Zdanowicz, 2009).

Experts Christopher Grigoriou & Gaël Raballand in a publication entitled "How Mirror Statistics Can Help Fight Customs Fraud in Developing Countries?" write that « "...international money laundering and international illicit financial flows (IFFs) are major problems, are strongly rooted in fraudulent treatment of imports and exports as they cross international borders. This includes smuggling, misclassification of products to change their valuation, and straight mis-invoicing, i.e. deliberately declaring erroneous product values to make it possible to shift money from one country to another secretly and illegally. Detecting undervaluation and misclassification is critical to the fight against tax evasion and IFFs." (Grigoriou, 2020).

In the report of experts by Joseph Spanjers & Matthew Salomon "Illicit financial flows to and from developing countries: 2005-2014" the authors cite the data that “an average of 87 percent of illicit financial outflows over the 2005-2014 period were due to the fraudulent misinvoicing of trade”. (Spanjers, 2017).

In the above studies, estimates of the size of illegal flows were carried out using mirror trade data of countries. It noted that " While mirror analysis does not confirm misinvoicing and fraud, it provides a basis for suspecting it. As such, mirror analysis should be supplemented with other types of information, and supported by the routine work of customs data, intelligence, and investigation services." (Grigoriou, 2020).

Shadow trade. On top of that with the help of mirror statistics the volume of shadow trade of certain product and goods can be estimated. For example, in the

publication (Soboleva, 2017; Belov, Soboleva, 2018), the market capacity of the shadow illegal trade in sea crabs and other biological resources between Russia and Japan is estimated using the volume of asymmetry of mirror data on physical volumes (in tons).

At the end of the review of subsection 2.1, we provide information on the accuracy of accounting for flows (the last left block in Figure 2.1), which is mentioned in a number of publications and turned out to be useful in choosing a research topic.

What is registered more precisely - export or import? To this question, the UN statistic experts answer that for a given country, imports are usually recorded with more accuracy than exports because imports are the main revenue base of the state budget, but exports are not [IEMD, 2018]. The general view of experts on the accuracy of data collected by customs offices is that import data are more reliable than export data because customs services are more serious about recording imported goods for purposes of budget revenue from duties collection, taxes, and other regulatory controls (Hamanaka, 2011, p.1; EIFRF, 2003).

This generally accepted point of view is shared by the authors of the study "How can mirror statistics help combat customs fraud in developing countries?" also pointing out that "It is usually assumed that import figures would be more reliable. These are the basis on which import duties and taxes are calculated, so generally receive more official scrutiny" (Grigoriou & Raballand, 2020).

From this we conclude that, according to experts, in the study of the problems of export of goods of country A to country B on the basis of the national statistics of country A, the use of mirror statistics of import of country B can more accurately describe the volume of trade in goods, which for one reason or another were not reflected in the national statistics of exports of country A.

At the stage of preliminary research, when choosing a dissertation topic we checked the validity of this statement on the example of foreign trade operations

between the Czech Republic and Belarus using the UN COMTRAID database. The results of this study were published by us in (Yurik S., 2017 – see below), where a mirror comparison of the statistics "Czech exports to Belarus - Belarusian imports from the Czech Republic" showed an acceptable result, which allowed us to conclude that it is possible to use mirror import statistics for export analysis.

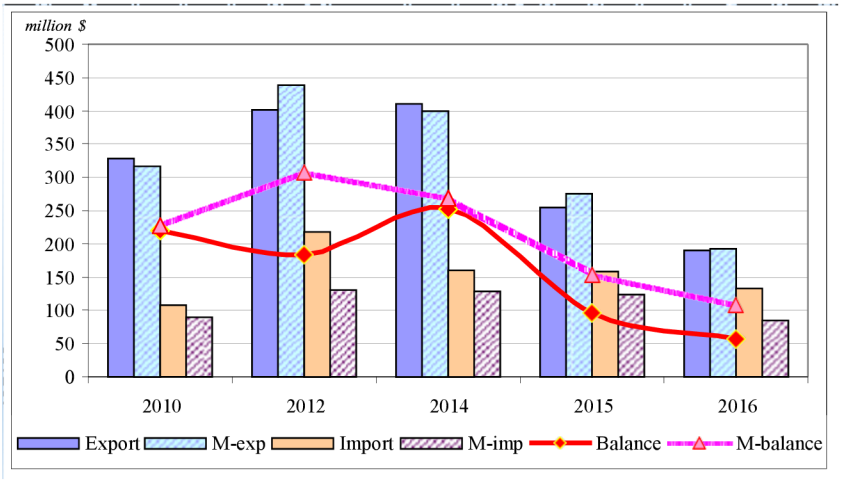
MATERIALS AND METHODS

Mirror statistics: differences in data. International trade between two countries is simultaneously monitored by the customs services of these countries. Export of goods of one country to the other one should be equal to the import of goods of the latter country from the former one, whereas importof the former country from the latter one should be equal to export of the latter country to the former one. In practice, however, the mentioned trade volumes usually differ, sometimes significantly. The reasons for such discrepancies can vary and should be separately examined in each case.

Let us elaborate on the above-said with the example of the trade balance statistics on the international trade between the Czech Republic and Belarus. The exports and imports flows between Belarusand the Czech Republic are tracked both by the Belarusian statistics and by the Czech statistics.Let us merge the data of the figures, taking the Czech statistics as the basis. The data for the Czech exports to Belarus is to be compared with the data for the Belarusian imports from the Czech Republic, whereas the data for the Czech imports from Belarus is to be compared with the datafor the Belarusian exports to the Czech Republic. The comparison results are visualized in Figure 1.

As can be seen in Figure 1, the statistics for the Czech exports to Belarus (Export) slightly differs from its mirror counterpart, the Belarusian imports from the Czech Republic (M-exp-Mirror-export) (in general, for the five-year period under review, the discrepancy in volumes did not exceed the statistical discrepancy, averaging 2% or $ 33 million). However, the statistics for the Czech imports from Belarus and its mirror counterpart, namely the Belarusian exports to the Czech Republic (M-imp-Mirror-import), significantly differed (for the five-year period the discrepancy accounted for about 28% of the total volume and totaled 220 $ million).

Figure 1. TRADE BALANCE: ČR & BELARUS



Basis-source: Czech statistics COMTRADE ; Mirror-source: Belarus statistics COMTRADE

Meanwhile, the understatement of the volumes happened only to the Belarusian statistics. There are high chances that such an understatement is due to the capital flight from Belarus as a country with unfavorable business environment. Further on, for the analysis of the Czech exports of goods to Belarus we will use the Czech statistics and compare and check the details in the Belarusian statistics for the imports of goods from the Czech Republic.

Revealed comparative advantages: calculations for the analysis. One of the popular indicators to assess comparative advantages of a certain country in trade is the Balassa index (Balassa, 1965), which was called the "revealed comparative advantage" index (Revealed comparative advantage – RCA). The revealed comparative advantage index is calculated according [1]

$$RCA_i = \frac{X_i^U / \sum X_i^U}{X_i / \sum X_i}, \quad (1)$$

where i is the commodity, X_i^U is the volume of the commodity i exports of the country U, X_i is the total volume of the commodity i world exports. If the index value is more than one that the country is considered to have a comparative advantage in the commodity. This means that the market share of that commodity exports in the country is larger than the average indicator for this commodity across the world, and the country has a revealed comparative advantage in that commodity.

In principle, one can utilize mirror statistics to calculate RCA indices. Therefore, in order to assess the revealed comparative advantages of the Czech goods in the Belarusian food products market we have calculated the RCA indices with the use of

both the data for the Czech exports to Belarus (the Czech statistics) and the data for the Belarusian imports from the Czech Republic (the Belarusian statistics). The calculations results are presented in Table 1.

Table 1. RCA indices for the food products supplied to Belarus from the Czech Republic

HS codes	RCA: Food-export to Belarus *(Czech-stat)*				RCA: Food-import from Czech *(Belarus-stat)*			
	2010	*2012*	*2014*	*2015*	*2010*	*2012*	*2014*	*2015*
01-24	0,4	0,3	0,4	0,4	0,6	0,4	0,9	0,5
01	0,7	0,7	4,2	4,0	1,0	0,4	3,9	4,5
02	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
03	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
04	0,0	0,1	0,1	0,0	0,0	0,1	0,1	0,1
05	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
06	0,1	0,1	0,0	0,0	0,1	0,1	2,6	0,0
07	0,1	0,2	0,1	0,1	0,1	0,1	3,4	0,1
08	0,0	0,0	0,2	0,0	0,0	0,0	4,4	0,0
09	0,1	0,0	0,0	0,0	0,1	0,0	0,1	0,0
10	0,0	0,0	0,1	0,1	0,0	0,0	0,1	0,1
11	1,6	0,9	1,4	1,7	1,7	1,0	1,6	1,4
12	0,4	0,3	0,5	0,5	0,8	0,4	0,5	0,6
13	1,4	0,0	0,0	1,2	1,3	0,0	0,0	1,2
14	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
15	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
16	0,0	0,1	0,0	0,0	0,0	0,1	0,0	0,0
17	1,4	0,0	0,0	0,1	2,1	0,1	0,1	0,2
18	0,2	0,2	0,4	0,3	0,2	0,1	0,4	0,1
19	0,1	0,1	0,2	0,2	0,3	0,2	0,2	0,5
20	0,2	0,1	0,1	0,0	0,3	0,1	0,1	0,1
21	4,6	2,8	3,3	3,5	6,7	3,9	4,1	5,0
22	0,4	0,5	0,5	0,3	0,6	1,3	0,6	0,6
23	0,8	1,2	0,7	0,3	0,8	1,3	1,1	0,2
24	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

Source: Czech statistics COMTRADE, Belarus statistics COMTRADE

It follows from Table 1 that in 2014-2015 Czech food products had a comparative advantage in commodity group 01 "Live animals", which is confirmed by the value of the RCA indices > 1 in both the Czech and Belarusian statistics. Also, comparative advantages are revealed for group 11 "Products of the milling industry" and group 21 "Miscellaneous edible preparations" for each year of the reviewed period in both the Czech and the Belarusian statistics.Further, comparative advantages are revealed for group 13 "Lac; Gums, resins and other vegetable saps and extracts " for 2010 and 2015 (there is no data for the other years). There is also a comparative advantage revealed for group 17 «Sugars and sugar confectionery» for 2010. A comparative advantage is also revealed for group 23 «Prepared animal fodder» for 2010 and is confirmed by the Belarusian statistics for 2011. For all the above groups the value of the RCA indices >1 was deduced based on the data from both the Czech and the Belarusian statistics.

RESULTS

Analysis of the export of Czech food products to the Belarusian market: additional tools. Next, we will explore additional capabilities of mirror statistics and RCA indices. In our analysis, we will consider six commodity groups of the Czech export of food products to Belarus: 01, 11, 13, 17, 21, 23, the groups for which comparative advantages were revealed above (Table 1).

Mirror statistics.

As already noted, the discrepancy between the Czech statistics for the Czech export to Belarus and the Belarusian statistics for the Belarusian import from the Czech Republic fits under the statistical discrepancy (about 2%). However, as the calculations show (Table 2), it is not the case for food products groups 01-24 as the Belarusian statistics shows larger volumes of the Czech food products import than the Czech statistics does for the food products export to Belarus.

Table 2. Difference in values for some Czech food products groups on the Belarusian market in the Czechand the Belarusian statistics (Czech statistics value minus Belarusian statistics value)

HS groups		*Volume,Thousand dollars*					
		2010	*2012*	*2014*	*2015*	*2016*	*10-16*
01-24	Food and agricultural products	-3 664	-4 891	-16 644	-3 025	-2 045	-30 270
08	Edible fruit	0	11	-9 335	0	-32	-9 356
21	Miscellaneous edible preparations	-1 907	-1 882	-886	-1 856	-1 198	-7 728
07	Edible vegetables and certain roots	-21	137	-4 610	-14	-15	-4 524
22	Beverages, spirits, and vinegar	-389	-2 181	-140	-493	-686	-3 889
06	Vegetable products	4	-6	-1 199	0	14	-1 187
19	Preparations of flour, starch or milk products	-206	-155	51	-372	-384	-1 067
17	Sugars and sugar confectionery	-582	-150	-59	-36	-71	-898
23	Prepared animal fodder	126	-368	-528	54	57	-658
	Other	-184	39	155	-177	241	74

Source: Czech statistics COMTRADE, Belarus statistics COMTRADE

It follows from Table 2 that during the period under review the value for food products (groups 01- 24) in the Czech statistics was $ 30.3 million lower than the one in the Belarussian statistics. Hence, the import of the Czech food products reflected in the Belarussian statistics is 64.4% larger than the export of the Czech food products to Belarus as reflected in the Czech statistics.

As it follows from Table 2, the biggest discrepancies are detected for 2014 for groups 08, 07, 06 which include vegetable, fruit and plant products. In total, these discrepancies amounted to $ 15.1 million which makes up about 50% of the total discrepancy for food products groups 01-24 for the five-year period. The mentioned discrepancies of 2014 were of burst nature as they were caused by some force majeure reasons, namely the introduction of the Russian Federation (RF) prohibitive sanctions against the EU import, including the food products of groups 07-08. In all likelihood, the statistics of 2014 witnessed the intensive completion of the

long-term contractsand the reassignment of the remaining products under group 06 which was not includedin the sanctions list. As it follows from Table 2, after 2014 the situation with the statistics discrepancies for groups 06-08 came to normal. We should also note that the discrepancies between both statistics for groups 21,22,19 (other edible preparations, spirits, including beer) have been increasing in the recent years.

Therefore, mirror statistics provided us with the following additional analysis capabilities and allowedus to detect:

- 2014 as the year of the force majeure on the food products market when significant discrepancies were observed in the statistical data on the supply of fruit and vegetable products of group 07-08 due to the Russian Federation having introduced the reciprocal sanctions against the EU;
- increasing discrepancies between both statistics that concern group 22 of spirits and beer and group 21 of other edible preparations (some of its subgroups are included in the RF sanctions list). Those discrepancies require additional investigation, primarily from the statistical services.

Revealed comparative advantages (RCA indices). The analysis of the RCS indices (Table 1) will be conducted with the use of the additional information on the commodity structure of the Czech food export to Belarus for the food product commodity groups 01-24. This information is presentedin Table 3 with an indication of the share of each group in their total volume.

Table 3. Commodity structure of the food products export from the Czech Republic to Belarus

HS groups	*Volume of exports, Thousand dollars*					*Share in exports*				
	2010	2012	2014	2015	2016	2010	2012	2014	2015	2016
01-24	10 177	9 106	13 265	7 602	6 872	100%	100%	100%	100%	100%
21	4 812	3 566	4 923	3 399	3 462	47,3%	39,2%	37,1%	44,7%	50,4%
01	285	323	2 173	1 293	489	2,8%	3,5%	16,4%	17,0%	7,1%
12	618	609	1 060	736	691	6,1%	6,7%	8,0%	9,7%	10,1%
11	514	386	610	486	301	5,1%	4,2%	4,6%	6,4%	4,4%
22	717	1 195	1 196	482	563	7,0%	13,1%	9,0%	6,3%	8,2%
23	1 013	1 928	1 343	284	464	10,0%	21,2%	10,1%	3,7%	6,8%
18	185	238	378	214	353	1,8%	2,6%	2,9%	2,8%	5,1%
13	170	…	…	136	…	1,7%	0,0%	0,0%	1,8%	0,0%
17	1 339	9	36	76	82	13,2%	0,1%	0,3%	1,0%	1,2%
Other	522	851	1 545	494	467	5,1%	9,3%	11,6%	6,5%	6,8%

Source: Czech statistics COMTRADE

Note: the data are sorted with regard to volumes of 2014 in the descending order

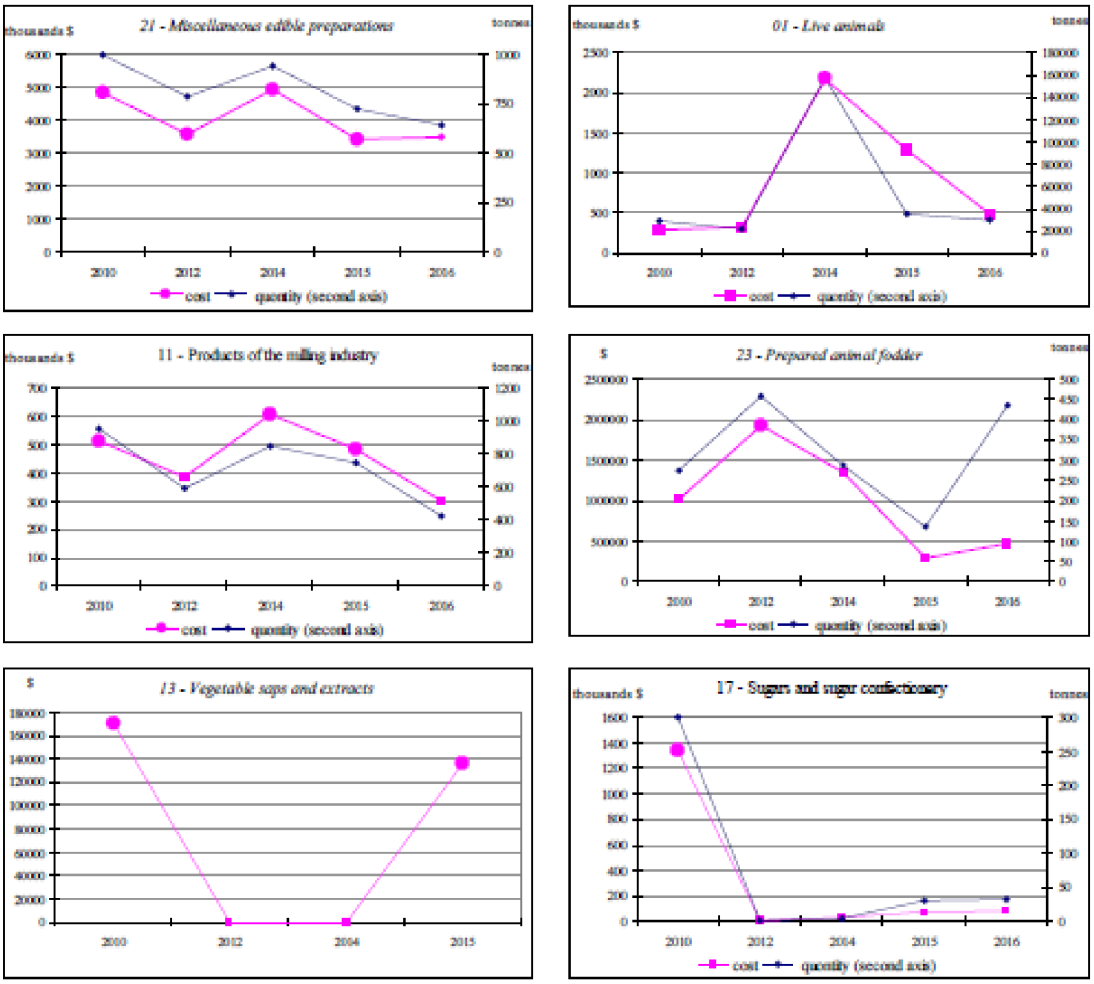
As it follows from Table 3, the above selected for consideration six commodity groups with RCA>1accounted for 75% of food exports in 2015. Let us remember that

according to Table 1 high values of the revealed comparative advantages are observed for group 21 for the whole period (the RCA values range from 2.8 to 4.6) which indicates that the share of the Czech products of this groupon the Belarusian market was higher than the world average. Also, the comparative advantagesin group 01 for were revealed 2014-2015 (the RCA value is about 4) which indicates an increased intensity of trade with a share higher than the world average.

Let us continue the interpretation of the indices RCA>1 for the selected groups using data on the value and physical volume of the export and presenting them in the form of following figures. The source of the data is Czech statistics (Czech Statistical Office, 2017). Note that in those figures the value curves are marked with large round markers at those years when the indices RCA were higher than one (>1).

1. *Group 21 «Miscellaneous edible preparations»* – 45% of export of groups 01-24 (2015). As it follows from Table 1, group 21 has one of the highest indices of the revealed comparative advantages and makes up almost half of the total value of the food products export. Almost the entire volume of the group was formed by two subgroups: 2103 Sauces and their components, seasonings and 2106 *Other* food preparations (1/3 and 2/3 of the volume).
2. *Group 01 «Live animals»* – 17% of total export of groups 01-24 (2015). As it can be *seen*in the revealed for 2014-2015 comparative advantages coincide with the two peaks of the export growth for group 01. The export volume was mainly formed by subgroups 0103 и 0105 (live swine and live poultry). The supply of group 01 sharply increased in 2014 (sanctions and reexport through Belarus) and then returned to the previous level. Apparently, this group, not being included in the RF sanctions list, was involved in some schemes of smuggling of goods to Russia from the EU via Belarus. But due to the Russian Federation's tightening of control the trade volume fell to the previouslevel in 2015-2016.
3. *Group 11 «Products of the milling industry»* – 6% of food products export (2015). For this group,the revealed comparative advantages also coincide with the three peaks of the export growth. The supply volume of group 11 was almost entirely formed by subgroup 1107 Malt. The export volumes of this group were at large maintained, but nevertheless significantly decreased by 2016, having reached its minimum.

Figure 2. The export volumes by groups



Source: Czech statistics COMTRADE

4. *Group 23 «Prepared animal fodder»* – 4% of food products export of groups 01-24 (2015). In this group, the revealed comparative advantage for 2012 also coincided with the export *value* peak. Since then the export values of group 23 were intensively decreasing as well as the physical volumes.But in 2016 the decline stopped due to the massive growth in the supply of cheap products (average export prices (decreased by almost 70%).

5. *Group 13 «Vegetable saps and extracts»* - 2% of food products export (2015). In this group, the comparative advantages were revealed for 2010 and 2015, which indicates that the share of this commodity export is larger than the world average. The export is represented by the only subgroup 1302 (Vegetables sap

and extracts) with some small trade volumes in 2010 and 2015, when such supply was documented by the statistics.

6. *Group 17 «Sugars and sugar confectionery»* - 1% of food products export (2015). The comparative advantage for this group was revealed only for 2010 in which the maximum value of the export supply was documented, connected with the smuggling schemes of sugar reexport to Russia via Belarus. After the RF established strict control, the export of sugar to Belarus, including the Czech export, declined sharply (the Czech Republic now mainly supplies sugar substitutes and sugar confectionary).

Therefore, it can be noted that the comparative advantages revealed for particular years tend to coincide with the peak values of the exports of the commodity groups which allows them to be used as indicators of export growth in a commodity group with account of the world average trade level, when the share of exports of goods is larger (RCA> 1) than the world average.

Moreover, with regard to sporadic indices RCA jumps (as in 2014 for commodity groups 06–08 of vegetables and fruit) the conclusion can be drawn that RCA indices can record critical changes in the trade in a particular commodity on a particular market (in our case, the introduction of the RF reciprocal sanctions against the food products imports from the EU).

CONCLUSION

Thus, having studied the additional tools for the analysis of the trade between the Czech Republic and Belarus we obtained the following results.

1. *The* analysis of the total results of the trade between the Czech Republic and Belarus showed that the Czech imports from Belarus significantly differed from its mirror counterpart, the Belarusian exports to the Czech Republic (its value reflected in the Belarusian statistics is understated by an average of 28% compared with the Czech statistics). Meanwhile, the Belarusian imports from the Czech Republic is slightly larger than the Czech exports to Belarus (by an average of 2%). The considerable discrepancy in the data for the supply of the Belarusian goods to the Czech market can be indicative of the schemes of the capital flight from Belarus as a country with unfavorable business environment (when a certain part of the export earnings is left abroad). It is noted that the data of mirror statistics should be analyzed separately for each relevant group of goods with account of the existing trade situation.

2. *Further*, through the example of the trade in food products (commodity groups 01-24) between the Czech Republic and Belarus it is demonstrated that mirror statistics enables:

– analysis and estimation of the capital flight flow. The Czech export of food products to Belarus is significantly smaller than the related Belarusian import from the Czech Republic (for the five-year period the discrepancy amounted to $30.2 million while the Czech export of food products totaled $47 million). Here, among other things, some schemes of the capital flight from Belarus might have been implemented when paying for import contracts;

– identification of a "force majeure" situation when changes in trade policy occur. Thus, basedon the analysis of the mirror statistics data on the food products for 2014 significant discrepancies in the statistical data on the supply of fruit and vegetables products of groups 07-09 were detected. The discrepancies were the result of the force majeure changes in the trade situation on the food products market caused by the introduction of the RF reciprocal sanctions against the EU;

– identification of the practical accounting problems, when the increasing discrepancies in statistics require additional clarification, also from the statistical services. With regards to the food productsit applies to group 22 (supply of spirits and beer) where the Belarusian statistics records an average of 1.9 times more of the Czech alcohol goods on the market than the Czech statistics does for the supply of such goods to the Belarusian market. Meanwhile, the excess of annual volumes has been increasing for the last two years and has grown to 2.1 times.

3. With regard to the capabilities of the revealed comparative advantages indices RCA for the food products groups 01-24 it was demonstrated that:

– *the* revealed comparative advantages indices RCA>1 coincide with the peak values (absoluteor relative maximums) of the exports of the commodity groups for each particular year, which allowsthem to be used as indicators of export growth with account of the world average trade level, when the share of exports of the commodity is larger than the world average;

– with regard to sporadic indices RCA jumps >1 it was noted that in such cases the *indices* can recordcritical changes in the trade situation for a particular commodity (such a case is examined through the example of the supply upswing in commodity groups 06-08 of vegetables and fruit in 2014 caused by the introduction of the RF reciprocal sanctions against the food products import from the EU).

Therefore, using of mirror statistics data and revealed comparative advantages indices while analy- zing international trade allows one to expand the information

realm and obtain information relevant for practice and statistics. Hereafter, we expect to use the discussed tools for the analysis of the Czechrepublic's trade on agricultural and food products markets of the EAEU, primarily of Russia, Kazakhstan and Belarus using EAEU statistical database (EAEU: Statistics Department, 2017).

This conclusion was used by us when choosing a thesis topic – Czech export of APF to Russia – which we will study on the basis of Russian mirror statistics of imports.

2.1.3 Discussion

A review of the above publications on subsection 2.1, dedicated to mirror statistics, allowed us to obtain the following intermediate conclusions:

1. From our point of view a common disadvantage of mirror statistics studies is their wide coverage, when asymmetry studies are carried out at the total cost for almost the entire composition of product groups. In this case due to the large amount of information the interpretation of the results is difficult and often remains at the level of fixing the fact of asymmetry and determining its size.

2. It is fair to assume that even if a large asymmetry of data is recorded according to the overall results of trade then there are groups of goods where the differences in data remain within the CIF/FOB standard deviation. In this case mirror statistics represent a full-fledged information base and its data on the import of goods are closer to the real conditions of the sales market since it takes into account the cost and quantity of goods from different countries for sale in the domestic market of the importing country with additional consideration of the costs of logistics and insurance in their cost. However, we did not see any publication that consideres the further useage of “normal” mirror statistics as an additional source of information - alongside with national statistics - to study trade between countries.

3. We also note that if the topic of the value asymmetry of mirror data in scientific research is presented quite diversely, then studies of the asymmetry of mirror data on natural supplies are practically not encountered. Here it may be useful for practice, along with the assessment of cost asymmetry, an additional study of the size of asymmetries by natural indicators and determination of their possible causes.

2.2 Foreign trade indices as a tool for statistics and analysis of foreign trade

Statistical indices are widely used to measure indicators that describe the dynamics of economic processes. Typically, the index formula compares the volumes of economic indicators of the reporting and reference periods in percentages or fractions of a unit. More detailed information on index indicators, including FT-indexes, we have placed in Appendix B.

With regard to foreign trade, each commodity flow (export or import) in the reporting period is characterized by a triad of individual statistical indicators of the quantity of goods, their unit prices, as well as the value of the total volume of goods, which is the result of multiplying the price by the quantity of goods. To measure the dynamics of trade in flows of goods of the same name, statistical foreign trade indices of prices, physical volume of supplies and the total value of goods of the same name are calculated. These indices compare the volumes of the corresponding indicator of the reporting and base years and present the total as a percentage or fraction of a unit.. FT-indices show the economic rate of change of the corresponding indicator of the price of a product and its in-kind supply, as well as the total value of the goods.

In relation to a specific product, FT-indices (*value, quantity, price*) are the most important statistical characteristics of a product in a given period of time and are called ***individual indices***. They represent a kind of economic rate of change in the

price-quantity components that form the final rate of change in the value of goods over time.

Note that if any two are known in the triple of indices (*value, quantity, price indices*), then the third is calculated based on them. For example, if the price and value index is known, then the quantity index will be equal to the ratio of the value index to the price index.

Within the framework of foreign trade statistics, on the basis of ***individual*** indices, ***consolidated*** indices are also calculated, which describe heterogeneous sets of different goods in given periods of time, presenting their dynamics in the form of a triplet of ***consolidated*** (aggregated) indices of value, quantity and price. Unlike individual indices, which are considered homogeneous (elementary) and have an objective material essence and a clear economic interpretation, consolidated indices show the dynamics of changes in a sample of various goods (often called a "basket of goods") in the form of calculated three consolidated price-quantity-value indices.

2.2.1 Consolidated indices in foreign trade statistics

The problems of studying and choosing an algorithm for calculating consolidated indices and their use in statistical practice are devoted to many publications of both individual authors and international organizations dealing with statistics. Publications in this area can be conditionally divided into predominantly theoretical (as a rule, this is a mathematical description of the features of constructing economic formulas and their mathematical interpretation, quite abstract for practical use) and applied (practical, including justifying the choice of specific calculation formulas for maintaining statistics, and also methodological features of the application of formulas, their economic meaning and interpretation).

The first direction does not fall within the scope of the subject of our research, and therefore we were little interested in the form of its abstractness and excessive mathematization of the calculation formulas, as a rule, divorced from the economic essence of the phenomena under consideration. Here, without pretending to be complete, as an example of works in this direction, we will name only the monographs (Allen, 1975; Koves, 1983; Bessonov, 2003), which are devoted to the consideration of mathematical aspects of theoretical constructions, the classification of index formulas and the determination of their properties.

The second direction presents applied statistical research on the subject of economic indices and proceeds from the fact that numerical indices are the basic tool for synthesizing economic statistics, to enable the formulas used to express and describe variables such as a country's economic growth or an economy's inflation rate, and also as to analyze the dynamics of foreign trade and to make international comparisons. If different formulas are used, the results are different and comparisons are not valid; so it is important to understand the formulas used. For this, countries and international organizations need to promote common methods of harmonization and standardization of measurements.

In particular, the recommended practices for choosing specific formulas for calculating FT-indices are disseminated in manuals and publications of international organizations (their employees), including the UN Statistics Division, the International Monetary Fund (IMF), the World Bank, the International Labor Organization (ILO), the Statistical the Office of the European Union (Eurostat) and the Organization for Economic Cooperation and Development (OECD).

From our point of view, both theoretically and practically, the recommended practices for calculating FT-indices are combined and presented in the «Export and import price index manual: theory and practice» (EIPIM, 2009), prepared by the staff of the statistical departments of the International Monetary Fund, International Labor Organization, Organization for Economic Co-operation and Development, Statistical

Office of the European Commission (Eurostat), United Nations Economic Commission for Europe, The World Bank on the basis of summarizing the experience of national statistical practices of FT-indices.

As the compilers note, the Manual contains detailed, comprehensive information and explanations for the selection and calculation of foreign trade indices (FT-indices). It provides an overview of the conceptual and theoretical issues. The chapters cover many topics; they elaborate on the different practices currently in use, propose alternatives whenever possible, and discuss the advantages and disadvantages of each alternative. Because it brings together a large body of knowledge on the subject, the Manual may be used as a teaching tool for training courses on FT-indices (EIPIM, 2009, p. xi-xii).

The methodological continuation and development of the principles of the EIPIM guideline is reflected in the broader UN Manual (Department of Economic and Social Affairs) - "International Merchandise Trade Statistics: Concepts and Definitions", published in 2011 (IMTS, 2011). Then, a little later, a practical guide for compilers of statistical services "International Merchandise Trade Statistics: Compilers Manual" (IMTS-CM, 2013) was published. It included a general methodology for maintaining foreign trade statistics, including a separate chapter devoted to methods for calculating FT- indices taking into account the successful national practices of such countries as Germany, Norway, Canada, Czech Republic, Italy. Also note that there are other publications describing national practices for keeping FT-indices statistics for Germany and Norway "Price and quantity measurement in external trade: two studies in national practice" (PQMET, 1983).

From the publications of 2020, one can draw attention to the work of UN staff "Index numbers and their relationship to the economy" (Dorin, F., Perrotti, D., Goldszier, P., 2020). This publication, geared towards compilers of statistics from different countries, summarizes the links between price and volume indices and microeconomic theory; it presents the formulas that are recommended for international

measurements, and it explains how to use them in international price and volume comparisons. All results and conclusions of the work are based on the "Export and import price index manual: theory and practice" (EIPIM, 2009).

In addition, the «Consumer price index manual: Theory and practice» published in 2004 by the International Labor Office, International Monetary Fund, Organization for Economic Cooperation and Development, Statistical Office of the European Communities (Eurostat), United Nations, The World Bank (CPIM, 2004) can be referred to fundamental guidelines in the field of practical development of economic indices. This Guide, in particular, provides an interesting overview of the theory of economic indices, including information for indices with Laspeyres and Paasche formulas based on basket of goods.

Currently, almost all countries participating in world trade follow the recommendations of the UN Statistics Department "compile and publish physical volume (quantity) indices , as well as price or value indices for total imports and exports on a monthly, quarterly and annual basis" (IMTS, 2011, para. 11.1). As a result, FT-indices are developed on a regular basis in the form of consolidated indices for exports and imports, as well as indices for commodity groups of particular importance to countries.

As a rule, FT-indices are included in the standard data set of national statistical systems and are calculated mainly using the well-known formulas of Laspeyres, Paasche and Fisher (by years, quarters, months) in accordance with the recommendations of EIPIM (2009). As noted above, most countries present FT-indices statistics not only by general macroeconomic indices, but also by their values for sections that are important for countries. The specific type and form of FT-indices presentation is determined by the country of origin.

More detailed information on FT-indices, including formulas for calculating Laspeyres, Paasche and Fisher indices, is available in Appendix B.

2.2.2 Additional possibilities of using FT-indices in the analysis of foreign trade

Foreign trade indices are one of the tools for analyzing foreign trade of goods, which allows us to examine the dynamics of commodity flows, taking into account changes in average prices and physical volumes of export and import. As a rule, foreign trade indices are included in the standard data set of national statistical systems in the form of summary total indices, which can be detailed by consolidated commodity groups (see tables for Russian statistics in Appendix B).

In general, at the macroeconomic level foreign trade indices describe the changes in prices and the number of deliveries of one universal commodity of the country and allow analyzing the conditions for the export and import of this commodity taking into account changes in its supply by price and quantity.

For the calculation of foreign trade indices, statistics forms a list of basic goods (the sample depth in it is not less than 95-99 percent), on the basis of which, using the known Laspeyres or Paasche formulas (see below (1) and (6)), the aggregate foreign trade index of the average prices and physical volume of exports and imports is calculated. All methods of calculating aggregated indices are well known and are described more than once in classic textbooks and statistical publications of international organizations, which underlie the statistics of all countries that are members of the IMF. First of all, this is the International Merchandise Trade Statistics: Compilers Manual (IMTS-CM, 2013), as well as other methodological and scientific publications, which were discussed above at the beginning of the paragraph.

From our point of view, the general disadvantage of using FT-indices in the analysis of foreign trade is that at best they use the published by statistics FT-indices and practically do not use the capabilities of index methods, which allow working with groups of goods and analyzing their consolidated group FT-indices. At present, these

indices are published by statistics in a minimal volume - only for enlarged product groups, which is clearly not enough for the vast majority of practical studies of specific problems of foreign trade. Since the methods for calculating group indices are known and described in the Compilers Manual (IMTS-CM, 2013), it would be possible to calculate the indices of interest by adapting the general methodology to specific research problems and solving them within the framework of a unified statistical methodology.

It was noticed that with the help of statistically calculated aggregated foreign trade indices, additional tasks can be formulated, such as an analysis of the influence of individual goods and their groups on the positions of other goods of the country's foreign trade (for example, how much the prices and volumes of physical energy supplies affect the total import index of the country, including the index of other goods). Similar tasks, unlike aggregated methods, require the appropriate disaggregation of indices for their solution (Aggregation, 2018, Disaggregation, 2018), when, based on the aggregated indices calculated by statistics, the FT-indices of the selected goods and / or groups of goods begin to be calculated and analyzed together with the total aggregate indices calculated by the statistics (according to the Laspeyres or Paasche or Fisher formulas).

It should be noted that disaggregation/aggregation methods are based on equivalent transformations and expand the analytical capabilities of the index methods, without changing the original standards and prerequisites of the latter.

For the first time, we considered the general formulation of such a problem for additional disaggregation and aggregation (Pushkin, 2004), but a specific method for its solution was not described, although it was applied in practice (Pushkin, 2009; Yurik, 2005). In particular, for the foreign trade of Belarus in the publication (Yurik, 2005), using disaggregation methods it was proved that the group of goods produced by private businesses of Belarus without financial state support demonstrates better

opportunities for adaptation to crisis phenomena (due to the optimal price reduction and volume changes and assortment of export supplies) than the group of goods produced by large state-owned enterprises with a full set of state benefits and financing.

In general, the solution of the tasks of selection relevant for the study commodity groups and goods is a natural extension of the classical marketing analysis and allows carrying out foreign trade research, for example, within the terminology and classification of commodity groups of the BCG Matrix (BCG Matrix, 2020). Here FT-indices would show the change in the rate of an indicator over a specified period of time, including for a selected group of goods.

In addition, FT-indices would be useful when doing benchmarking. Recall that benchmarking is the process by which the success of one company (country) is measured against other similar companies (countries) to determine if there are gaps that can be closed by improving its performance. Studying other companies (countries) can highlight what it takes to enhance the company's efficiency and become a bigger player in its industry (What-B, 2021).

In our case (for the Czech Republic), a study of the state of APF trade in other neighboring countries of the Visegrad Group (Poland, Hungary, Slovakia) can help to identify what is needed to improve the trading efficiency of the chosen country (Czech Republic) and turning it into a larger player in trade in the Russian APF market compared to neighboring countries.

Since all EU countries involved in the APF trade in the Russian market experienced a decline in trade after the introduction of Russian counter-sanctions in August 2014, this research topic is relevant.

2.3 Discussion

Thus, based on the analysis of publications on sub-topics 1-2, devoted to mirror statistics and foreign trade indices, the following conclusions can be drawn.

1. In our opinion, a common disadvantage of mirror statistics studies in terms of inconsistency (asymmetry) of mirror flows is the too wide coverage of trade, when asymmetry studies are carried out for almost the entire composition of commodity groups. At the same time, the assessment of the asymmetry of mirror data is carried out mainly in terms of cost indicators, while the volumes of physical indicators are practically not used.

2. It is fair to assume that even if there is a large asymmetry in the data for overall trading results, there are commodity groups where the differences in data remain within the CIF / FOB standard deviation. In this case, mirror statistics represent a full-fledged information base, on the basis of which, for example, one can study exports from one country to another using the mirror statistics of the import of another country. At the same time, experts note that data of mirror statistics on the import of goods deserve more confidence than export ones, their formation as sources of budget revenues is controlled more carefully.

3. As known, FT-indices show a kind of "speed of movement" of exports and imports of goods over a given period of time and are presented in the form of three indices: value, volume and price. The methods for calculating FT-indices are well known and based on the recommendations of international organizations that oversee international trade statistics (first of all, the IMF and the UN).

The analysis of publications showed that, despite the development of national FT-indices statistics, in general, their use as tools for analyzing foreign trade flows can be considered insufficient. First of all, this concerns the identification of groups of goods that are significant for practical analysis and assessment of their condition, dynamics and impact on other components of exports or imports.

We assumed that in this direction, based on additional aggregation / disaggregation of indices using a general methodology, it is possible to calculate group FT-indices of selected groups, for example, within the terminology and classification of commodity groups of the BCG matrix (BCG matrix, 2018). Here FT-indices would show the change in the rate of an indicator over a specified period of time, including for selected groups of goods, and would also indicate their development trends.

In addition, we also suggested that FT-indices would be useful for benchmarking the trade of the Czech Republic and neighboring countries from V4 and identifying areas for further expansion of trade and an increase in the Czech market share compared to the rest of the V4 countries.

3 Methodology: information and methodological support for calculations and quantitative analysis

Research on the topic of the dissertation was carried out in stages during training under the PhD program. As part of the Methodology section 3, at the first stage, the features of mirror statistics and the possibility of using it as a *database for analyzing* the export of Czech NPFs to Russia within the framework of the research topic were studied. Then the research was continued in the field of methods and tools of analysis..

Here, benchmarking was chosen as a *research methodology*, which made it possible to conduct a comparative analysis of the dynamics of APF trade in the Russian market (after the introduction of Russian counter-sanctions) for the Czech Republic in comparison with other V4 countries (Hungary, Poland and Slovakia), to assess the level of recovery for these countries trade (in relation to pre-crisis volumes) and determine the leader of the recovery of trade among the V4 countries for further study of the features and promising directions for the development of APF exports to the Russian market.

FT-indices were chosen as *analysis tools* for studying the dynamics and trends of trade, for which original calculation algorithms were proposed with the selection of groups of significant goods.

Below in this section, we will consider a detailed benchmarking analysis scheme, as well as describe the algorithms for calculating FT-indices that were used to study the dynamics of foreign trade within the framework of the dissertation topic.

3.1 Benchmarking in the comparative analysis of foreign trade of V4 countries

In the study, for stages 2-4 the concept of benchmarking was used, which is currently widely used in business in the comparative analysis of results and the search for the best development paths. We adapted this scheme for the countries of the V4 Visegrad Group (Czech Republic, Hungary, Poland and Slovakia) to conduct a comparative analysis of the results of APF trade in the Russian market and identify a leader, as well as study his trading practices.

According to the short definition: «Benchmarking is the process of comparing a company's performance to the performance of other companies» (Benchmarking-W, 2021). The broader definition indicates that «…Benchmarking is the process of studying and adapting the best practices of other enterprises to improve own results; creating a benchmark for assessing internal performance indicators in an enterprise; a way of collecting information by enterprises in order to identify the best practices of other enterprises» (Benchmarking, 2021).

Standard benchmarking stages (see also Benchmarking-W, 2021) usually include the selection of objects for comparison, the definition of target indicators when comparing objects, the collection of information and its analysis based on standard or original methods, the choice of a standard in order to study its best practices and improve the performance of other objects or a specific object.

Selection of countries for comparison. For our study, it was decided to compare the indicators of the total trade volumes of APF in the Russian market the Czech Republic and other V4 countries - Hungary, Poland and Slovakia based on geographic proximity and largely similar natural conditions and economic positions as new EU

members. Also, the selected countries have traditional trade relations with Russia as the largest export market for goods in the CIS.

The comparison criterion is the dynamics of the recovery of APF trade volumes in the Russian market (relative to the pre-crisis years of 2012-2013).

The period of comparisons is 2015 and beyond, which allows us to study the dynamics of the trade process after the introduction of Russian counter-sanctions in August 2014, starting with a decline in trade and then overcoming the decline and recovery in trade.

Taking into account the specified features of the development of trade, our comparative analysis was conditionally divided into two steps. The first step is to study the main changes caused by the decrease in the foreign trade turnover of the commodity composition of the supply of APF for V4 in the Russian market after the introduction of Russian counter-sanctions. The second step is to identify the country that is leading the recovery of foreign trade and an expanded analysis of its practice of APF trading in the Russian market. As a result, the main stages of benchmarking can be schematically represented as follows (Fig. 3.1):

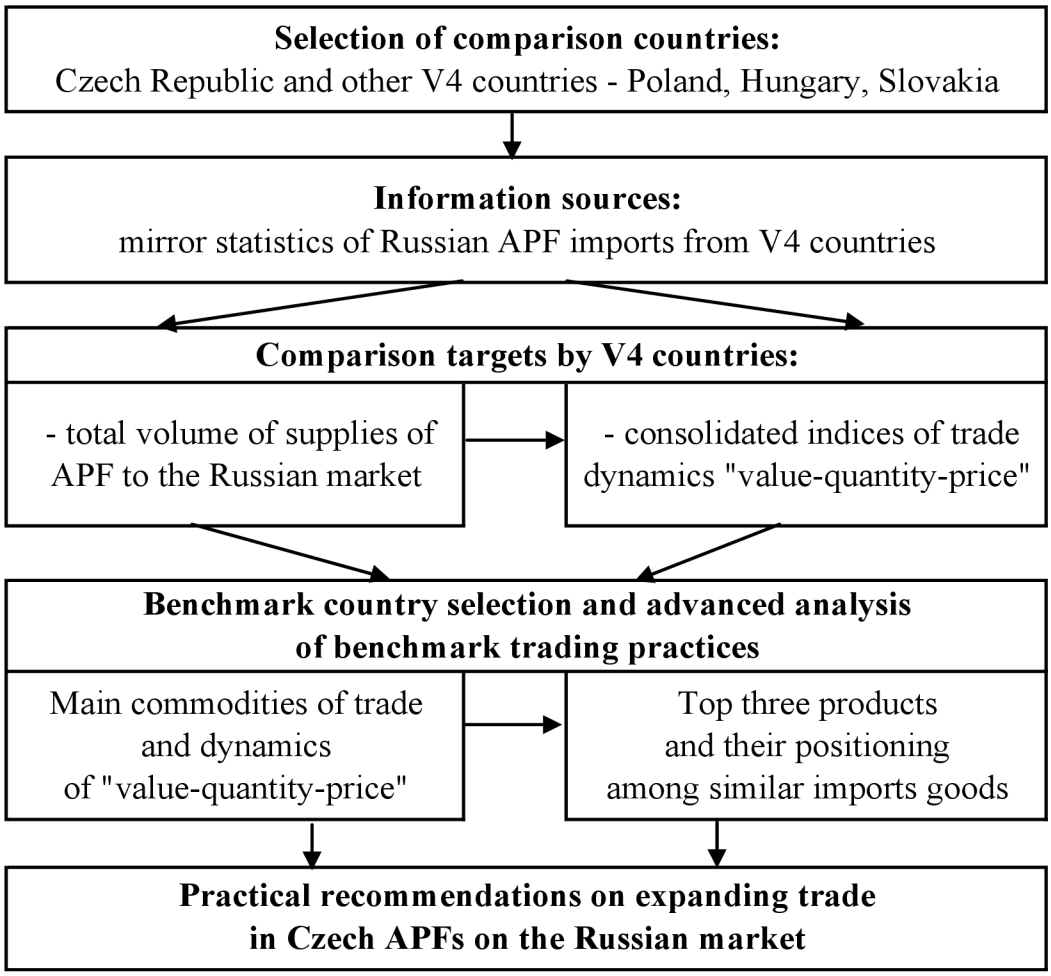


Figure 3.1 Outline of the main steps of benchmarking analysis
Source: author

The above benchmarking scheme formed the basis for the overall study design, which we present below.

3.2 Flowchart of research stages for section 3

The study on the topic of the dissertation was carried out in stages using statistics since 2015 (after the introduction of Russian counter-sanctions in August 2014) and included four stages, for which the statistics that were relevant for that period of time were used.

To reveal the topic the methods for calculating indicators were developed with the help of which calculations were carried out, tables with analytical comments to them were formed and clarified the tasks of the subsequent stages.

In general, the content of the stages can be represented as follows:

- stage 1 — Standards for quantitative asymmetry of data in order to assess the acceptability of the asymmetry of mirror statistics and hit of its CIF / FOB indicators in the range of permissible values

- stage 2 — Benchmarking of APF shipments to Russia: initial stage and study of the positioning of countries with a similar to the Czech Republic economic structure (V4 countries were selected here) to study the primary consequences of the introduction of counter-sanctions (August 2014) in the Russian APF market on the results and structure of trade in 2015 -2016. Here in a methodological support of calculations for solving the assigned tasks was propose which is shown in Figure 3.2

- stage 3 — Benchmarking of APF shipments to Russia: overcoming the decline in APF trade in the Russian market after the introduction of countersanctions with a comparison of the results of the recovery in trade volumes of the selected countries to determine the leader in the recovery of trade volumes in 2015-2017 among the V4 countries (based on the results of the comparative analysis). In this case Czech Republic turned out to be the undisputed leader in the recovery and expanding trade

among V4 countries. Also the methods for calculating the solution of the assigned tasks were developed which is noted in Figure 3.2

- stage 4 — Final stage: analysis of the leader's positions and trading practices. Post-sanction development of Czech APF trade in Russia in the mirror of Russian statistics (analysis of the state and problems, development of recommendations for expanding trade).

Visually, we presented the Flowchart of research stages for section 3 Methodology in Figure 3.2 in the form of interconnected blocks of four stages of analysis with the allocation of sub-blocks describing the corresponding research tasks for which a new information support was proposed - mirror statistics of APF imports to Russia. Also, unique (author's) methods for calculating index indicators and forming analytical tables have been developed for the subsequent analysis of the dynamics and development trends of Czech APF trade in the Russian market.

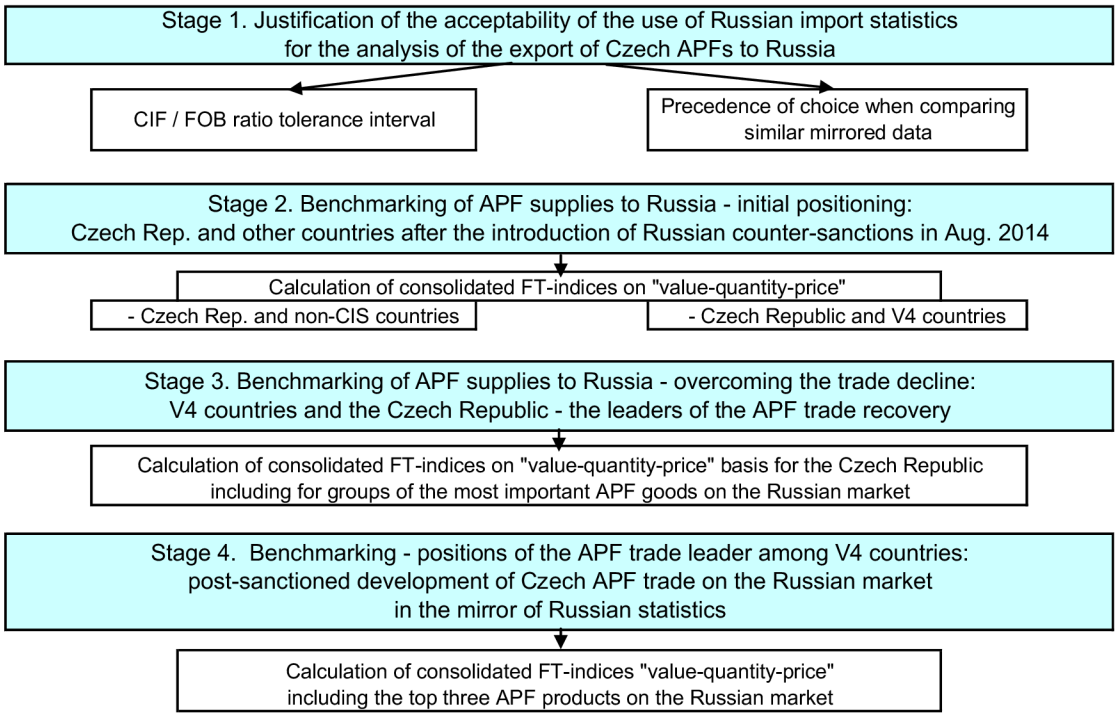


Figure 3.2 Flowchart of research stages for section 3
Source: author

Let us sequentially consider the stages 1-4 presented in Figure 3.2 within the framework of the features of information and methodological support of calculations for subsequent quantitative analysis.

3.2.1 Stage 1: informational and methodological support of the analysis based on mirror statistics

As is known, international trade between two countries is simultaneously monitored by the customs services of these countries. The result is a two-sided display of trade data, which is commonly referred to as mirror statistics. Theoretically in mirror statistics export of goods of one country to the other one should be equal to the import of goods of the latter country from the former one, whereas import of the former country from the latter one should be equal to export of the latter country to the former one. In practice, however, the mentioned trade volumes usually differ. Such a difference in data of mirror statistics is usually called asymmetry.

What is considered normal asymmetry of mirror flows? First of all, the asymmetry of the data is associated with the difference in the prices of the recorded flows. As is known, according to customs statistics methodology (IEMD, 2018; IMTS, 2011), the value of exporting goods of a country A to the market of a country B is represented by statistics of a country A in FOB prices, while imports of goods from a country A to a country B are represented by statistics of a country B at CIF prices, which additionally include the costs of insurance and transportation of goods. According to the IMF, the world average CIF/FOB value is 1.06 (DOTS, 2018; Bogdanova & Chuplanov, 2010), although the earlier studies used a coefficient of 1.10 (EIFRF, 2003; DOTS, 2018). Currently, the Central Bank of Russia at the mirror comparing statistics for non-CIS countries applies coefficient 1.0588 (BOPR-C, 2018, p. 1 – see Appendix C).

We also note that the permissible differences in the estimates depend on the specifics of the goods and are determined by the amount of expenses not only for transportation and insurance, but also during transportation losses, as well as calendar differences in sending and receiving goods.

Thus, we can conclude that the admissible discrepancy in the estimates of the asymmetry of mirror data is usually taken equal to 6–10%, and in the future we will focus on this range of values.

What is registered more precisely - export or import? To this question, the UN statistic experts answer that for a given country, imports are usually recorded with more accuracy than exports because imports are the main revenue base of the state budget, but exports are not (IEMD, 2018). The general view of experts on the accuracy of data collected by customs offices is that import data are more reliable than export data because customs services are more serious about recording imported goods for purposes of budget revenue from duties collection, taxes, and other regulatory controls (Hamanaka, 2011, p.1; EIFRF, 2003; WITS, 2010).

In other words, if you focus on the subject of the research (The Study of Czech APF Supplies to Russia Based on Russian Import Statistics) then according to experts the Russian import statistics data for subject of research within the framework of the dissertation topic will be more accurate than the Czech export statistics data.

Hence you can conclude that in case of discrepancies in the mirror data in frame of our research (it can be both value and natural volumes of trade) the data of Russian import statistics will be taken as preferred and more reliable since calculations of the cost and quantity of goods injected into the market are being done with more accuracy.

3.2.2 Stage 2-3: methodological support of FT-indices calculations for quantitative analysis of research tasks

When carrying out marketing analysis of foreign trade of goods, the study of the value indicators of trade must necessarily be supplemented with information on prices and physical volumes of exports and imports of goods. The information on the development of prices and volumes is generally presented in the form of indices. Currently, foreign trade indices (FTI) are one of the tools for analyzing foreign trade and allow us to examine the dynamics of commodity flows taking into account changes in average prices and physical volumes of exports and imports of goods. All methods of calculating aggregated indices are known and are described more than once in the publications of the author of the formulas for foreign trade indices (Laspeyres, 1871; Paasche, 1874; Fisher, 1922) and numerous textbooks on index methods (see, for example, Allen, 1975; Koves, 1983; Lebedev, 2014, and other authors). Modern approaches to the development of statistics using FTI are generalized and presented by the experts of IMF, WB, OECD, Eurostat in the joint development of the Export and Import price index manual (EIPIM, 2009; XMPI Manual, 2009).

Nowadays, as a rule, FTI are included in the standard data set of national statistical systems of IMF countries and are calculated by the aggregation method (Aggregation, 2018) at the macroeconomic level in the form of average price indices and volume indices of a single universal commodity of the country. For the calculation of FTI, statistics forms a list of main goods of the reference and reporting years (the sample depth in it, as a rule, is not less than 90 percent of the volume of goods), on the basis of which, using the formulas, the aggregate FTI of the average prices and physical volumes of exports and imports are calculated. These indices are subsequently published by the statistics, but the list of main goods is usually not published in view of its large size, although statistics show some of the most important commodities, for

example, in t he standard tables of distribution of the most important goods by countries.

We have noticed that with the help of aggregated FTI, calculated by statistics based on the list of main goods, additional tasks can be formulated, such as an analysis of the influence of individual goods and their groups on the positions of other goods of the country's foreign trade (for example, how much the prices and volumes of energy supplies affect the total import index of the country, including the index of other goods). Similar tasks can be solved by disaggregating of the already calculated total indices (Aggregation, 2018, Disaggregation, 2018), when the list of main goods is conventionally divided into two groups - a group of goods selected for analysis and a group of others. For the selected goods using the Laspeyres or Paasche formulas, the indices of their group are calculated, then for the group of the remaining goods, based on the proposed method, the indices of their group are determined by the formulas. Note that aggregation and disaggregation methods are based on equivalent transformations and significantly expand the analytical capabilities of the index methods, without changing the original standards and prerequisites of the latter. We found no analogues of the disaggregation methods for analysis of foreign trade by other authors similar to those proposed by us.

For the first time, a general statement of such a problem based on the Fisher formula (geometric mean from Laspeyres and Paasche) was considered (Pushkin, 2004), but a specific method for solving it was given without the description of formulas, although it was applied in practice (Pushkin, 2009; Yurik, 2005). In particular, for the foreign trade of Belarus in the publication (Yurik, 2005), using disaggregation methods it was proved that the group of goods exported by private businesses of Belarus without financial state support demonstrates better opportunities for adaptation to crisis phenomena (due to the optimal price reduction and volume changes and assortment of export supplies) than the group of goods produced by large state-owned enterprises with a full set of state benefits and financing.

In general, the solution of the tasks of selection commodity groups and goods is a natural extension of the classical marketing analysis and allows carrying out foreign trade research, for example, within the classification of commodity groups of the BCG matrix (BCG matrix, 2018). In this publication we, as an example, identified a group of products of sustainable growth and analyzed the dynamics of their prices and supplies, as well as a group of other products with an assessment of the prospects for their sales in the Russian market.

As have been noted in the Review section in the majority of cases foreign trade indices are calculated by the statistics of countries using the well–known Laspeyres or Paasche formulas on the basis of data on exports and imports of goods (see Appendix B). In Russia the Laspeyres formula is used to calculate foreign trade indices and the data source is the customs statistics – Customs statistics of the Russian Federation (FCSR, 2018-2020). The statistics of foreign trade of the Russian Federation represents foreign trade indices by the total results for the country, including for the CIS countries and the non–CIS countries, and also calculates foreign trade indices for the enlarged commodity sections of the HS (see Appendix A).

Below it will considered a sequence of mathematical formulas for calculating the FT-indices of "value-quantity-price" based on the Laspeyres formula using the methods of aggregating and disaggregating the list of goods. All the above calculation algorithms are also valid for the Paasche formula - just need to replace one formula in the ratios with another.

Further, the mathematical formulas of algorithms for calculating FT-indices based on the Laspeyres formula (Section 3.3.2.1) will be given, and then the table-matrix forms of these algorithms (Section 3.3.2.2) will be described, with the help of which these algorithms can be implemented in Microsoft Office Excel and calculate different variants of FT-indices for analysis.

3.2.2.1 General formulas for calculating the Laspeyres price average index based on the aggregation method (A-method) and the disaggregation method (D-method)

As defined by the UN Glossary of Statistics, "aggregation denotes the compounding of primary data into an aggregate, usually for the purpose of expressing them in a summary form. For example, national income and price index numbers are aggregative, in contrast to the income of an individual or the price of a single commodity" (Aggregation, 2018). In general, "the statistics for related categories can be grouped or collated (aggregated) to provide a broader picture. Categories can be split (disaggregated) when finer details are required" (Disaggregation, 2018).

In Russian statistics, FT-indices are calculated based on the Laspeyres formula:

$$I^p = \frac{\sum p^1 * q^0}{\sum p^0 * q^0}, \quad (3.1)$$

where p^0, p^1 –the price per unit of goods in the reference and reporting years;

q^0, q^1 – the quantity of goods in the reference and reporting years;

I^p – Laspeyres average price index.

In this publication, for calculating FT-indices "value-quatity-price", we used the methods of aggregation and disaggregation of indices, which are a modification of the general methods (Pushkin & Yurik, 2018 – see below), adapted to solve the problems under consideration.

MATERIALS AND METHODS

Foreign trade indices are calculated by the statistics of countries using the well–known Laspeyres and Paasche formulas based on data on exports and imports of

goods. In Russia the Laspeyres formula is used to calculate foreign trade indices and the data source is the customs statistics (Customs statistics of the Russian Federation – database, 2018).

Denote q0, q1 – the quantity of goods in the reference and reporting years; p0, p1 – the price per unit of goods in the reference and reporting years, respectively. Foreign trade indices are aggregated and are usually calculated by the average price index Ip. The quantity index is then calculated by dividing the value index by the price index. Summation is made by the number of goods exported and imported by the country. The Laspeyres price index assumes the use of weights of the reference period and is calculated by the formula:

$$I^{p}_{lps} = \frac{\Sigma p_1 * q_0}{\Sigma p_0 * q_0}, \quad (1)$$

$\Sigma p_1 * q_0$ – the cost of products of the reference period at the prices of the reporting period;

$\Sigma p_0 * q_0$ – the actual cost of products in the reference period.

The statistics of foreign trade of the Russian Federation represents foreign trade indices by the total results for the country, including for the CIS countries and the non–CIS countries, and also calculates foreign trade indices for the enlarged commodity sections of the HS.

Setting the task of identifying the most important (significant) goods and their groups in exports or imports using total foreign trade indices

To describe the calculation algorithm, we use the table–matrix form with the numbering of rows of the matrix from 0 to 3, the columns from A and then alphabetically. The cells of the matrix with known values are marked in blue, description of calculations on the text below.

Method A: the allocation of commodity from the total.

Given: Foreign trade total indices and indices for the goods (Table 1). It is required to find: indices of the other goods.

We carry out additional obvious calculations of the values of the indices of the average prices $p1^0$ and $p1^1$ (columns E and F) for goods 1 according to the formula:

$$p_i^t = s_i^t / q_i^t, \quad (2)$$

where i = 1 - (i = 1, ..., n – the quantity of goods); p_i^t – the price of goods i in year t; s_i^t – the value of the commodity i in the year t.

Table 1 Initial data for calculations of variant A

		A	B	C	D	E	F	G	H	I
		t=0	t=1	t=0	t=1	t=0	t=1	Average price index (I^p_{Lps})	Volume index (I^p_{vlm})	Value index (I^p_{vl})
		Value, thousand $		Volume, unit		Price, $/unit				
0	TOTAL	S^0	S^1	-	-	-	-	$I^p_{Lps}{}^0$	$=(S^1/S^0)/I^p_{lps}$	$=S^1/S^0$
1	- goods 1	$s_1{}^0$	$s_1{}^1$	$q_1{}^0$	$q_1{}^1$	$p_i^t = s_i^t / q_i^t$		...	...	$= s_i^1 / s_i^0$
2	Other *	$=S^0 - s_1{}^0$	$=S^1 - s_1{}^1$							

Source: Author

Also for further calculations, we fill in the two line items "Other" A2 and B2 of Table 1 – this isthe cost of other goods in the reference and reporting years; S^0 and S^1:

$$S^0_{oth} = S^0 - s_1{}^0 ,$$

$$S^1_{oth} = S^1 - s_1{}^1 \quad (3)$$

where S^0, S^1 – total value of goods in the reference and reporting years; $s_1{}^0$, $s_1{}^1$ – the value of goods 1 in the reference and reporting years.

We will also recall that the Average price index (in our case this is Laspeyres price index I^p_{Lps}) is calculated by the statistics according to the formula (1), Value index (I^p_{vl}) is the ratio of the set values S1 / S0 (they can also be calculated for all rows by column I of table 1). As a result, the Volume index I^p_{vlm} is calculated by the formula:

$$I^p_{vlm} = (S^1/S^0) / I^p_{lps} = I^p_{vl} / I^p_{lps} . \quad (4)$$

Having prepared the information, we proceed to the calculation formula Laspeyres price index I^p_{Lps} * for the line "Other" (position L2 of Table 2). Note that Table 2 is an extension of Table 1 with hidden columns C–F and additional columns J–L.

Table 2 Calculations Laspeyres price index using method A

		A	B	G	H	I	J	K	L
		t=0	t=1	Average price index (I^p_{Lps})	Volume index (I^p_{vlm})	Value index (I^p_{vl})	Laspeyres price index		
		Value, thousand $					$p_0 * q_0$	$p_1 * q_0$	I^p_{Lps}
0	TOTAL	S^0	S^1	I^p_{Lps}	$=(S^1/S^0)/I^p_{lps}$	$=S^1/S^0$	$= S^0$	$=I^p * S^0$	$I^p_{Lps}{}^0 = G0$
1	- goods 1	$s_1{}^0$	$s_1{}^1$	...	...	$= s_i^1 / s_i^0$	$= s_1{}^0$	$= p_1{}^1 * q_1{}^0$	-
2	Other *	$=S^0 - s_1{}^0$	$=S^1 - s_1{}^1$	$I^p_{Lps}{}^* = L2$	=I2 / G2	=B2 / A2	=J0 – J1	= K0 – K1	= K2 / J2

Source: Author

Next, we calculate the numerator and denominator (1) using the values of matrix-table 2, so that the formula for calculating Laspeyres price index IpLps* for the line "Other" will be as follows:

$$I^p_{Lps}{}^* = K2 / J2 = (K0 - K1) / (J0 - J1), \quad (5)$$

where the elements of formula (5) are the values at the intersection of the indicated columns K, J and rows 0, 1 of the matrix–table 2. Thus, the unknown indices are calculated.

Method B: group N of goods and calculation of the Laspeyres index of the group.

Given: all the necessary indicators for a group N of goods (Table 3). It is required to find: a total index of average prices and natural supplies for this group.

In this case the Laspeyres index is calculated by the formula (1), considering the statistic values for each commodity (columns A–F) and the additional calculation of the total value of all goods of the reporting year t = 1 in the reference year prices t = 0 (cell K0 of table 3).

Table 3 Initial data and calculations Laspeyres price index using method B

		A	B	C	D	E	F	G	H	I	J	K	L
		t=0	t=1	t=0	t=1	t=0	t=1	Average price index	Volume index (I^p_{vlm})	Value index (I^p_v)	Laspeyres price index		
		Value, thousand $		Volume, unit		Price, $/unit					$p_0 * q_0$	$p_1 * q_0$	I^p_{Lps}
0	Total by goods	$S^0=\sum s_i^0$	$S^1=\sum s_i^1$	-	-	-	-	I^p_{Lps}	$=(S^1/S^0)/I^p_{lps}$	$=S^1/S^0$	S^0	$=\sum p_i^1*q_i^0$	=K0/J0
1	- goods 1	s_i^t, i=1,N, t=1.2		q_i^t, i=1,N, t=1,2		$p_i^t= s_i^t / q_i^t$, i=1,N, t=1.2						$=p_i^1*q_i^0$, i=1,N	
2	- goods 2												
..	.....												
N	- goods N												

Source: Author

We note that method B can be combined with method A. As a result, we are able to analyze the indices of a certain sample and other goods in a common set of export or import goods. Obviously, it is possible, if necessary, to increase the number of groups of goods, including significant for the analysis goods in them. The calculation algorithms will be similar to methods A and B.

Also it is necessary to make appropriate changes to the formulas in Tables 2–3 (columns J and K), if for the calculation of foreign trade indices the statistical bodies the Paasche formula is used:

$$I^p_{psch} = \frac{\sum p_1 * q_1}{\sum p_0 * q_1}, \qquad (6)$$

Using methods A and B listed above, the required index indicators of the tables were calculated to analyze the supply of Czech products to the Russian market.

RESULTS AND DISCUSSION

Approbation of methods and discussion of results

The initial statistical basis for calculations based on the proposed index methods for analyzing Czech exports to Russia was data from statistics on imports of

Czech goods to the Russian market. Data source – Federal Customs Service of Russia (2018).

We note that in the Russian customs statistics, foreign trade indices are calculated using the Laspeyres formula. For approbation of the index methods, the information on trade in foodstuff and agricultural raw materials was chosen as the analysis group – these are goods from commodity groups HS 01–24. The main products of Czech imports of foodstuff and agricultural raw materials to the Russian market are presented in Table 4.

Table 4 Russian import from Czech Republic: main goods

	HS code			2016			Indices 2016/2015			2016-2015, thous. $
				Quantity	Value, thous. $	Share	price	volume	value	
		Russian import from Czech Rep.			109 323	100%	-	-	1,087	
		- HS (01-24) from Czechia			108 393	99,3%	0,989	1,102	1,090	8 933
		- 32 main goods								
1	2309	Animal feed	t	13630	24 704	22,6%	**1,137**	**1,274**	**1,448**	7 648
2	0407	Birds'eggs	t	6627	21 556	19,7%	0,768	1,317	1,012	248
3	2203	Beer made from malt	l	17635211	16 301	14,9%	0,979	1,142	1,119	1 731
4	1207	Other oil seeds and oleaginous fruits	t	7376	12 011	11,0%	0,863	1,197	1,034	393
5	2208	Spirits, liqueurs and other spirituous, beverages	l	358817	3 672	3,4%	0,926	1,102	1,021	76
6	1302	Vegetable saps and extracts	t	249	3 530	3,2%	**1,451**	**1,556**	**2,258**	1 966
7	1704	Sugar confectionery (including white chocolate)	t	1392	3 375	3,1%	0,987	0,928	0,916	-310
8	1210	Hop cones	t	342	3 352	3,1%	0,974	1,239	1,207	574
9	1107	Malt, whether or not roasted	t	6230	3 343	3,1%	0,970	0,977	0,948	-182
10	2106	Other food products	l	300	2 792	2,6%	1,575	0,476	0,750	-931
11	2101	Extracts of coffee, tea or mate'	t	808	2 495	2,3%	**1,018**	**1,140**	**1,160**	344
12	1602	Other prepared or preserved meat	t	898	2 397	2,2%	0,994	0,681	0,676	-1 147
13	1905	Pastry, cakes, biscuits and other	t	401	1 826	1,7%	1,513	0,599	0,906	-190
14	1209	Seeds of a kind used for sowing	t	138	1 080	1,0%	**1,134**	**1,221**	**1,385**	300
15	0106	Live poultry	pcs	2405	893	0,8%	**1,716**	**1,696**	**2,910**	586
16	1904	Prepared foods obtained	t	205	694	0,6%	1,050	0,554	0,582	-498
17	1901	Malt extract	t	221	640	0,6%	0,738	0,831	0,614	-403
18	2008	Fruit, nuts and other	t	187	510	0,5%	1,060	0,773	0,819	-113
19	2201	mineral water without sugar	l	818039	427	0,4%	1,022	0,843	0,861	-69
20	2202	Waters mineral, containing sugar	l	575304	401	0,4%	**1,013**	**1,226**	**1,242**	78
21	2206	Other fermented beverages	l	219650	328	0,3%	0,904	0,266	0,241	-1 034
22	0105	Flour	pcs	421560	301	0,3%	**1,102**	**1,233**	**1,360**	80
23	2007	Jams, fruit jellies, marmalades	t	280	301	0,3%	0,807	0,720	0,581	-218
24	2209	Viengar and substitutes	l	798000	258	0,2%	0,970	1,462	1,418	76
25	1902	Pasta	t	271	225	0,2%	**1,028**	**1,726**	**1,774**	98
26	2005	Other vegetables prepared	t	141	214	0,2%	0,868	0,972	0,844	-40
27	1514	Rape	t	119	166	0,2%	1,047	0,930	0,974	-5
28	1001	Wheat	t	183	159	0,1%	1,740	0,600	1,044	7
29	2103	Sauces and preparations therefor	t	61	142	0,1%	1,059	0,726	0,769	-43
30	0208	Other meat and edible meat offal	t	40	135	0,1%	0,996	2,000	1,993	67
31	1520	Glycerol	t	240	115	0,1%	0,923	0,632	0,583	-82
32	1806	Chocolate and other food	t	11	52	0,0%	0,845	0,478	0,404	-77

Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2018.

At the beginning of Table 4 the data of Czech imports to Russia for foodstuff and agricultural raw materials shown by Russian customs statistics are presented. The list of these products includes 32 items (4–digit HS code) from commodity groups (01–24), which are presented separately in 32 products in table 4, as well as the total

result, including foreign trade indices calculated using the Laspeyres formula. As follows from Table 4 the list of 32 goods is more than 99% of the value of Czech imports which allows using their composite indices also in the analysis of groups.

Goods with growing value

As one example of the use of foreign trade indices, we will analyze data on goods with the largest growing value in 2016 (the last column of Table 4). In the group of selected products we include only those in which all three of the index is greater than one (in Table 4 there are eight such goods, they are marked with a fill).

We will include in the group with growing cost four products with the largest volume of value growth and the indices of all indices are more than one. In addition, we show the position of beer as a separate line, since the increase in its value has the third result in the list–32 goods, although the average price index of 0.997 is slightly less than one. Once again we note that our group includes only those Czech goods that have significantly expanded their presence in the Russian market due to a simultaneous increase in prices and natural supplies.

The calculated data of Table 5 show that the five allocated goods expand their presence in the Russian market, having high competitiveness, which allows them to simultaneously increase the price and increase natural volumes of supplies.

In general prices and natural supplies for selected five goods (30.2% of total imports of goods) increased by 15.6% and 29.4% respectively, which increased the cost of supplies by 1.5 times or by $ 10.9 million. As a result, there was a change in the structure of imports, where the share of the five allocated goods–leaders increased from 22% in 2015 to 32.7% in 2016. In a somewhat different way, it was possible to increase the volume of beer sales – this became possible due to a small decrease in prices (by 2.1%) and growth in natural supplies (by 14.2%), with the result that the cost of beer sales for the year increased by $1.7 million.

The remaining 26 goods from Table 4 were able to keep the volume of natural supplies (the index of quantity is 1) only because of a fall in prices (by 5.8%), which caused a decrease in the value of sales by $ 3.6 million.

Thus, the analysis of goods from the group of unconditional sales leaders allows us to indicate their contribution to the growth of exports of goods to the market and a change in the share in exports, as well as to determine the characteristics of the indices of other goods (in our case, there was a drop in sales, comparable to a decrease in average prices). Note that in order to continue the analysis, depending on the research objectives, the group of other goods can be divided into subgroups, using the same method, similar to that considered in this example, to calculate the composite

indices of subgroups.

Table 5 Russian import from Czech Republic food and agricultural products: goods with growing value

HS code			2016			2016-2015, thou $	Indices 2016/2015		
			Quantity	Value, thou $	Share		price	volume	value
	32 main goods			108 393	100%	8 933	0,989	1,102	1,090
	- 5 goods with growing value			32 701	30,2%	10 845	1,156	1,294	1,496
2309	Animal feed	t	13630	24 704	22,8%	7 648	1,137	1,274	1,448
1302	Vegetable saps and extracts	t	249	3 530	3,3%	1 966	1,451	1,556	2,258
2101	Extracts of coffee, tea or mate'	t	808	2 495	2,3%	344	1,018	1,140	1,160
1209	Seeds of a kind used for sowing	t	138	1 080	1,0%	300	1,134	1,221	1,385
0106	Live poultry	pcs.	2405	893	0,8%	586	1,716	1,696	2,910
2203	- Beer made from malt	l	17635211	16 301	15,0%	1 731	0,979	1,142	1,119
	- Other 26 goods			59 392	54,8%	-3 642	0,942	1,000	0,942

Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2018.

Analysis of the competitive position of the Czech Republic among non–CIS countries in the Russian agricultural and food market

Table 6 presents data on the volumes of Russian imports from non–CIS countries together with the corresponding indices of foreign trade, including indicators for the import of foodstuff and agricultural raw materials (groups 01–24) from non–CIS countries. Then the data of the Czech import of agricultural products to Russia – total, including the share of the Czech Republic in the volume of non–CIS countries agricultural products, is presented. The last line of the table contains data on imports of agricultural products from the rest of the non–CIS countries (excluding the Czech Republic), as well as the foreign trade indices calculated using method A on this line. We draw your attention to the fact that this problem is solved in the event that foreign trade indices of the country are specified for the selected group (in our case these are indices in groups 01–24 for the Czech Republic). We considered them to be the same as the indices of the main 32 goods in groups 01–24 (99% of the country's imports), which were calculated above using Method A in Table 4.

As can be seen from Table 6, in general, imports of agricultural products from non–CIS countries decreased by 8% or $ 1.8 million, while physical supplies decreased (by 5.3%) and average prices fell (by 2.9%). The rest of the non–CIS countries (without the Czech Republic), as shown in Table 6, have the same index characteristics (a difference of tenths of a percent in the value and volume indices). At the same time, imports of goods from the Czech Republic, on the contrary, increased by 9%, or by almost $ 9 million, with an increase in physical volumes of supplies (by 10%) and almost unchanged average prices (they decreased by only 1.1%). In other words, the Czech Republic expanded the presence of its agricultural products on the Russian market, practically without reducing average prices for products.

Table 6 Russian import from non–CIS countries: trade indices

	2015		2016		2016-2015, thou $	Indices 2016/2015		
	value, thousand $	% of total	value, thousand $	% of total		price	volume	value
Russian import from non-CIS countries	161 692 700		162 724 500		1 031 800	0,978	1,026	1,003
- foodstuff and agricultural raw (01-24) - from non-CIS countries	22 213 700	13,7%	20 428 500	12,6%	-1 785 200	0,971	0,947	0,920
- from Czech Republic	100 532	0,1%	109 323	0,1%	8 791	-	-	1,087
- share (01-24) from non-CIS	0,45%		0,54%					
- main goods (32 pcs.)	99 637	0,1%	108 549	0,1%	8 912	0,989	1,101	1,089
(%of total import from Czech Rep.)	99,1%		99,3%					
Other 01-24 (non-CIS countries without the Czech Re	22 114 063		20 319 951		-1 794 112	0,971	0,946	0,919

Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2018.

Thus, the competitive position of the Czech Republic on agricultural trade in the Russian market in terms of the ratio of changes in the "product–price–cost" factors looks more preferable in 2015–2016 than the average for non–CIS countries (without the Czech Republic), because of the indices of the Czech Republic is significantly higher than the average level of non–CIS countries and has an increase in sales in the Russian market, unlike the rest of the non–CIS countries, where sales decreased by 8.1%.

With the availability of information, the analysis can be continued, for example, with the allocation of countries of major competitors. In addition, it can be selected another or other product groups. The calculation algorithms for solving these new problems will in principle be the same as in the cases considered above.

CONCLUSION

Foreign trade indices are calculated using the well-known Laspeyres and Paasche formulas in aggregate form on the basis of a list of the basic export or import goods. From the point of view of foreign trade analysis, it seems interesting to solve the "reverse" problem - the disaggregation of indices, when the influence of the dynamics of changes in trade of significant goods or their groups on general trade changes, as well as on other commodities, is analyzed using statistically calculated foreign trade indices. With the help of disaggregation methods, tasks can be formulated and solved, for example, within the framework of BCG matrix classifications, as well as many others.

In the research the statements of two basic problems of aggregation foreign trade indices for large groups of goods taking into account their importance are considered and the methods of their solution with formulas of calculations in a table–matrix form are described. The first method of calculation allows us to calculate the total price index of group (or groups) of goods, the second method is intended for calculations of price indices of other goods out of the allocated group (or groups). It is noted that the combination of the methods considered makes it possible to select and

analyze the state of the indicators of commodity groups taking into account changes in the "price–quantity–value" factors.

For approbation of methods, foodstuff and agricultural raw materials from commodity groups HS 01–24 were included into the study group. For the indicated commodity group of Czech goods it was necessary to analyze the state and conditions of sales in the Russian market. The customs statistics of Federal Customs Service of Russia was chosen as the source of data for the solution of the task.

On the basis of the Russian customs statistics, calculations of the aggregated price indices for import of all Czech foodstuff and agricultural raw materials to the Russian market were made, as well as calculations with allocation of additional group of the goods which have provided the greatest expansion of sales.

Thus, the calculations of the indices and the analysis of the presence of Czech goods and goods of other non–CIS countries on the Russian agricultural and food market showed the following: in 2015–2016 the rest of the non–CIS countries (without the Czech Republic) reduced their sales (by 8%) due to a simultaneous fall in prices (by 3%) and volumes of natural sales (by 5%). At the same time, unlike the rest of the non–CIS countries, the Czech Republic was able to ensure the growth of sales of foodstuff and agricultural raw materials (by 9%) on the basis of growth in natural supplies (by 10%) and practically stable average prices (a decrease of 1%).

Further, the analysis of the list of the main goods of Czech imports to the Russian market showed that the total growth in sales of Czech goods on the Russian agricultural and food market was provided by the group of goods of the greatest growth. These commodities have high competitive potential and increase sales volumes with simultaneous price (by 16%) and natural supplies (by 29%) increase. Although the rest of Czech goods preserved volumes of natural supplies, as a whole they reduced the sales value due to the fall in average prices (by 6%).

It is planned to conduct a research with the use of foreign trade indices on the trade of the Visegrad Group countries with the Russian Federation in the agricultural and food market. In particular, it is supposed to analyze the state and influence of sanctions against Russia Federation on trade of the countries, as well as assess the possibilities of restoring trade volumes by expanding sales of non-sanction goods.

To describe the sequence of mathematical formulas for determining FT-indices for certain sets of given indicators, we will use the following notation:

n, k – the quantity of goods in the sample and in the selected group;

p^0_i, p^1_i – the price of goods i in the reference and reporting years;

q^0_i, q^1_i – the quantity of goods i in the reference and reporting years;

s^0_i, s^1_i – the value of goods i in the reference and reporting years;

S^0_n, S^1_n – the value of all n goods in the reference and reporting years;

S^{01}_n – the value of all n goods in the reference year at the prices of the reporting year (numerator of the Laspeyres formula (3.1));

I^s_n, I^p_n, I^q_n – value index, average price index and quantity index of the reporting year to the reference year for a group of n goods.

Aggregation method (A-method):

need to define *total FT-indices for a list of n products.*

Initially known: s^1_i, s^0_i, q^1_i, q^0_i, i = 1,2…,n.

Additionally, we calculate the total value of n goods:

$$S^1_n=\sum s_i^1 \; ; \quad S^0_n=\sum s_i^0 \; , i = 1,2…n. \tag{3.2}$$

Further, we note that the denominator of formula (3.1) is equal to S^0_n:

$$\sum p_i^0 q_i^0 = \sum s_i^0 = S^0_n \; , i = 1,2…n, \tag{3.3}$$

and the numerator can be calculated by the formula:

$$S^{01}_n=\sum p_i^1 * q_i^0 \; , i = 1,2…n. \tag{3.4}$$

Then the value index, average price index and quantity index for a list of n products are calculated by the formulas:

$$I^s_n = S^1_n / S^0_n ; \tag{3.5}$$

$$I^p_n = S^{01}_n / S^0_n ; \tag{3.6}$$

$$I^q_n = I^S_n / I^p_n . \tag{3.7}$$

Disaggregation method (D-method):
need to define *total indices for a group of k products and a group of other (n - k) products*

For a group of k products (k <n), initially known: s^1_j s^0_j, q^1_j q^0_j, j = 1,2…,k. To determine FT-indices using formulas (2)-(4), we calculate the required total parameter values for n = k, and then the final value index, average price index and quantity index for the group using formulas (3.5) - (3.7) for n = k.

For the group of other (n - k) goods, the total values of formulas (3.2) - (3.4) necessary for calculating the three indices are defined as the difference between the corresponding amounts for n and k goods. Then the value index, average price index and quantity index for the remaining (n - k) goods are calculated according to formulas (3.8) - (3.10):

$$I^s_k = S^1_k / S^0_k = (S^1_n - S^1_k) / (S^0_n - S^0_k) ; \quad (3.8)$$

$$I^p_k = S^{01}_k / S^0_k = (S^{01}_n - S^{01}_k) / (S^0_n - S^0_k) ; \quad (3.9)$$

$$I^q_k = I^S_k / I^p_k . \quad (3.10)$$

3.2.2.2 General table-matrix algorithms for calculating FT-indices using the A-method and D-method

To describe the calculation algorithm, we use the table–matrix form with the numbering of rows of the matrix from 0 to 3, the columns from A and then alphabetically. The cells of the matrix with known values are marked in blue, description of calculations on the text below.

A-method: aggregation method for calculating summary FT-indices for a group of goods based on the Laspeyres formula

Given: all the necessary indicators for a group N of goods (Table 3.1). It is required to find: a total index of average prices and natural supplies for this group.

In this case the Laspeyres index is calculated by the formula (1), taking into account the statistic values for each commodity (columns A–F) and the additional calculation of the total value of all goods of the reporting year t = 1 in the reference year prices t = 0 (cell K0 of table 3.1).

Table 3.1 Initial data and calculations Laspeyres price index
using method A (aggregation)

		A	B	C	D	E	F	G	H	I	J	K	L
		t=0	t=1	t=0	t=1	t=0	t=1	Average price index	Volume index (I^P_{vlm})	Value index (I^P_{vl})	Laspeyres price index		
		Value, thousand $		Volume, unit		Price, $/unit					$p_0 * q_0$	$p_1 * q_0$	I^P_{Lps}
0	Total by goods	$S^0=\sum s_i^0$	$S^1=\sum s_i^1$	-	-	-	-	I^P_{Lps}	$=(S^1/S^0)/I^P_{lps}$	$=S^1/S^0$	S^0	$=\sum p_i^1*q_i^0$	=K0/J0
1	- goods 1	s_i^t, i=1,N, t=1.2		q_i^t, i=1,N, t=1,2		$p_i^t= s_i^t / q_i^t$, i=1,N, t=1.2						$=p_i^1*q_i^0$, i=1,N	
2	- goods 2												
…	…….												
N	- goods N												

Source: Author
Note. We have placed an enlarged version of this table in the Appendix D.

We note that method B can be combined with method A. As a result, we are able to analyze the indices of a certain sample and other goods in a common set of export or import goods. Obviously, it is possible, if necessary, to increase the number of groups of goods, including significant for the analysis goods in them. The calculation algorithms will be similar to methods A and B.

D-method: disaggregation method for calculating FT-indices of a group of "other products" in the list when one product is selected and the specified consolidated FT-indices of the list of products and the selected product the allocation of commodity from the total list

Given: Foreign trade total indices and indices for the goods (Table 3.2). It is required to find: indices of the other goods.

We carry out additional obvious calculations of the values of the indices of the average prices p_1^0 and p_1^1 (columns E and F) for goods 1 according to the formula:

$$p_i^t = s_i^t / q_i^t , \tag{3.12}$$

where i – the quantity of goods (i = 1, ..., n); p_i^t – the price of goods i in year t; s_i^t – the value of the commodity i in the year t.

Table 3.2 Initial data and calculations Laspeyres price index using method D (disaggregation)

		A	B	C	D	E	F	G	H	I
		t=0	t=1	t=0	t=1	t=0	t=1	Average price index (I^p_{Lps})	Volume index (I^p_{vlm})	Value index (I^p_{vl})
		Value, thousand $		Volume, unit		Price, $/unit				
0	TOTAL	S^0	S^1	-	-	-	-	$I^p_{Lps}{}^0$	$=(S^1/S^0)/I^p_{lps}$	$=S^1/S^0$
1	- goods 1	$s_1{}^0$	$s_1{}^1$	$q_1{}^0$	$q_1{}^1$	$p_i^t = s_i^t / q_i^t$		...	...	$= s_i{}^1 / s_i{}^0$
2	Other *	$=S^0 - s_1{}^0$	$=S^1 - s_1{}^1$							

Source: Author
Note. We have placed an enlarged version of this table in the Appendix D.

Also for further calculations, we fill in the two line items "Other" A2 and B2 of Table 3.2 – this is the cost of other goods in the reference and reporting years S^0_{oth} and S^1_{oth}:

$$\begin{aligned} S^0_{oth} &= S^0 - s_1{}^0 , \\ S^1_{oth} &= S^1 - s_1{}^1 \end{aligned} \tag{3.13}$$

where S^0, S^1 – total value of goods in the reference and reporting years; $s_1{}^0$, $s_1{}^1$ – the value of goods 1 in the reference and reporting years.

We will also recall that the Average price index (in our case this is Laspeyres price index I^p_{Lps}) is calculated by the statistics according to the formula (3.1), Value index (I^p_{vl}) is the ratio of the set values S1 / S0 (they can also be calculated for all rows by column I of table 3.2). As a result, the Volume index I^p_{vlm} is calculated by the formula:

$$I^p_{vlm} = (S^1/S^0) / I^p_{lps} = I^p_{vl} / I^p_{lps} . \tag{3.14}$$

Having prepared the information, we proceed to the calculation formula Laspeyres price index I^p_{Lps}* for the line "Other" (position L2 of Table 2).

Note that Table 2 is an extension of Table 1 with hidden columns C–F and additional columns J–L.

Table 3.3 Calculations Laspeyres price index using method D

		A	B	G	H	I	J	K	L
		t=0	t=1	Average price index (I^p_{Lps})	Volume index (I^p_{vlm})	Value index (I^p_{vl})	Laspeyres price index		
		Value, thousand $					$p_0 * q_0$	$p_1 * q_0$	I^p_{Lps}
0	TOTAL	S^0	S^1	I^p_{Lps}	$=(S^1/S^0)/I^p_{lps}$	$=S^1/S^0$	$= S^0$	$=I^p * S^0$	$I^p_{Lps}{}^0 = G0$
1	- goods 1	$s_1{}^0$	$s_1{}^1$	…	…	$= s_i{}^1 / s_i{}^0$	$= s_1{}^0$	$= p_i{}^1 * q_i{}^0$	-
2	Other *	$=S^0 - s_1{}^0$	$=S^1 - s_1{}^1$	$I^p_{Lps}{}^* = L2$	=I2 / G2	=B2 / A2	=J0 – J1	= K0 – K1	= K2 / J2

Source: Author

Note. We have placed an enlarged version of this table in the Appendix D.

Next we calculate the numerator and denominator (3.1) using the values of matrix-table 2, so that the formula for calculating Laspeyres price index $I^p_{Lps}{}^*$ for the line "Other" will be as follows:

$$I^p_{Lps}{}^* = K2 / J2 = (K0 - K1) / (J0 - J1), \quad (3.15)$$

where the elements of formula (3.15) are the values at the intersection of the indicated columns K, J and rows 0, 1 of the matrix–table 2. Thus, the unknown indices are calculated.

Also it is necessary to make appropriate changes to the formulas in Tables 2–3 (columns J and K), if for the calculation of foreign trade indices the statistical bodies the Paasche formula is used:

$$I^p_{psch} = \frac{\sum p_1 * q_1}{\sum p_0 * q_1}, \quad (3.16)$$

Based on the A-method, D-method, and their combinations, adapted computational algorithms were developed to analyze the research problems of this thesis and generate tables in Section 4.

3.2.2.3 Modifications of methods for calculating FT-indices to analyze the dynamics and trends of trade

For the first time, a description of the A-method and D-method for calculating FT-indices and a discussion of their capabilities in solving the problems of analyzing Czech APF supplies to the Russian export market was published earlier in articles (Pushkin N. & Yurik S., 2018).

3.2.2.3.1 Assessment of the dynamics of the country's trade: calculation of the general FT-indices for the goods of the general sample using the A-method

For the calculation of FT-indices the statistics forms a list of main goods of the reference and reporting years (the sample depth in it, as a rule, is not less than 90 percent of the volume of goods), on the basis of which FT-indices of the average prices and physical volumes of exports and imports are calculated using the known Laspeyres formulas according to A-method.

This method, which is a modification of the A-method for solving the problem formulated above, was implemented in the Excel software shell in the form of a matrix-table (table 3.4)

Table 3.4. The calculation algorithm of the general FT-indices for the goods of the general sample using the A-method

		A	B	C	D	E	F	G	H	K
		t=0		t=1		Average price index (I^L)	Volume index (I^q)	Value index (I^S)	Price, $/unit	Numerator of the formula (1) Laspeyres (Num^L)
		Value, thou $	Volume, unit	Value, thou $	Volume, unit					
0	Total by goods	$S^0=\sum s_i^0$, i=1,N		$S^1=\sum s_i^1$, i=1,N		$I^L = Num^L_N / S^0$	$I^q = I^S / I^L$	$I^S = S^1/S^0$	-	$Num^L_N = \sum p_i^1 * q_i^0$, i=1,N
1 2 … N	- goods 1 - goods 2 …… - goods N	s_i^0, i=1,N	q_i^0, i=1,N	s_i^1, i=1,N	qi^1, i=1,N				$p_i^t=s_i^1/q_i^1$, i=1,N	$=p_i^1*q_i^0$, i=1,N

Source: Author
Note. We have placed an enlarged version of this table in the Appendix D.

In the description of formulas the following notation was be used: N – the number of products in the general sample; p^0_i, p^1_i – the price of goods i in the reference and reporting years; q^0_i, q^1_i – the quantity of goods i in the reference and reporting years; s^0_i, s^1_i – the value of goods i in the reference and reporting years; S^0, S^1 – the value of all n goods in the reference and reporting years; S^0 – the value of all n goods in the reference year at the prices of the reporting year (Denominator of the Laspeyres formula (3.1)); Num^L - Numerator of the formula (3.1) Laspeyres; I^s_n, I^p_n, I^q_n – value index, average price index and quantity index of the reporting year to the reference year for a group of n goods.

The values of the indicators of table 3.4 with blue/gray shading are initially set. It is required to determine the FT-indices I^s_n, I^p_n, I^q_n.

The calculations begin with the numerator of the Laspeyres formula (column K of table 3.4). Then, the price index Isn and the physical volume index I^q_n are sequentially calculated. As a result, in line 0 all three indices I^s_n, I^p_n, I^q_n are calculated.

Using this algorithm, the indices of the main sample of goods were calculated in the tables of section 4 (in particular, these are tables 4.2, 4.3, 4.8, 4.11).

3.2.2.3.2 Assessment of the dynamics of trade in main goods: calculation algorithm of indices of the group of main and the rest of goods in the framework of the general sample using the combined A&D method

When describing the formulas used the notation from the previous subsection, as well as additional notation:

N the number of products in the general sample,

k – the number of main goods (N> k);

p^0_i, p^1_i – the price of goods i in the reference and reporting years, i=1,k;

q^0_i, q^1_i – the quantity of goods i in the reference and reporting years, i=1,k;

s^0_i, s^1_i – the value of goods i in the reference and reporting years;

S^0, S^1; – the value of all N goods in the reference and reporting years;

S^0_k, S^1_k – the value of k main goods in the reference and reporting years;

S^0 – the value of all N goods in the reference year at the prices of the reporting year (Denominator of the Laspeyres formula (3.1) of all N goods);

S0k – the value of k main goods in the reference year at the prices of the reporting year (Denominator of the Laspeyres formula (3.1) of k main goods);

Num^L - Numerator of the formula (3.1) Laspeyres of all N goods;

Num^L_k - Numerator of the formula (3.1) Laspeyres of k main goods;

Is, Ip, Iq – value index, average price index and quantity index of the reporting year to the reference year for a group of N goods.;

Isn, Ipn, Iqn – value index, average price index and quantity index of the reporting year to the reference year for a group of k main goods.

The values of the indicators of table 3.4 with blue/gray shading are initially set. It is required to determine the FT-indices I^s_n, I^p_n, I^q_n for n=k and n=N-k.

The data generation algorithm with a description of the calculation formulas is presented in table-matrix form in table 3.5. The values of the indicators of table 3.5 with blue / gray shading were initially set, including those calculated in the matrix table 3.5.

Table 3.5. The calculation algorithm of indices of the group of main and the rest of goods in the framework of the general sample using the combined A&D method

		A	B	C	D	E	F	G	H	K
		t=0		t=1		Average price index (I^L)	Volume index (I^q)	Value index (I^s)	Price, $/unit	Numerator of the formula (1) Laspeyres (Num^L)
		Value, thou $	Volume, unit	Value, thou $	Volume, unit					
	Total by N goods	$S^0=\sum s_i^0$, i=1,N		$S^1=\sum s_i^1$, i=1,N		$I^L = Num^L_N / S^0$	$I^q = I^s / I^L$	$I^s = S^1/S^0$	-	$Num^L_N = \sum p_i^1 * q_i^0$, i=1,N
0	- k goods	$S^0_k=\sum s_i^0$, i=1,k	-	$S^1_k=\sum s_i^1$, i=1,k	-	$I^L_k = Num^L_k / S^0_k$	$I^q_k = I^s_k / I^L_k$	$I^s = S^1/S^0$	-	$Num^L_k = \sum p_i^1 * q_i^0$, i=1,k
1 2 … k	- goods 1 - goods 2 …… - goods k	s_i^0 , i=1,k	q_i^0 , i=1,k	s_i^1 , i=1,k	qi^1 , i=1,k	-	-	-	$p_i^t=s_i^1 / q_i^1$, i=1,k	$=p_i^1 * q_i^0$, i=1,k
k+1	- other (N-k) goods	$= S^0 - S^0_k$	-	$= S^1 - S^1_k$	-	$I^L_{N-k} = Num^L_{N-k} / (S^0 - S^0_k)$	$I^q_{N-k} = I^s_{N-k} / I^L_{N-k}$	$I^s = S^1/S^0$	-	$Num^L_{N-k} = Num^L_{N-k} - Num^L_{N-k}$

Source: Author

Note. We have placed an enlarged version of this table in the Appendix D.

The data calculation algorithm begins with the numerator of the Laspeyres formula for the final row of the selection of k main products (row 0). Then, the price index I^s_k and the volume index I^q_k are calculated sequentially. As a result, in line 0 all three price indices are calculated for a sample of main goods.

After that, for the line of the remaining (N-k) goods, the numerator of the Laspeyres formula and three price indices are calculated using the line formulas (k + 1).

Using this algorithm (see tables in Section 4) the indices of the selected group of main products and the group of others were calculated on the basis of the general sample (Table 4.7, 4.8, 4.11) as well as the indices of the selected product groups of different speeds (Table 4.8-4.8.1) together with the indexes of the top 12 goods (leaders) and other important goods. (Table 4.11).

3.2.2.3.3 Assessment of trade dynamics of the base country surrounded by other countries: calculation algorithm of indices of other countries of the region with known common indices of this base country and the entire region using the D-method

This problem is solved using the already calculated indices for a particular country within the general sample of goods (see 3.2.2.1), as well as FT-indices of the region, which are calculated by the country's statistical services and included in the database of the FCS of the Russian Federation (for example, indices of the CIS countries and non-CIS product sections from the FCSR database).

When describing the calculation algorithm, we will use the following notation:

R, oth - indication of indicators of all countries of region R and indicators of other countries of region R (excluding the analyzed country);

S^0_R, S^0, S^0_{oth} , S^1_R, S^1, S^1_{oth} - the value of goods in region R, a country (or a single group of countries) and other countries in region R in the base and reporting years;

Num^L_R , Num^L_N Num^L_{oth} - Numerators of the formula (3.1) Laspeyres for region R, country (or a single group of countries) and other countries.

An algorithm for generating data with a description of the calculation formulas is presented in table-matrix form in table 3.6.

Table 3.6. The calculation algorithm of indices of other countries of the region with known common indices of this base country and the entire region using the D-method

		A	C	E	F	G	K
		t=0	t=1	Average price index (I^L)	Volume index (I^q)	Value index (I^s)	Numerator of the formula (1) Laspeyres (Num^L)
		Value, thou $	Value, thou $				
1	Countries of the region - total	S^0_R	S^1_R	I^L_R	I^q_R	$I^s = S^1_R/S^0_R$	$Num^L_R = I^L_R * S^0_R$
2	Country *(or group of countries)*	S^0	S^1	I^L	$I^q = I^s / I^L$	$I^s = S^1/S^0$	$Num^L = I^L * S^0$
3	Other countries in the region	$S^0_{oth} = S^0_R - S^0$	$S^1_{oth} = S^1_R - S^1$	$I^L_{oth} = Num^L_{oth} / S^0_{oth}$	$I^q_{oth} = I^s_{oth} / I^L_{oth}$	$I^s_{oth} = S^1_{oth} / S^0_{oth}$	$Num^L_{oth} = Num^L_R - Num^L_N$

Source: Author
Note. We have placed an enlarged version of this table in the Appendix D.

As in previous cases, the data in the cells of the matrix table with blue / gray fill is exogenously (pre) set. For row 1, this data is calculated by statistical services, for row 2 it can be determined, for example, within the framework of algorithm 3.2.2.2 when calculating the indices of the general sample (row 0 of Table 3.4). The calculation algorithm begins with the numerator of the Laspeyres formula for the countries of the region and the country in question (or a single group of countries). Then the indicators of line 3 are calculated for the remaining countries of the region: S^0_{oth}, S^1_{oth}, Num^L_{oth}, as well as the values of the three required indices.

Using this algorithm, the indicators of the tables of section 4 were calculated (Table 4.4-4.5).

At the end of this paragraph, the above information will be summarized and a general diagram of the stages and tasks of research will be presented (Figure 3.3), built on the basis of Scheme 3.2 with additional designation of methods for calculating indicators and numbers of analytical tables, which will be analyzed in the chapter 4.

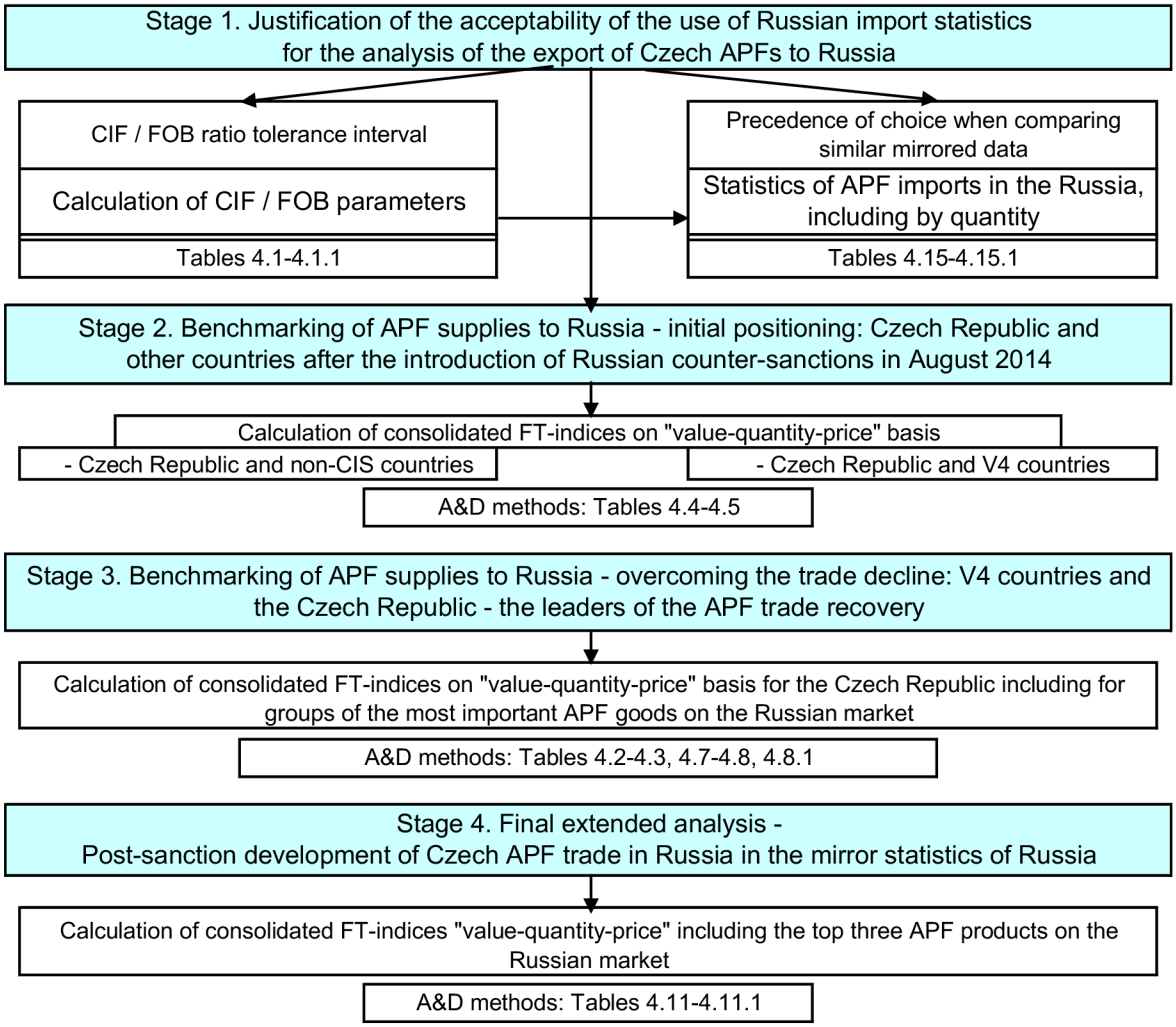


Figure 3.3 Relationship of research stages with methods and algorithms for calculating analytical tables in Chapter 4
Source: author

3.3 Discussion

Thus, on the basis of the research carried out, the following intermediate conclusions can be drawn regarding the informational and methodological support of the thesis.

As a subject of study Czech APF-export to the Russian market was chosen, as well as *an information base* - the Russian mirror statistics of Czech APF-import. As the analysis of publications has shown, the choice of a subject and mirror statistics for its study is reasonable, since import statistics are conducted with greater care than export statistics (on the basis of imports, corresponding budget revenue items are formed and data on imports of goods are checked quite carefully in any country). However, the validity of using mirror statistics for research purposes should be supplemented by checking the admissibility of deviations of mirror data within the average value of the CIF / FOB ratio (no more than ten percent), which must be monitored over the entire research time interval.

In the field of *methodological support* for the analysis of the dynamics of the development of foreign trade, the author proposes methods for calculating foreign trade indices for selected goods and product groups. General algorithms for FT-indices calculating based on aggregation and disaggregation of indices, as well as matrix-table analogs of these algorithms for computer implementation in EXCEL are described. Taking into account the purpose of the dissertation research, these general algorithms were adapted and described to solve a series of research problems and were carried out taking into account the peculiarities of the initial data (Russian import statistics calculates index indicators using the Laspeyres formula). This makes it possible to compare statistical and analytical indicators calculated in a unified methodology (IMTS-CM, 2013), which is used in foreign trade statistics of almost all IMF member countries.

The author noted that the undoubted advantage of the methods proposed is that they provide researchers with the opportunity to analyze groups of goods within the framework of a general statistical sample (for example, based on the well-known method of the Boston Matrix (BCGM, 2018)), while the calculations are carried out within the framework of a single statistical methodology as if these indicators were calculated by the statistics itself.

From a mathematical point of view, the methods of aggregation and disaggregation proposed by the author with the allocation of groups of goods are based on equivalent transformations of the corresponding formulas and do not change the original standards and prerequisites for calculations in the FT-index statistics.

4 Results

Disclosure of the topic of the research was broken in four main stages, which were consistently developed by the author during his studies at CULS, since November 2016. The results of each stage of the research of the dissertation topic, as it was completed, were published in the form of articles in publications in 2017-2020[2]. In total, 9 papers were published on the topic of the dissertation, including 7 articles in publications indexed in Scopus & WoS (all of these articles have been double-blind peer-reviewed by international trade experts):

1. Yurik, S. (2017). Foreign trade of the Czech Republic and Eurasian Economic Union in agricultural and food market: additional tools for analysis, Agrarian perspectives XXVI, CULS Prague, pp. 439-447
2. Pushkin, N. & Yurik, S. (2018). Index Methods for Analysis of Commodity Groups of Foreign Trade, 18th International Joint Conference: Central and Eastern Europe in the Changing Business Environment, Prague–Bratislava, HSE, 353-361
3. Yurik, S. & Pushkin, N. (2018). Czech goods in the Russian agricultural and food market: additional analysis capabilities using foreign trade indices. Agrarian perspectives XXVII, CULS Prague, pp. 443-451
4. Yurik, S., Pushkin, N., Yurik, V. (2019). Visegrad Group: analysis of agricultural trade in the Russian market using mirror statistics, 19th International Joint Conference: Central and Eastern Europe in the Changing Business Environment, Prague, 353-367
5. Yurik, S., Pushkin, N., Yurik, V. (2019). Analysis of export of goods of a producer country based on the mirror statistics of imports of the consuming country using foreign trade indices, XX April International Academic Conference on Economic and Social Development, Moscow, HSE (without indexing Scopus & WoS)

[2] Note that one of the stage of the study (2018) was supported by funding under the CULS grant, the remaining stages were not additionally funded.

6. Yurik, S., Pushkin, N., Yurik, V. (2019). The possibility of using mirror statistics in the analysis of Czech exports of agricultural products and foodstuffs to the Russian market, Agrarian perspectives XXVIII, CULS Prague, pp. 342-349
7. Yurik, S. & Pushkin, N. (2019). On the possibilities of using mirror statistics in analyzing the export of agricultural products and food to the Russian market, Conference "Lomonosov 2019", Section "Agricultural Economics", Moscow, Moscow State University M.V. Lomonosov (without indexing Scopus & WoS)
8. Yurik, S., Pushkin, N., Halik, J., Yurik, V. (2020). Mirror Comparison of Czech Export and Russian Imports Statistics: Tips for Business and Trade Policy. 20th International Joint Conference: Central and Eastern Europe in the Changing Business Environment. 26 – 27 October, Bratislava
9. Yurik, S., Pushkin, N., Yurik, V., Halík, J., & Smutka, L. (2020). Analysis of Czech Agricultural Exports to Russia Using Mirror Statistics. Entrepreneurial Business and Economics Review, 8(2), 27-46

As a reminder, in August 2014, in response to sectoral sanctions against Russia, the national government issued resolution No. 778, which prohibited import of processed and raw agricultural products from the United States, the EU, Ukraine and a number of other countries (Norway, Canada, Australia, etc.). The goal was to limit market access for countries, which supported sectoral sanctions. Russian counter-sanctions were, in particular, imposed on meat, fish, dairy products, fruit and vegetables. Currently, counter-sanctions have been extended until the end of 2021 (and further until the middle of 2022) and continue to operate together with the list of prohibited goods (see Resolutions of the Government of the Russian Federation of August 7, 2014 N 778, as amended on June 9, 2021), which has hardly changed.

Research on the topic of the dissertation included four main stages, in which the post-sanction dynamics of the APF trade in the Russian market, starting from 2015, was analyzed (see Figure 4.1). The author identified these four stages in Chapter 3 "Methods" and revealed their content from the point of view of the methodological aspects of the study (see diagram-figure 3.2).

Figure 4.1 below shows the dynamics of APF trade in the Russian market for market for the Czech Republic and other V4 countries. The figure, taking into account the dynamics of trade V4, additionally shows the stages of research with the allocation of intervals by years with an assessment of the quality of trade changes (recession, resumption of growth, slowdown in growth). Then, Figure 4.2 presents a diagram of the research stages with an indication of the tasks to be solved, and then the results of the analysis for all stages of the research are described.

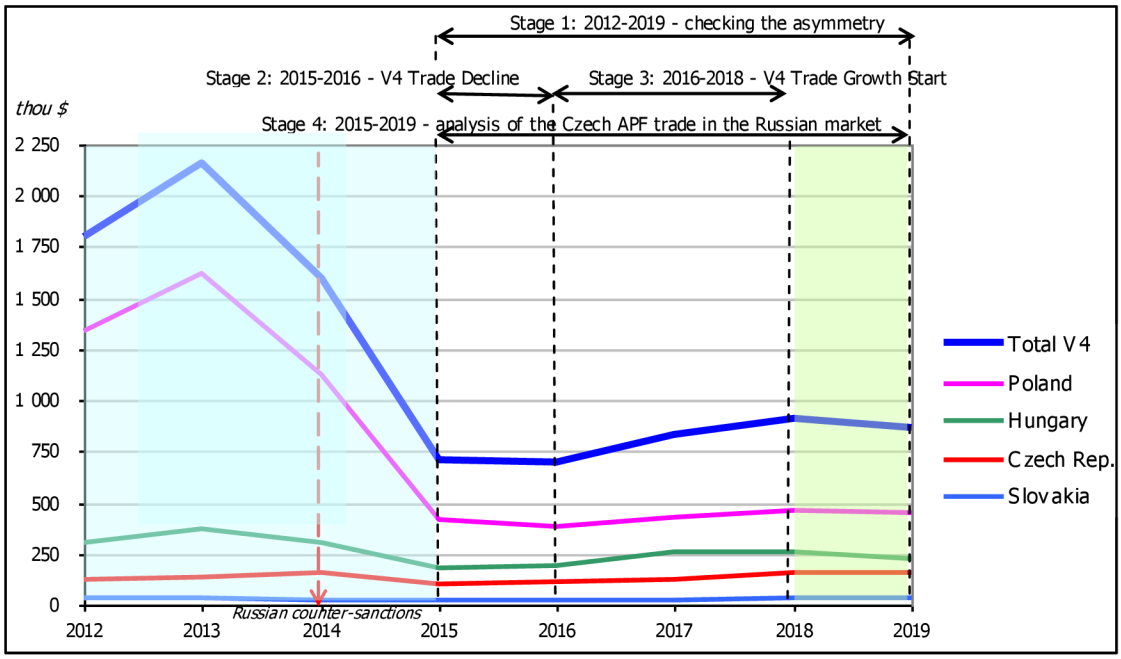


Figure 4.1. Time intervals of the main research stages
Source: visual representation of table 4.5.1 –
own calculations on the basis of data of the Federal Customs Service of Russia, 2021

As follows from Figure 4.1, *the first stage (2015-2019)* was the basic component of stages 2-4 of the quantitative analysis on the research topic and included an initial assessment of the admissibility of using mirror statistics to study APF supplies to the Russian market (this estimate is for 2015-2019 data, as shown by the

analysis, it was positive, i.e. indicated that it is permissible to use mirror statistics data at subsequent stages of the study).

At the second stage (2015-2016), the dynamics of the decline in trade was analyzed in general for V4-countries, as well as separately for them. As a result, it was noted that some countries (Hungary and the Czech Republic) were able to stop the decline in trade and began, albeit slowly, to restore the growth of APF supplies to the Russian market, while other countries (primarily Poland and Slovakia) continued to reduce trade, although with a slowdown speed. In general for V4 countries, as follows from Figure 4.1, at the second stage, a decrease in the volume of APF supplies to the Russian market was recorded.

At the third stage (2016-2018), the growth of APF trade volumes of V4 resumed, including for all V4 countries. This phase saw a steady increase in trade volumes for the Czech Republic, which is the only V4 country to reach a historic high in trade and surpass pre-crisis levels of 2012-2013. Based on this criterion (achieving pre-crisis trading volumes in 2012-2013), the Czech Republic was recognized as the leader in NPF trading on the Russian market among the V4 countries.

At the fourth stage (2015-2019), on an extended interval, the positions of the Czech trade leader in the main trade commodities were analyzed and practical recommendations were formulated for expanding trade in Czech APFs on the Russian market.

It should be noted that the main information base of the study was the statistics of 2015-2018, including for the second stage - the statistics of 2015-2016, for the third stage - the statistics of 2015-2018. The final stage used statistics up to 2019. The results of the milestone studies were published in 2017-2020. When preparing the text of the dissertation, we used the text and information of the tables of the first publications without changes and supplemented them for reference with statistics up to 2019 with appropriate comments. At the same time, we were not able to combine the tables correctly, since, as a rule, the statistics contained data adjustments during the

transition from the reporting year to the base year. In our case, this meant that the data for 2019, when accessed a year later, were represented by different values (the differences are minor, but they exist). This fact required a clear indication of the time of access to statistics when describing the sources of information in tables and figures. In each specific case, below we provide this information, indicating the year of access to the databases, as well as the publication where these tables and figures first appeared.

In Figure 4.2, we presented a schematic description of the research stages by year with a description of the tasks to be solved within each stage.

Let's move on to a detailed description of the research results for the four indicated stages.

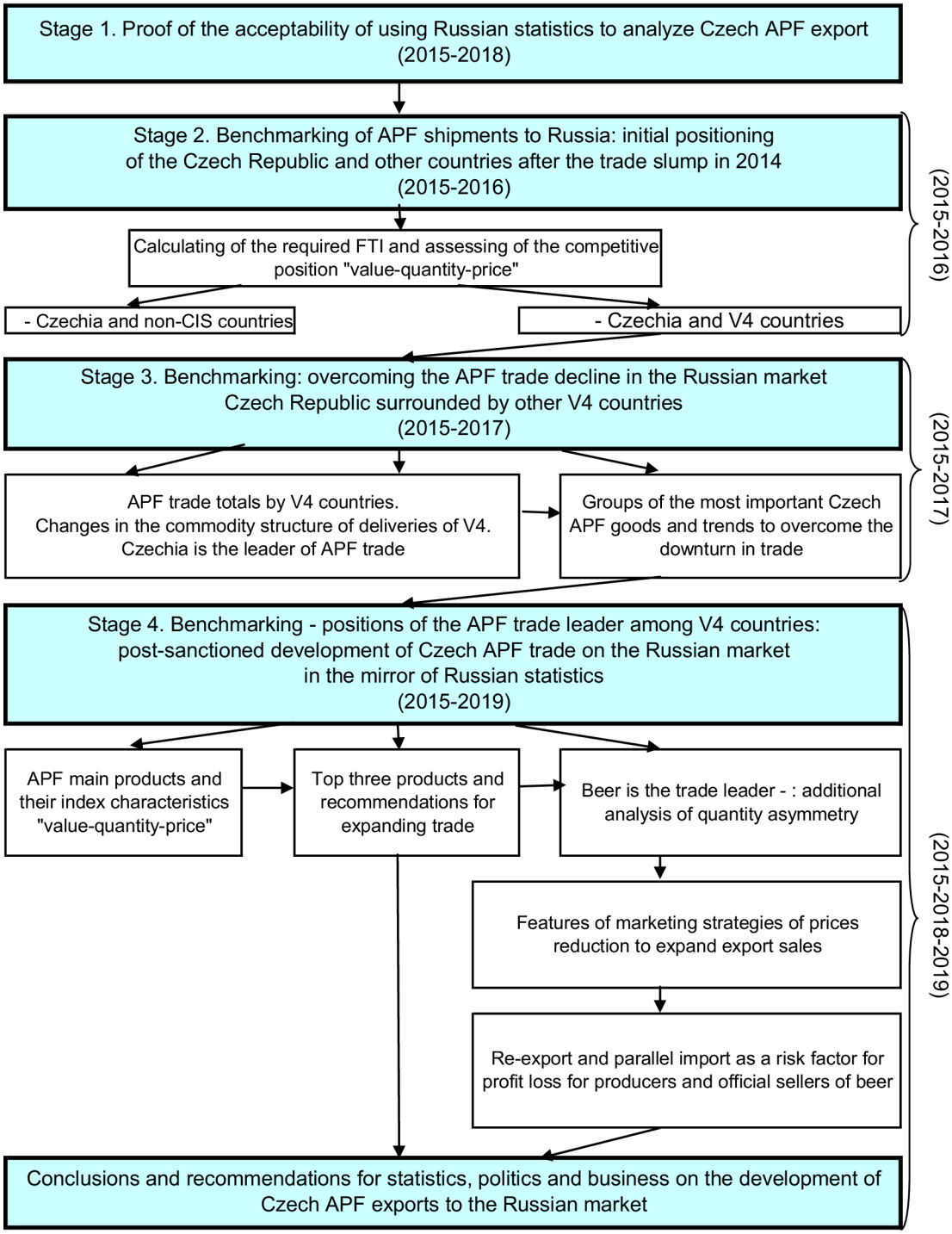


Figure 4.2 Main stages of research and presentation of results.
Source: Author

4.1 Stage 1. Proof of the acceptability of using Russian import statistics to analyze Czech APF export

As noted above, theoretically in mirror statistics export of goods of one country to the other one should be equal to the import of goods of the latter country from the former one, whereas import of the former country from the latter one should be equal to export of the latter country to the former one. In practice, however, the mentioned trade volumes usually differ. Such a difference in data of mirror statistics is usually called asymmetry.

First of all, the asymmetry of the data is associated with the difference in the prices of the recorded flows. As is known, according to customs statistics methodology (IEMD, 2018; IMTS, 2011), the value of exporting goods of a country A to the market of a country B is represented by statistics of a country A in FOB prices, while imports of goods from a country A to a country B are represented by statistics of a country B at CIF prices, which additionally include the costs of insurance and transportation of goods.

According to the IMF, the global average CIF / FOB is 1.06 (DOTS, 2018), although earlier studies used a ratio of 1.10 (EIFRF, 2003; DOTS, 2018). Currently, the Central Bank of Russia uses a coefficient of 1.0588 when compiling the balance of payments of the Russian Federation (BOPR-C, 2018, p. 1). This coefficient is used in the formation of the current account of the balance of payments, where, according to the balance of payments methodology, exports are presented in FOB prices, and transportation and insurance costs are transferred to the corresponding items in the balance of services (BOP-manual, 2009). Thus, we can conclude that the permissible discrepancy between the mirror statistics data in our case for APF goods will be determined by the interval from 6% to 10%.

4.1.1 Total estimate of the asymmetry of mirror statistics of the Czech Republic and Russia for APF

Mirror comparison of the data of export and import of Czech goods to the Russian market showed the following (Tab. 4.1). A comparison of the overall results shows that from 2015 to 2018 the total Czech exports to Russia (FOB prices - Czech statistics) were higher than the volumes of Russian imports from the Czech Republic (CIF prices - FCSR) by an average of 11%. This unnatural asymmetry of data indicates problems with errors in reporting and / or determining the customs value of goods, that may mask shadow operations, minimize taxes and capital flight, which requires additional analysis by both statisticians and customs officers when critical volumes are reached. In addition, note that the update of Table 4.1 as of January 2021 showed the continued growth of the unnatural overall asymmetry of mirror data in 2019 to the level of 14%.

We will narrow the focus of research and consider the supply of APF to the Russian market. In contrast to the overall results, a mirror comparison of APF trade data (Tab. 4.1) shows a generally normal situation with an average valuation excess of CIF prices over FOB by 6-7%, which is comparable to the ratio of 1.0588 of the Central Bank of Russia for calculating the balance of payments (BOPR-C, 2018).

Additionally, we note that in 2019 (accessing the database in 2020), the level of asymmetry decreased and amounted to 3% (Table 4.1.1). In addition, statistics edited a number of indicators by year, as a result of which the asymmetry coefficients also changed slightly, but remained within the normal range.

Conclusion. Thus, it can be concluded that, in general, the use of import statistics of the UN COMTRADE / the Federal Customs Service of the Russian Federation for the analysis of mirror data on the Czech APF trade in the Russian market is possible in view of methodologically permissible differences in data.

Tab. 4.1 – Mirror comparison of APF trade data

HS	CIF: Russian import from the Czech Republic				FOB: Czech export to Russia				CIF/ FOB			
	2015	2016	2017	2018	2015	2016	2017	2018	2015	2016	2017	2018
	$				$							
Total	2 679 134 129	2 766 511 012	3 216 554 357	3 775 323 696	3 199 489 631	3 074 515 354	3 539 595 373	4 116 618 162	84%	90%	91%	92%
01-24	100 323 730	108 853 401	125 876 176	156 775 528	95 555 906	104 737 968	115 660 558	143 593 202	105%	104%	109%	109%

Source: own calculations based on the UN COMTRADE database for publication (Yurik S., 2019)

Tab. 4.1.1 – Mirror comparison of APF trade data (supplement with 2019)

HS	CIF: Russian import from the Czech Republic, thous.$				FOB: Czech export to Russia, thous.$				CIF / FOB			
	2015	2017	2018	2019	2015	2017	2018	2019	2015	2017	2018	2019
TOTAL	2 679 134	4 196 215	3 775 324	3 699 259	3 199 490	3 539 595	4 118 115	4 303 006	84%	119%	92%	86%
01-24	100 482	127 374	156 951	159 768	95 556	115 665	143 595	155 042	105%	110%	109%	103%

Source: own calculations based on the UN COMTRADE database, accessed January 2021

Note: the data for 2018 in tables 4.1.1 and 4.1 have differences, which is caused by different access times to the UN COMTRADE database

4.2 Stage 2. Benchmarking APF supplies to Russia: initial positioning of V4 countries after Russian counter-sanctions and trade decline

Before moving on to the next second stage of research, we recall that when describing general research methods in Section 3, we proposed using the concept of benchmarking, which is currently widely used in business in the comparative analysis of results and the search for the best development paths. For our study, it was decided to compare the indicators of the total trade volumes of APF in the Russian market the Czech Republic and other V4 countries - Hungary, Poland and Slovakia based on geographic proximity and largely similar natural conditions and economic positions as new EU members. Also, the selected countries have traditional trade relations with Russia as the largest export market for goods in the CIS.

We have adapted the benchmarking scheme for the V4 countries (Czech Republic, Hungary, Poland and Slovakia) to conduct a comparative analysis of the results of APF trade in the Russian market and identify a leader, and also to study his practice of trading the APF after the introduction of Russian counter-sanctions. [3]

The general research scheme (Fig. 4.1-4.2) presents stages 2-4 in which benchmarking is used, and their goals and objectives are indicated. The research for each stage was carried out sequentially in time at its own time interval, and the results obtained made it possible to refine the formulation of the goals and objectives of the subsequent stages. In addition, at the end of each stage, the research results were published using the statistics available at the time of the research.

[3] As noted above, in August 2014, in response to sectoral sanctions against Russia, the national government prohibited import of processed and raw agricultural products from the United States, the EU, Ukraine and a number of other countries (Decree-560, 2014; Resolution-778, 2014/2021). The goal was to limit market access for countries, which supported sectoral sanctions. Russian countersanctions were, in particular, imposed on meat, fish, dairy products, fruit and vegetables. Currently, counter-sanctions have been extended until the end of 2021 and continue to operate together with the list of prohibited goods (List of Russian counter sanctions, 2014, 2021).

As noted in Figure 4.1, the purpose of this stage was to study the initial positioning of the Czech Republic and other countries (primarily V4) in 2015-2016 in APF trade in the Russian market immediately after the imposition of Russian counter-sanctions in August 2014 and the subsequent drop in trade. ... The objective of the study was to study the competitive positions of countries from the point of view of the "rates" of reduction of the "value-quantity-price" consolidated foreign trade indices for APF supplies to the Russian market by V4 and non-CIS countries.

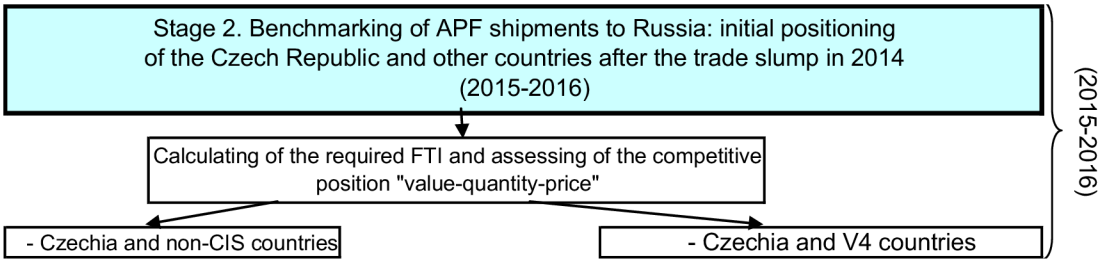


Figure 4.3 Stage 2: Scheme of presentation of results
Source: author, fragment of Figure 4.1.

The research was conducted in 2017 on the statistical information available at that time in 2015-2016. The results of the research in stage 2 were published in 2018 (Yurik, S. & Pushkin, N., 2018; Pushkin, N. & Yurik, S., 2017). Below, the text of these publications was used, supplemented, if necessary, with relevant comments.

4.2.1 The main goods of Czech APF export to the Russian market and their FT-indices of "value-quantity-price"

The initial statistical basis for calculations based on the proposed index methods for analyzing Czech exports to Russia was data from statistics on imports of Czech goods to the Russian market. Data source – Federal Customs Service of Russia (2018).

We note that in the Russian customs statistics, foreign trade indices are calculated using the Laspeyres formula. For approbation of the index methods, the information on trade in foodstuff and agricultural raw materials was chosen as the analysis group – these are goods from commodity groups HS 01–24. The main products of Czech imports of foodstuff and agricultural raw materials to the Russian market are presented in Table 4.2.

At the beginning of Table 4.2 the data of Czech imports to Russia for foodstuff and agricultural raw materials shown by Russian customs statistics are presented. The list of these products includes 32 items (4–digit HS code) from commodity groups (01–24), which are presented separately in 32 products in table 4.2, as well as the total result, including foreign trade indices calculated using the Laspeyres formula. As follows from Table 4.2 the list of 32 goods is more than 99% of the value of Czech imports which allows using their composite indices also in the analysis of groups 01–24.

Table 4.2. Russian import from Czech Republic: main goods

	HS code			2016			Indices 2016/2015			2016-2015, thous. $
				Quantity	Value, thous. $	Share	price	volume	value	
		Russian import from Czech Rep.								
		- HS (01-24) from Czechia			109 323	100%	-	-	1,087	
		- 32 main goods			108 393	99,3%	0,989	1,102	1,090	8 933
1	2309	Animal feed	t	13630	24 704	22,6%	**1,137**	**1,274**	**1,448**	7 648
2	0407	Birds'eggs	t	6627	21 556	19,7%	0,768	1,317	1,012	248
3	2203	Beer made from malt	l	17635211	16 301	14,9%	0,979	1,142	1,119	1 731
4	1207	Other oil seeds and oleaginous fruits	t	7376	12 011	11,0%	0,863	1,197	1,034	393
5	2208	Spirits, liqueurs and other spirituous, beverages	l	358817	3 672	3,4%	0,926	1,102	1,021	76
6	1302	Vegetable saps and extracts	t	249	3 530	3,2%	**1,451**	**1,556**	**2,258**	1 966
7	1704	Sugar confectionery (including white chocolate)	t	1392	3 375	3,1%	0,987	0,928	0,916	-310
8	1210	Hop cones	t	342	3 352	3,1%	0,974	1,239	1,207	574
9	1107	Malt, whether or not roasted	t	6230	3 343	3,1%	0,970	0,977	0,948	-182
10	2106	Other food products	l	300	2 792	2,6%	1,575	0,476	0,750	-931
11	2101	Extracts of coffee, tea or mate'	t	808	2 495	2,3%	**1,018**	**1,140**	**1,160**	344
12	1602	Other prepared or preserved meat	t	898	2 397	2,2%	0,994	0,681	0,676	-1 147
13	1905	Pastry, cakes, biscuits and other	t	401	1 826	1,7%	1,513	0,599	0,906	-190
14	1209	Seeds of a kind used for sowing	t	138	1 080	1,0%	**1,134**	**1,221**	**1,385**	300
15	0106	Live poultry	pcs.	2405	893	0,8%	**1,716**	**1,696**	**2,910**	586
16	1904	Prepared foods obtained	t	205	694	0,6%	1,050	0,554	0,582	-498
17	1901	Malt extract	t	221	640	0,6%	0,738	0,831	0,614	-403
18	2008	Fruit, nuts and other	t	187	510	0,5%	1,060	0,773	0,819	-113
19	2201	mineral water without sugar	l	818039	427	0,4%	1,022	0,843	0,861	-69
20	2202	Waters mineral, containing sugar	l	575304	401	0,4%	**1,013**	**1,226**	**1,242**	78
21	2206	Other fermented beverages	l	219650	328	0,3%	0,904	0,266	0,241	-1 034
22	0105	Flour	pcs.	421560	301	0,3%	**1,102**	**1,233**	**1,360**	80
23	2007	Jams, fruit jellies, marmalades	t	280	301	0,3%	0,807	0,720	0,581	-218
24	2209	Viengar and substitutes	l	798000	258	0,2%	0,970	1,462	1,418	76
25	1902	Pasta	t	271	225	0,2%	**1,028**	**1,726**	**1,774**	98
26	2005	Other vegetables prepared	t	141	214	0,2%	0,868	0,972	0,844	-40
27	1514	Rape	t	119	166	0,2%	1,047	0,930	0,974	-5
28	1001	Wheat	t	183	159	0,1%	1,740	0,600	1,044	7
29	2103	Sauces and preparations therefor	t	61	142	0,1%	1,059	0,726	0,769	-43
30	0208	Other meat and edible meat offal	t	40	135	0,1%	0,996	2,000	1,993	67
31	1520	Glycerol	t	240	115	0,1%	0,923	0,632	0,583	-82
32	1806	Chocolate and other food	t	11	52	0,0%	0,845	0,478	0,404	-77

Source: own calculations based on the FCSR database
for publication (Yurik&Pushkin, 2018; Pushkin&Yurik, 2018)

4.2.2 Analysis of the competitive "value-quantity-price" position of the Czech Republic among non–CIS countries in the Russian APF market

Table 4.3 presents data on the volumes of Russian imports from non–CIS countries together with the corresponding indices of foreign trade, including indicators for the import of foodstuff and agricultural raw materials (groups 01–24) from non–CIS countries. Then the data of the Czech import of agricultural products to Russia – total, including the share of the Czech Republic in the volume of non–CIS countries agricultural products, is presented. The last line of the table contains data on imports of agricultural products from the rest of the non–CIS countries (excluding the Czech Republic), as well as the foreign trade indices calculated using method A on this line. We draw your attention to the fact that this problem is solved in the event that foreign trade indices of the country are specified for the selected group (in our case these are indices in groups 01–24 for the Czech Republic). We considered them to be the same as the indices of the main 32 goods in groups 01–24 (99% of the country's imports), which were calculated above using Method A in Table 4.2.

As can be seen from Table 4.3, in general, imports of agricultural products from non–CIS countries decreased by 8% or $ 1.8 million, while physical supplies decreased (by 5.3%) and average prices fell (by 2.9%). The rest of the non–CIS countries (without the Czech Republic), as shown in Table 4.4, have the same index characteristics (a difference of tenths of a percent in the value and volume indices).

At the same time, imports of goods from the Czech Republic, on the contrary, increased by 9%, or by almost $ 9 million, with an increase in physical volumes of supplies (by 10%) and almost unchanged average prices (they decreased by only 1.1%). In other words, the Czech Republic expanded the presence of its agricultural products on the Russian market, practically without reducing average prices for products.

Table 4. 3 Russian import from non–CIS countries: trade indices

	2015		2016		2016-2015, thou $	Indices 2016/2015		
	value, thousand $	% of total	value, thousand $	% of total		price	volume	value
Russian import from non-CIS countries	161 692 700		162 724 500		1 031 800	0,978	1,026	1,003
- foodstuff and agricultural raw (01-24)								
- from non-CIS countries	22 213 700	13,7%	20 428 500	12,6%	-1 785 200	0,971	0,947	0,920
- from Czech Republic	100 532	0,1%	109 323	0,1%	8 791	-	-	1,087
- share (01-24) from non-CIS	*0,45%*		*0,54%*					
- main goods (32 pcs.)	99 637	0,1%	108 549	0,1%	8 912	0,989	1,101	1,089
(% of total import from Czech Rep.)	*99,1%*		*99,3%*					
Other 01-24 (non-CIS countries without the Czech Rep	22 114 063		20 319 951		-1 794 112	0,971	0,946	0,919

Source: own calculations based on the FCSR database for publication (Yurik&Pushkin,2018;Pushkin&Yurik,2018)

Thus, the following conclusion can be drawn: the competitive position of the Czech Republic on agricultural trade in the Russian market in terms of the ratio of changes in "value-quantity-price" factors looks more preferable in 2015–2016 than the average for non–CIS countries (without the Czech Republic), because of the indices of the Czech Republic is significantly higher than the average level of non–CIS countries and has an increase in sales in the Russian market, unlike the rest of the non–CIS countries, where sales decreased by 8.1%.

Unfortunately, Russian statistics do not publish other FT-indices at the regional level (for example, for EU countries). Therefore, a comparative analysis of the positions of the Czech Republic and three other countries of the Visegrad Group (V4) - Hungary, Poland and Slovakia - will be continued. For comparative analysis, we additionally calculated summary FT-indices based on the FCSR data using the index methods described in Section 3 Methods.

4.2.3 Competitive positions in the Russian APF market by country: non-CIS countries, Czech Republic and other V4 countries

Table 4.4 shows the volumes of imports data of APF (groups 01–24) from non–CIS countries, the Visegrad Group (V4), including separately from the Czech Republic. Also, relevant indices of foreign trade are given, which for non-CIS countries are calculated by the Russian statistics, and for the other positions were calculated by us using method A. For the Czech Republic the list of main goods includes 32 items (Table 4.4), for the V4-countries – 139 items (due to lack of space, we do not list them), while the depth of the sample in the two lists was more than 99% .

Table 4.4. Russian APF import from V4: trade indices

	2016		2016-2015, thou $	Indices 2016/2015		
	Value, thou $	Share		price	volume	value
Russian import from non-CIS countries	20 428 700	100.0%	-1 784 900	0.971	0.947	0.920
Russian import from the Visegrad Group (V4)	702 444	3.44%	-11 452			0.984
- 139 main goods	696 788	3.41%	-8 414	1.058	0.912	0.965
Russian import from the Czech Republic	109 323	0.54%	8 791			1.087
- 33 main goods	108 391	0.53%	8 902	0.989	1.102	1.089
Russian import from non-CIS countries (without V4)	19 726 256	96.6%	-1 773 448	0.968	0.948	0.918

Source: own calculations based on the FCSR database for publication (Yurik&Pushkin, 2018; Pushkin&Yurik, 2018)

As can be seen from Table 4.4., The value of APF supplies to Russia decreased in 2015-2016 from non-CIS countries as a whole (by 8%), including from V4 countries - by 1.6% and other non-CIS countries (excluding V4) - by 7.2%. But if the value deliveries of APF from non-CIS countries decreased on the basis of both quantity (by 5.3%) and a decrease in the average price (by 2.9%), then from V4 countries, APF supply prices, on the contrary, increased by 5.9 %, and the physical volumes of supplies decreased markedly (by 9.2%).

At the same time, imports of goods from the Czech Republic, on the contrary, increased (by 9%) with an increase in physical volumes of supplies (by 10%) and almost unchanged average prices (they decreased by only 1.1%). In other words, the Czech Republic expanded the presence of its agricultural products on the Russian market, practically without reducing average prices for products.

Conclusion. Thus, the following conclusion can be drawn. The competitive positions of the Czech Republic in APF trade in the Russian market in terms of the ratio of changes in the "price - quantity - value" factors look more preferable in 2015–2016 than the average for non-CIS countries and V4 countries. In addition, the positions of V4 countries in comparison with other non-CIS countries (without V4) in terms of export value also differ in a positive direction (Table 4.4): APF imports to Russia from non-CIS countries decreased by 8.2% while imports from V4 countries fell by only 1.6%.

Taking into account the results noted in the further analysis, we chose V4 countries as a focus group for benchmarking, since their index characteristics of trade dynamics are better than the average for non-CIS countries.

4.3 Stage 3. Benchmarking: overcoming the APF trade decline -- Czech Republic surrounded by other V4 countries

In the Czech Republic, after the introduction of Russian counter-sanctions in August 2014 and the decline in trade by the end of 2015, an increase in APF supplies to Russia was noted, while in non-CIS and V4 countries, the decline in exports continued in 2015-2016.

At the next stage of benchmarking, in order to identify a leader, the time interval 2015-2017 was extended and a comparative analysis was carried out among the V4 countries - the Czech Republic, Hungary, Poland and Slovakia. First of all, overcoming the decline in trade and the growth of APF supplies to the Russian market were analyzed.

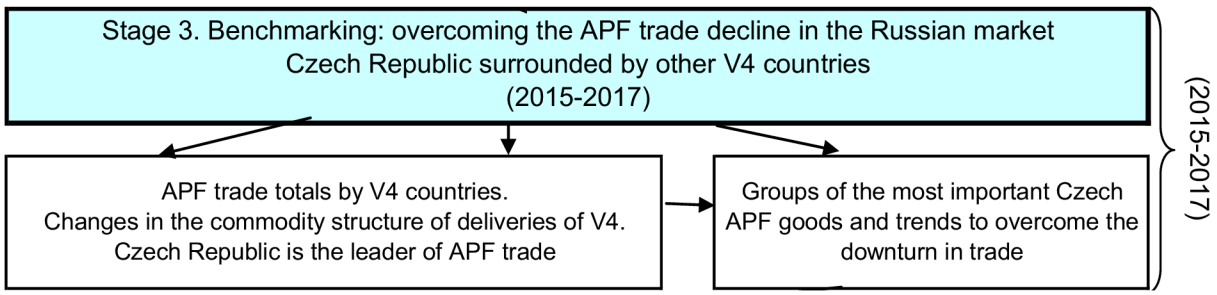


Figure 4.4 Stage 3. Scheme of presentation of results
Source: author, fragment of Figure 4.1

4.3.1 The general results of the V4 countries APF trade in the mirror of Russian statistics

Trading on the Russian APF market for V4 is traditionally included in the foreign trade as one of the most popular business destinations. The share of APF trade in total V4 trade from the Russian Federation in the last three years (2015-2017) has remained at 6–

7%, although before the introduction of Russian sanctions in 2014, it was higher – 9–10% (tab. 4.5).

In each of the V4 countries are the following indicators. Thus, in the Czech Republic and Slovakia, APF trade in the Russian Federation in 2017 amounted to 3.7% and 0.9% of the total foreign trade with Russia, although before the introduction of Russian sanctions in the pre-crisis 2013, its share was 2.5% and 1%, respectively. APF trade is more important for Hungary and Poland, where in the general results of trade on the Russian market its share from 2013 to 2017: for Hungary, it grew from 12.3% to 12.6%; for Poland, it decreased from 19.5% to 8.7%. As follows from Table 4.5, in 2012–2017, the share of each country of V4 in APF deliveries to the Russian market changed as follows: for the Czech Republic - increased from 6.9% to 15.1%, for Slovakia - slightly increased from 2% to 2.2%; for Hungary, it increased significantly from 17.1% to 31.6%; for Poland, it decreased from 74% to 51.1%.

Table 4.5. Dynamics of APF supplies (HS 01-24) of V4 to the Russia Federation in 2012-2017

		2012	2013	2014	2015	2016	2017	2012	2013	2014	2015	2016	2017	2017/ 2012,%	2017-2012, million $
		Value, million $						Share, %							
V4	Total	19 646	20 189	17 583	10 418	10 055	12 428							63,3%	-7 218
	01-24	1 805,2	2 163,9	1 602,6	713,9	702,2	831,6	100%	100%	100%	100%	100%	100%	46,1%	-974
	- share, %	*9,2%*	*10,7%*	*9,1%*	*6,9%*	*7,0%*	*6,7%*								
CZECH REPUBLIC	Total	5 354	5 318	4 898	2 846	2 766	3 422							63,9%	-1 932
	01-24	124,5	134,6	154,9	100,5	109,3	125,5	6,9%	6,2%	9,7%	14,1%	15,6%	15,1%	100,8%	1
	- share, %	*2,3%*	*2,5%*	*3,2%*	*3,5%*	*4,0%*	*3,7%*								
SLOVAKIA	Total	3 715	3 538	2 864	1 760	1 666	2 007							54,0%	-1 708
	01-24	35,4	35,2	24,3	19,8	17,4	18,6	2,0%	1,6%	1,5%	2,8%	2,5%	2,2%	52,5%	-17
	- share, %	*1,0%*	*1,0%*	*0,8%*	*1,1%*	*1,0%*	*0,9%*								
HUNGARY	Total	3 103	3 007	2 740	1 715	1 662	2 091							67,4%	-1 012
	01-24	308,7	369,5	298,2	180,0	196,2	262,6	17,1%	17,1%	18,6%	25,2%	27,9%	31,6%	85,1%	-46
	- share, %	*9,9%*	*12,3%*	*10,9%*	*10,5%*	*11,8%*	*12,6%*								
POLAND	Total	7 474	8 326	7 081	4 097	3 960	4 908							65,7%	-2 566
	01-24	1 336,6	1 624,7	1 125,2	413,6	379,3	424,9	74,0%	75,1%	70,2%	57,9%	54,0%	51,1%	31,8%	-912
	- share, %	*17,9%*	*19,5%*	*15,9%*	*10,1%*	*9,6%*	*8,7%*								

Source: own calculations based on the Federal Customs Service of Russia database for publication (Yurik & Pushkin, 2018)

Table 4.5.1. Dynamics of APF supplies (HS 01-24) of V4 to the Russia Federation in 2012-2019

		2012	2013	2014	2015	2016	2017	2018	2019	2012	2013	2014	2015	2016	2017	2018	2019	2018/2012, %	2018-2012, million $	2019/2012, %	2019-2012, million $
		Value, million $								Share, %											
V4	Total	19 646	20 189	17 583	10 418	10 055	12 428	13 285	13 217									67,6%	-6 361	67,3%	-6 429
	01-24	1 805,2	2 163,9	1 602,6	713,9	702,2	830,6	908,7	866,6	100%	100%	100%	100%	100%	100%	100%	100%	50,3%	-896	48,0%	-939
	- share, %	9,2%	10,7%	9,1%	6,9%	7,0%	6,7%	6,8%	6,6%												
CZECH REPUBLIC	Total	5 354	5 318	4 898	2 846	2 766	3 422	3 777	3 699									70,5%	-1 577	69,1%	-1 655
	01-24	124,5	134,6	154,9	100,5	109,3	125,4	157,6	159,8	6,9%	6,2%	9,7%	14,1%	15,6%	15,1%	17,3%	18,4%	126,6%	33	128,3%	35
	- share, %	2,3%	2,5%	3,2%	3,5%	4,0%	3,7%	4,2%	4,3%												
SLOVAKIA	Total	3 715	3 538	2 864	1 760	1 666	2 007	2 193	2 163									59,0%	-1 521	58,2%	-1 552
	01-24	35,4	35,2	24,3	19,8	17,4	17,8	28,5	28,2	2,0%	1,6%	1,5%	2,8%	2,5%	2,1%	3,1%	3,3%	80,5%	-7	79,7%	-7
	- share, %	1,0%	1,0%	0,8%	1,1%	1,0%	0,9%	1,3%	1,3%												
HUNGARY	Total	3 103	3 007	2 740	1 715	1 662	2 091	2 165	2 274									69,8%	-938	73,3%	-829
	01-24	308,7	369,5	298,2	180,0	196,2	262,6	261,2	225,7	17,1%	17,1%	18,6%	25,2%	27,9%	31,6%	28,7%	26,0%	84,6%	-47	73,1%	-83
	- share, %	9,9%	12,3%	10,9%	10,5%	11,8%	12,6%	12,1%	9,9%												
POLAND	Total	7 474	8 326	7 081	4 097	3 960	4 908	5 150	5 080									68,9%	-2 324	68,0%	-2 394
	01-24	1 336,6	1 624,7	1 125,2	413,6	379,3	424,8	461,5	452,9	74,0%	75,1%	70,2%	57,9%	54,0%	51,1%	50,8%	52,3%	34,5%	-875	33,9%	-884
	- share, %	17,9%	19,5%	15,9%	10,1%	9,6%	8,7%	9,0%	8,9%												

Source: own calculations based on the Federal Customs Service of Russia database, 2021

Note: the data for 2017 in tabl. 4.5.1 and 4.5 have slight differences, which is caused by different access times to the FCSR database

APF trade in V4 countries, as follows from Table 4.5, in the considered period of 2012-2017 as a whole decreased by more than half (by 54% or 974 million dollars). The most significant reduction in the trade volume has been recorded since 2014. At this time, Russia imposed reciprocal trade restrictions on APF trade for EU countries (List of Russian counter sanctions, 2014), which led to an unprecedented reduction in the volume of supplies of V4 countries to the Russian Federation as a whole (Fig. 4.5), including APF supplies (Fig. 4.6).

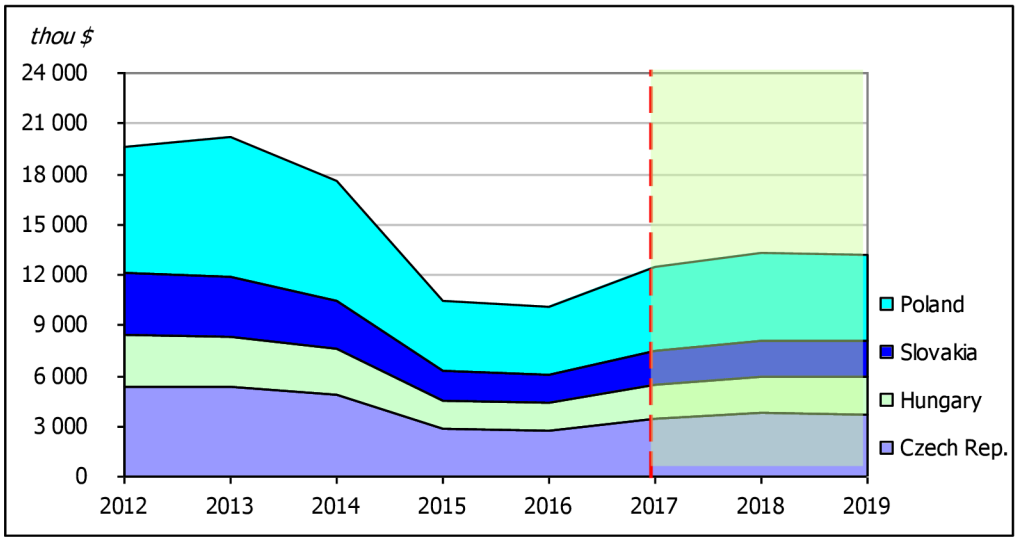


Figure 4.5 Russian imports from V4-countries

Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2021

Russian sanctions on deliveries to the Russian Federation had a different impact on each of the V4 countries, but everywhere in each of the countries they caused a drop in the supply of goods to the Russian market. Thus, the greatest total losses due to the sanctions were recorded in Poland. Here, from 2012 to 2017, the supply of Polish products to the Russian market as a whole declined by 34% or 2.6 billion dollars. The second place in the list of total losses was occupied by the Czech Republic with a reduction in deliveries to the Russian Federation from 2012 to 2017 by 36% or 1.9 billion dollars. In Slovakia and Hungary, total shipments to the Russian market also decreased by 46% and 32%, or by 1.7 and 1 billion dollars respectively.

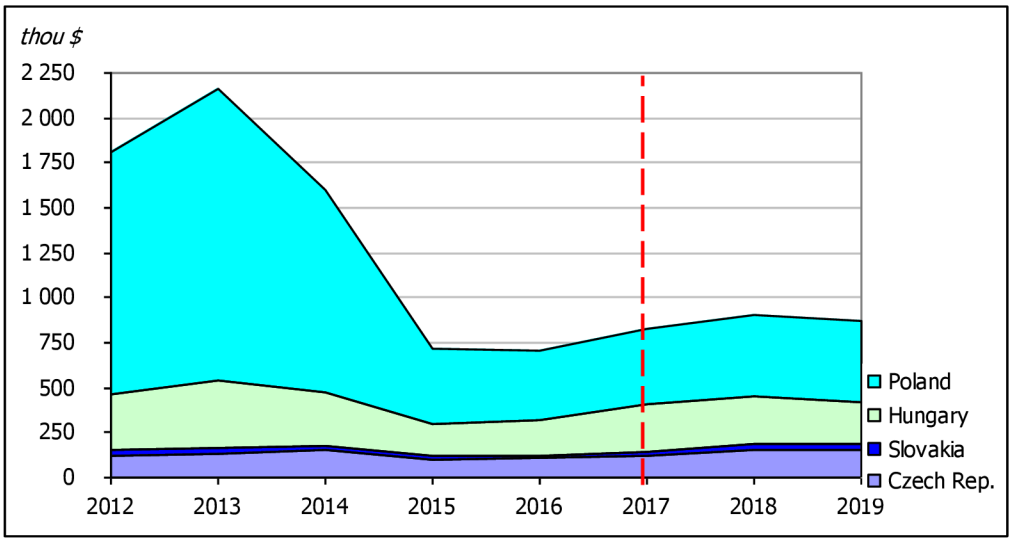


Figure 4.6. Russian APF (HS 01-24) import from V4 2012-2017 with 2018-2019
Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2019

As for the loss of APF supplies (Table 4.5), Poland was also the leader here (a decrease of 68% or 912 million dollars), while Poland's share in the APF supplies for the whole V4 significantly decreased from 74% to 51.1%. Hungary and Slovakia managed to stop the fall and get closer to the level of 2014. In Hungary, the APF supplies (Table 4.5) decreased by 15% or $ 46 million, and in Slovakia - by 47% or $ 17 million. At the same time, as noted above, the share of these two countries in the APF supplies structure increased all over: in Hungary - from 17.1% to 31.6%, in Slovakia - from 2% to 2.2%.

We note that of the V4 countries, only the Czech Republic was able to stop the decline and in 2017 to exceed the level of APF supplies 2012 by 1 million dollars (an increase of 0.8%).

4.3.2 Structure of reduction of APF supplies to the Russian market of V4 countries by commodity groups subject to sanctions restrictions

As is known the counter sanctions of Russia in the form of a list of prohibited goods (List of Russian counter sanctions, 2014) were introduced in August 2014 and included a ban on the supply of products from EU countries and some other countries for most product subgroups (four positions of HS code) from product groups 02 (meat and offal), 03 (fish and shellfish), 04 (dairy products, birds' eggs), 07 (vegetables and roots), 08 (fruits and nuts), 16 (sausages and similar prepared foods), 19 (cheeses and cottage cheese with vegetable fats), 21 (finished products with milk and vegetable fats). In October 2017, this list was expanded at the expense of commodity group 01 (live animals) with a ban on the import of live pigs, except the purebreds. In addition, at the end of 2018, the sanctions of the Russian Federation were extended until the end of 2019. Currently, the sanctions have been extended until the end of 2021 (List of Russian counter sanctions, 2021).

Consider how the imposed sanctions of the Russian Federation reflected on the dynamics of the value of APF supplies volumes of V4 countries by product groups 01-24 in 2014-2017. We presented these indicators graphically by V4 countries in Figures 4.3-4.6.

As Figure 4.7 shows for *Poland* the greatest reduction in the APF supplies falls to Other goods, which included commodity groups 04 (dairy products, birds' eggs), 07-08 (fresh fruits and vegetables) in 2012-2014. In the past three years (2015-2017), these goods have not been supplied due to the sanctions of the Russian Federation, and import from Poland have stabilized at an average level of $ 400 million.

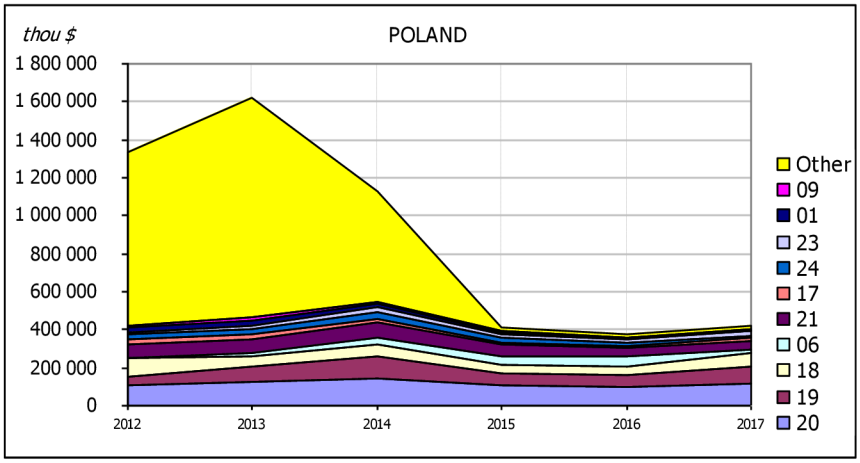


Figure 4.7. Russian APF (HS 01-24) import from V4-countries: Poland
Source: Federal Customs Service of Russia (2019)

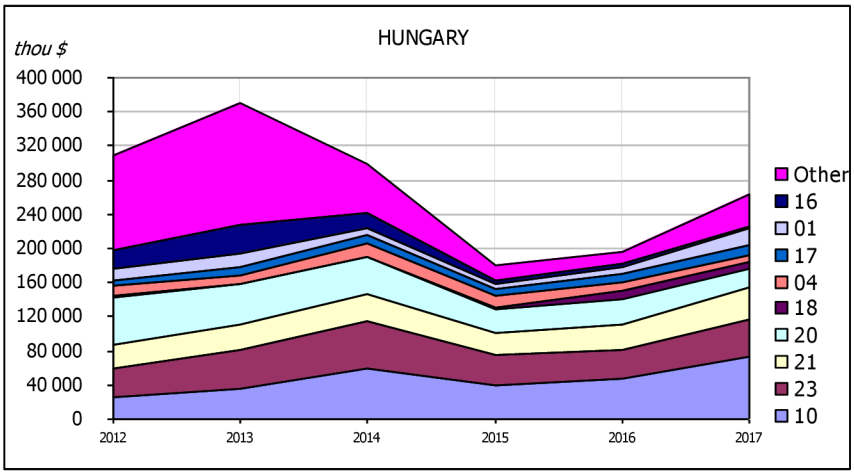


Figure 4.8 Russian APF (HS 01-24) import from V4-countries: Hungary
Source: Federal Customs Service of Russia (2019)

For *Hungary*, the largest cuts in APF supplies after the imposition of sanctions were given by Other products (Fig. 4.8) due to the cessation of supplies of meat and offal (from group 02). In the last three years, there has been an increase in the supply of goods from group 10 (cereals, seeds), as well as goods not included in the sanction list from groups 02 (meat and offal). We also note a noticeable increase in the supply of goods from group 01 (live animals), according to which an import ban was imposed on live pigs (subgroup 0103) in October 2017, which could affect future supply trends.

For *Slovakia* (Fig. 4.9) the Other products group was also a source of supply cuts and included sanctions groups 21 (finished products with milk and vegetable fats) and 16 (sausages and similar prepared foods).

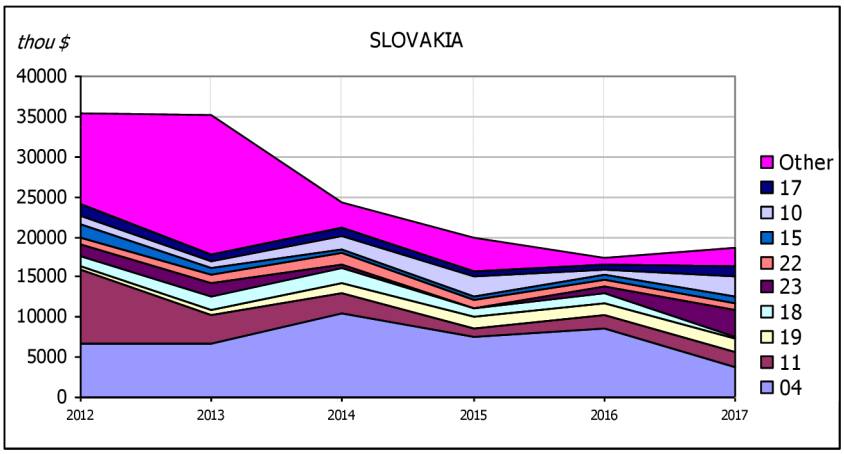


Figure 4.9. Russian APF (HS 01-24) import from V4-countries: Slovakia
Source: Federal Customs Service of Russia (2019)

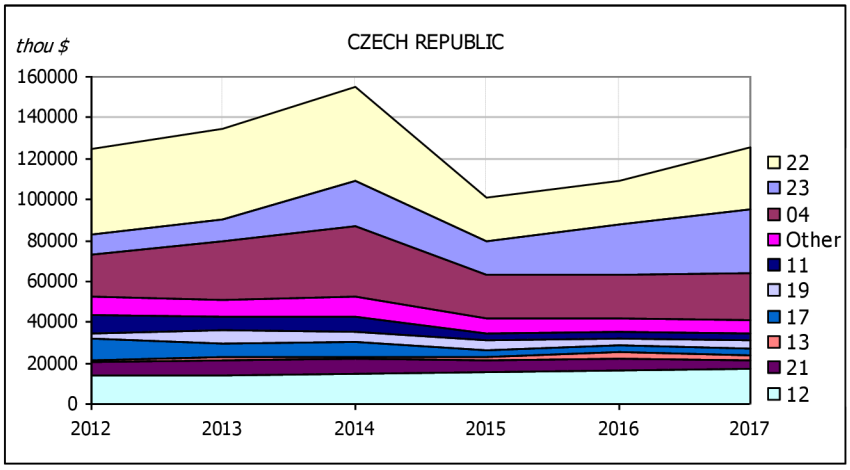


Figure 4.10. Russian APF (HS 01-24) import from V4-countries: Czech Republic
Source: Federal Customs Service of Russia (2019)

For *the Czech Republic* (Fig. 4.10), a noticeable reduction can be noted only in the unauthorized group 22 (alcoholic and non-alcoholic beverages), as well as in the sanction group 02 (meat and offal) with the supply of goods not included in the sanction list.

Table 4.6 shows the distribution of supply reductions by APF product groups in each country of V4, while for convenience, sanctions groups are marked with a yellow fill. First, we consider the distribution of supply reductions by product groups HS 01-24 for V4 countries. As follows from Table 4.6, of course, Russian sanctions affected all V4 countries, and the volume of APF trade in 2012–2017 declined in many product groups. The names of APF product groups (01-24) with HS codes are presented in Appendix A (HS Codes APF, 2021).

Thus, in *the Czech Republic*, of the total amount of the reduction in APF deliveries of 28.7 million dollars in the sanctioning groups (21, 01, 08, 16, 07) the reduction amounted to 5.3 million dollars. On the other hand, in the total volume of growth in deliveries by 29.7 million dollars deliveries of sanction groups increased by 3.7 million dollars. As a result, by 2017 compared to 2012, the Czech Republic was the only V4 country able to increase by $ 1 million the volume of APF supplies to the Russian market, including through the expansion of supplies within the framework of sanctions groups by subgroups of goods that were not included in the sanctions list. Here we also mention *Slovakia* and *Hungary*, which, within the framework of sanctions groups 19, 21, 01, increased the supply of goods that were not banned.

Several different situation can be noted for *Poland*, where the trade reduction took place practically on all sanctions groups of the list (List of Russian counter sanctions, 2014), and growth of deliveries of not forbidden goods within sanctions groups it is not noted in general. As a result, Poland still suffers significant losses, and the volume of APF supplies to the Russian market practically does not grow.

Thus, we can conclude that Russian sanctions to one degree or another caused a reduction in APF supplies to the Russian market of all V4-countries. But some countries were forced to completely stop the supply of sanctions products (Poland), others (the Czech Republic, Slovakia and Hungary), stopping the supply of sanction goods, reoriented to the supply of other products not included in the sanction list, as well as increase the supply of goods from unsanctioned groups.

Table 4.6. Changes in the volume of APF supplies of V4 countries by 01-24 product groups

CZECH REP.		SLOVAKIA		HUNGARY		POLAND	
HS	*2017-2012 thou $*	*HS*	*2017-2012 thou $*	*HS*	*2017-2012 thou $*	*HS*	*2017-2012 thou $*
01-24	1 010	*01-24*	-16 834	*01-24*	-46 034	*01-24*	-911 690
Reduction		Reduction		Reduction		Reduction	
22	-10 743	*11*	-7 197	*02*	-48 996	*07*	-234 032
17	-6 790	*16*	-6 021	*20*	-34 267	*04*	-113 654
11	-5 484	*04*	-2 884	*16*	-18 881	*02*	-99 586
21	-2 320	*01*	-2 814	*08*	-11 494	*03*	-99 586
01	-1 730	*18*	-1 026	*19*	-7 431	*18*	-30 042
08	-728	*15*	-705	*22*	-5 558	*21*	-24 183
16	-353	*17*	-365	*04*	-4 841	*01*	-18 582
20	-263	*21*	-174	*07*	-4 116	*16*	-11 583
07	-177	*20*	-76	*09*	-530	*17*	-10 712
18	-116	Growth		*15*	-299	*24*	-9 856
24	-35	*23*	1 648	*06*	-189	*09*	-6 829
Growth		*10*	1 511	*11*	-104	*22*	-1 460
23	21 307	*19*	1 127	Growth		*11*	-1 308
12	3 364	*22*	89	*10*	47 116	*15*	-1 217
19	1 882			*23*	21 307	*13*	-264
04	1 869			*23*	10 813	*05*	-91
13	717			*21*	9 122	Growth	
15	307			*18*	8 346	*19*	49 126
10	164			*17*	6 655	*06*	12 768
06	54			*01*	4 430	*23*	11 439
02	50			*12*	3 222	*20*	7 888
09	35			*24*	966	*12*	1 383
05	0					*10*	510
						14	62

Source: own calculations based on the data base of the Federal Customs Service of Russia for the publication (Yurik S., 2019).

Note. Yellow highlighted commodity groups from the sanctions list (List of Russian counter sanctions, 2014). In the heading of the table, "2017-2012" means "2017 minus 2012". The names of APF product groups (01-24) with HS codes are presented in Appendix A

Analysis of statistics 2015-2017 showed (fig. 4.11) that of the V4 countries, only the Czech Republic after 2014 was able to stop the post-sanction drop in APF trade in the Russian market and in 2017 exceeded the level of supplies in 2012 by $ 1 million (an increase of 0.8%).

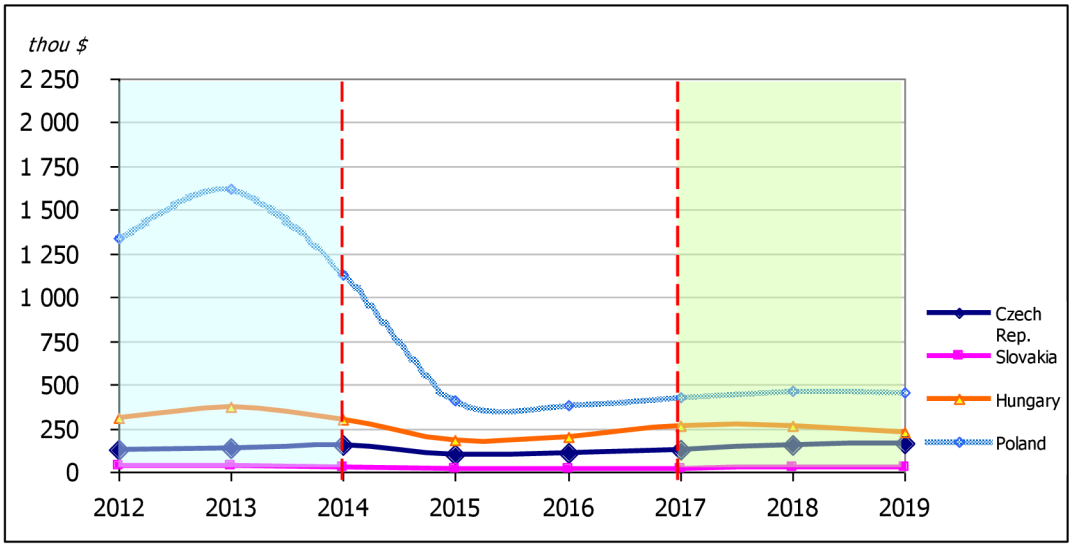


Figure 4.11 Dynamics of Russian imports from V4 countries
Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2020

As follows from additional Table 4.5.1, to which the results of 2018-2019 were added, this trend continued - the Czech Republic, the only V4 country, continued to grow in 2012 APF trade volumes (by $ 33 million and $ 35 million, respectively).

4.3.2.1 Discussion

Thus, the following conclusions can be drawn:

1. Russian sanctions to one degree or another caused a reduction in APF supplies to the Russian market of all V4-countries. But some countries were forced to completely stop the supply of sanctioned goods (Poland), others (Czech Republic, Slovakia and Hungary), having stopped the supply of sanctioned goods, switched to the supply of

other goods not included in the sanctions list, and also increased the supply of goods of other groups outside the sanctions list.

2. As a result of the resumption of trade, all V4 countries, except for the Czech Republic, by 2019 could not exceed the pre-crisis level of trade (2012) and remained below it. Only the Czech Republic, the only one of the V4 countries, was able to reach the pre-crisis level of trade by 2017, and then in 2018-2019 to consistently increase the volume of APF trade in the Russian market.

Thus, based on the results of the analysis, we determined that, according to the criterion of trade recovery, the Czech Republic is the leader among the other V4 countries, as it was able to surpass the pre-crisis level of trade and reach the historical maximum of APF trade in the Russian market.

Further, we will continue to consider the post-sanction status of the Czech trade as a V4 leader in more detail in relation to specific goods using the "price-quantity-value" characteristics..

4.3.3 Selection and initial assessment of Czech AFP main goods groups using FT-indices

As can be seen in Figures 4.7-4.10, after the introduction of sanctions, the trade volumes of the V4 countries, although they have significantly decreased, but in 2015-2017 for each country stabilized at their new level. Let's consider and analyze these new realities of trade in the Russian APF market using the example of the Czech Republic, which is the only non-CIS country after the introduction of Russian sanctions in 2014 against the EU by 2018 was able to halt the decline in APF trade and exceed 2012 trade volumes. The analysis will be carried out on the basis of specific goods, the receipt of which is recorded by statistics in the customs base (FCSR, 2019). For the analysis, we will use

index aggregation methods within the relevant groups of goods (Yurik&Pushkin, 2018; Pushkin&Yurik, 2018).

The value of APF of commodity groups 01-24 in 2015 and 2017 amounted to 100.5 and 125.5 million dollars respectively and within three years it grew by 25% or 25 million dollars. For the calculation of foreign trade indices (FTI), taking into account the requirements of the FTI calculation methodology, we generated a list of the main Czech imported goods from 32 main products, which we divided into a group of 11 products with the greatest value weight and the remaining 21 products. The first group of 11 heavyweight goods had a share in the total volume of Czech imports in 2015 and 2017, respectively, 85% and 92%. Its commodity composition is presented in Table 4.7 along with the calculated indices, including for the selected groups of goods. The calculations were carried out using the algorithms discussed in detail in our publication (Yurik S., 2018; Pushkin N., 2018).

As follows from Table 4.7, a group of 11 main goods ensured an increase in Czech APF import in 2015-2017 in the amount of 29.8 million dollars or 35%. At the same time, the remaining goods reduced the volume of deliveries by $ 3.7 million or by 31%. As a result, the total supply of 32 main goods increased by $ 26.1 million or by 26.8%. Here the leaders were the following subgroups: 2309 (animal feed) with an increase in supplies of $ 14.1 million; supplies of 22 alcoholic and other beverages in the total amount of 10.8 million dollars - this is a subgroup of 2203 (beer) and 2208 (spirits and liqueurs); subgroup 0407 (birds' eggs) with an increase in supplies of 1.8 million dollars. The latter subgroup has good growth rates and is not yet included in the Russian sanction list (List of Russian counter sanctions, 2014), which includes quite a few subgroups of dairy products from commodity group 04.

Four groups of goods with different FT-indices. We noticed that 11 heavyweight goods have different index characteristics, according to which additional groups can be formed: 1st group of goods-leaders, whose value supplies grow simultaneously with the rise in prices and quantity of goods (all *FT-indices* are greater than one); 2nd group,

where the value of the supply of goods is growing, but prices are falling (the average price index is less than one, the other indices are more than one); 3rd group, value deliveries of goods grow along with price increases with a decrease in volumes of supplies (quantity index is less than one, other indexes are more than one); 4th group with a final fall in value volumes (the value index is less than one, and so one of the remaining indices is also less than one).

Table 4.7. Russian APF import from the Czech Republic:
set of main goods with the largest share of value

№	HS		2015		2017		2017-2015, thou $	Indices 2017/2015		
			Value, thou $	Share	Value, thou $	Share		price	volume	value
	01-24	Agricultural products and foodstuffs	100 532	100%	125 500	100%	24 968			1,248
	32 main goods		97 339	96,8%	123 429	98,4%	26 091	1,053	1,204	1,268
	- 11 main goods with the largest share of value		85 438	85,0%	115 233	91,8%	29795	1,064	1,267	1,349
1	2309	Animal feed	17 056	17,0%	31 160	24,8%	14105	1,179	1,550	1,827
2	2203	Beer	14 570	14,5%	23 814	19,0%	9244	0,933	1,751	1,634
3	0407	Birds'eggs	21 308	21,2%	23 127	18,4%	1819	0,812	1,337	1,085
4	1207	Other oil seeds and oleaginous fruits	11 618	11,6%	11 646	9,3%	27	1,009	0,993	1,002
5	2208	Spirits, liqueurs and other spirituous, beverages	3 596	3,6%	5 181	4,1%	1585	1,110	1,298	1,441
6	1210	Hop cones	2 778	2,8%	4 503	3,6%	1725	1,222	1,326	1,621
7	2106	Reparations not elsewhere specified or included	3723	3,7%	4100	3,3%	378	2,084	0,529	1,101
8	1704	Sugar confectionery (including white chocolate)	3 684	3,7%	3 568	2,8%	-116	1,093	0,886	0,968
9	1107	Malt; whether or not roasted	3 525	3,5%	3 265	2,6%	-260	0,926	1,001	0,926
10	1905	Pastry, cakes, biscuits and other bakers'wares	2 016	2,0%	2 720	2,2%	704	1,644	0,821	1,349
11	1302	Vegetable saps and extracts	1 564	1,6%	2 149	1,7%	585	1,582	0,869	1,374
	- other *21 main goods*		11901	11,8%	8197	6,5%	-3705	1,064	0,647	0,689

Source: own calculations on the basis of data of the Federal Customs Service of Russia for publication (S. Yurik, 2019)

It should be noted that the first three groups of products with a growing value provide 86% of the value of supplies with its growth compared to 2015 by $ 30.2 million. The structure of Czech APF import to Russia by selected groups is presented in Figure 4.12 and Table 4.8.

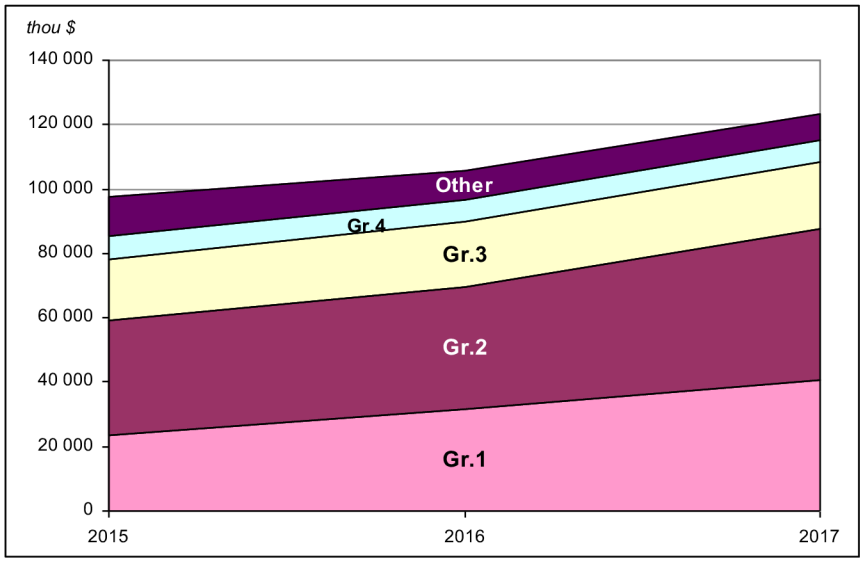


Figure 4.12. Groups of Czech APF imported to Russia
Source: own calculations on the basis of data of the Federal Customs Service of Russia for publication (S. Yurik, 2019)

The 2st group. As shown in Table 4.8, by weight in the value of supplies is leading the second group of goods (beer and birds' eggs), with the most significant share (37.4%) in the total volume of APF supplies in 2017. In this group the increase in the value by 30.8% or $ 11.1 million is due to the growth in volumes with a decrease in average prices. Thus, the natural supply of beer increased by 75.1% while prices decreased by 6.7%, while the value increased by 63.4% or $ 9.2 million. Natural supply of eggs increased by 33.7%, the average price decreased by 18.8%, as a result, the value increased by 8.5% or $ 1.8 million.

Table 4.8. Russian APF import from the Czech Republic:
set of main goods with rising and decreasing of value

HS		2015		2017		2017-2015, thou $	Indices 2017/2015		
		Value, thou $	Share	Value, thou $	Share		price	volume	value
01-24	Agricultural products and foodstuffs	100 532	100%	125 500	100%	24 968			1,248
	32 main goods	97 339	96,8%	123 429	98,4%	26 091	1,053	1,204	1,268
	- 11 main goods *with the largest share of value*	85 438	85,0%	115 233	91,8%	29 795	1,064	1,267	1,349
	- GROUP 1 *(increase in price, quantity, value)*	23 430	23,3%	40 844	32,5%	17 414	1,173	1,486	1,743
2309	Animal feed	17 056	17,0%	31 160	24,8%	14105	1,179	1,550	1,827
2208	Spirits, liqueurs and other spirituous, beverages	3 596	3,6%	5 181	4,1%	1585	1,110	1,298	1,441
1210	Hop cones	2 778	2,8%	4 503	3,6%	1725	1,222	1,326	1,621
	- GROUP 2 *(increase in value, decrease in price)*	35 878	35,7%	46 941	37,4%	11 064	0,861	1,519	1,308
2203	Beer	14 570	14,5%	23 814	19,0%	9244	0,933	1,751	1,634
0407	Birds'eggs	21 308	21,2%	23 127	18,4%	1819	0,812	1,337	1,085
	- GROUP 3 *(increase in value, decrease in quantity)*	18 921	18,8%	20 615	16,4%	1 694	1,336	0,816	1,090
1207	Other oil seeds and oleaginous fruits	11 618	11,6%	11 646	9,3%	27	1,009	0,993	1,002
2106	Reparations not elsewhere specified or included	3723	3,7%	4100	3,3%	378	2,084	0,529	1,101
1905	Pastry, cakes, biscuits and other bakers'wares	2 016	2,0%	2 720	2,2%	704	1,644	0,821	1,349
1302	Vegetable saps and extracts	1 564	1,6%	2 149	1,7%	585	1,582	0,869	1,374
	- GROUP 4 *(decrease in value)*	7 209	7,2%	6 833	5,4%	-377	1,011	0,937	0,948
1704	Sugar confectionery (including white chocolate)	3 684	3,7%	3 568	2,8%	-116	1,093	0,886	0,968
1107	Malt; whether or not roasted	3 525	3,5%	3 265	2,6%	-260	0,926	1,001	0,926
	- 21 other main goods *(decrease in value)*	11 901	11,8%	8 197	6,5%	-3 705	1,064	0,647	0,689

Source: own calculations on the basis of data of the Federal Customs Service of Russia for publication (Yurik&Puchkin, 2019)

In general, the second group of products demonstrates a good example of adaptation to market conditions, when the supply of eggs (subgroup 0407) in the sanctions group of goods 04 began to expand at affordable prices, which led to an increase in the presence of these goods on the Russian APF market. Data on price conditions and market share of natural supply of eggs and beer we present in Tables 4.9–4.10.

Tables 4.9. Birds' eggs: data on price and market share of Russian import from non-CIS in 2017

	t	thous, $	$/kg	Share
0407 Birds' eggs				
non-SIC	33787	178561,3	5,28	100%
NL	12444	49055,9	3,94	37%
CZ	6728	23127,1	3,44	20%
DE	6175	33516,4	5,43	18%
FR	2205	26828,3	12,17	7%
PT	1349	6390,4	4,74	4%
ES	1284	6329,8	4,93	4%
SK	1034	3840,1	3,71	3%
CA	885	12593,9	14,23	3%
HU	783	7921,6	10,12	2%
BE	247	1060,8	4,29	1%
SE	240	1117,1	4,65	1%
GB	123	5097,7	41,44	0%
IT	107	737,6	6,89	0%
DK	91	444,9	4,89	0%
PL	61	226,8	3,72	0%
IE	19	88	4,63	0%
BR	12	185,1	15,43	0%

Source: own calculations on the basis of data of the Federal Customs Service of Russia for publication (S. Yurik, 2019)

Thus, (Tab. 4.9) compared to other V4 countries, in 2017 the average price of Czech eggs deliveries was 3.44 dollars / kg lower than in other V4 countries (in Hungary, Poland and Slovakia, the price of eggs was respectively 10.12; 3.72; 3.71 dollars / kg). At the same time, in natural supplies, the share of the Czech Republic among non-CIS countries on the Russian egg import market is significantly higher than

other V4 countries - 19.9% versus 2.3%, 0.2%, 3.1%, respectively, of Hungary, Poland and Slovakia. In this case, the Czech Republic occupies the second position in the Russian market of imported eggs, behind the Netherlands (37% of the market with a price of $ 3.94 / kg) and ahead of Germany (18% of the market with a price of $ 5.43 / kg). Thus, the competitive position of the Czech Republic on the Russian market for imports of eggs from non-CIS countries is the highest among the V4 countries, which determined the final result. Prospects for further growth in the supply of Czech eggs are quite optimistic and the price allows winning a large market share.

As for subgroup 2203 beer (Tab. 4.10), its position in the Russian market can be called stable, since among non-CIS countries in 2017 Czech beer occupied 18% of the market, and this is the second place after Germany (41%) with a noticeable margin from third place Belgium (10% of the market of non-CIS countries). The average beer price per liter for Germany, the Czech Republic and Belgium was 1.03; 0.88 and 1.39 doll/l. According to our estimates, the demand for original Czech beer in the Russian market will continue with a tendency of growth in both the number of deliveries and prices, since the closest competitors from non-CIS countries have a noticeable gap in prices from the Czech Republic. In addition, it is possible to recommend the expansion of the supply of premium Czech beer. Judging by the prices for German and Belgian beer, the Russian market is ready to pay more for high-quality original beer brewed and bottled in the Czech Republic.

The 1st group combined three main products with indices greater than one. Although the share of this group (32.5%) in APF import in 2017 is less than the second group, the first group is in first place in terms of the increase in supply: its deliveries increased by 74.3% or $ 17.4 million. The leader of the first group is the subgroup 2309 (animal feed), the volume of supplies of which increased in value by 83% or 14.1 million dollars, including volumes and average prices increased by 55% and 18% respectively.

Tables 4.10. Beer: data on price and market share of Russian import from non-CIS countries in 2017

	L	thous, $	$/L	Share
2203 Beer made from malt				
non-CIS	153835151	167630	1.09	100%
DE	62968072	64551	1.03	41%
CZ	27037780	23814	0.88	18%
BE	14941712	20763	1.39	10%
LT	8048022	5513	0.69	5%
GB	7456429	10128	1.36	5%
IE	6748694	13311	1.97	4%
MX	6653370	7541	1.13	4%
CN	3880122	3952	1.02	3%
KR	2807170	2124	0.76	2%
FI	1920810	2357	1.23	1%
NL	1810921	2986	1.65	1%
PL	1719673	1132	0.66	1%
JP	1528475	1636	1.07	1%
US	1513274	2154	1.42	1%
FR	1461029	1232	0.84	1%
Other	3339598	4436	1.33	2%

Source: own calculations on the basis of data of the Federal Customs Service of Russia for publication (S. Yurik, 2019)

This most dynamic product subgroup has good growth prospects in the Russian market, where the demand for this product is high, especially in the area of first-class modern pet food, whose production in Russia is underdeveloped or absent. Further, supplies of subgroup 2208 (spirits and liqueurs) are growing steadily, with a forecast of positive growth in value due to the consistently high demand for Czech alcohol in the Russian Federation. The next subgroup of 1210 (hop cones) has good growth prospects: the value of supply increased by 62% or 1.7 million dollars. with an increase in prices and volumes, respectively, by 22% and 33%. In the Russian import market in 2017 hops from the Czech Republic ranks second after Germany (the market share of volumes is 11% and 73%, respectively), but the price of Czech hops is higher than Germany's - $ 12.3 / ton against $ 10.4 / ton. It is clear that product quality can be different, but the issue of price as a factor in expanding the presence of Czech hop suppliers in the Russian market must be under control.

The 3rd group, consisting of four products, ensured a 9% increase in value or $ 1.7 million, with a decrease in the supply of products by 18.4% and a rise in prices by 33.6%. Here the greatest increase in value by 35% or by 0.7 million dollars was provided by the subgroup 1905 (pastry, cakes, biscuits, other bakers' wares), the prices of whose products increased 1.6 times with a decrease in supply volumes by 17.9%. Supplies of subgroup 1302 (vegetable saps and extracts) increased by $ 0.6 million or 37.4% due to a 1.6-fold increase in prices, while supply volumes decreased by 13.1%. Subgroup 2106 (food preparations not elsewhere specified or included) was able to increase the value of supply by 10.1% or by $ 0.4 million, with prices rising 2.1 times and reducing natural supply by almost half (48%). Subgroup 1207 (other oil seeds and oleaginous fruits) demonstrates stability: the value increased by 0.2%, the price by 0.9%, the amount decreased by 0.7%. For the time being it is difficult to predict the future behavior of the 3rd group in view of a rather wide range of supplies within the group's goods. But one thing is for sure - this is a group of growth in supply, although more modest than in previous groups.

The 4th group combines 2 products (of the remaining 11 main ones), the value of deliveries of which in 2015-2017 decreased by 5.2% or 0.4 million dollars due to a decrease in natural supply by 6.3% and a rise in prices by 1.1%. These are the general indices of group 4, although, as follows from Table 4.8, the reasons for the decrease in the value of the goods are different. Thus, in terms of deliveries of subgroup 1704 (sugar confectionery), the value reduction occurred against the backdrop of rising prices (by 9.3%), while the volume of natural supplies decreased by 11.4%. At the same time, in the other product group 1107 (malt), on the contrary, the value of supply decreased by 7.4% or by 0.26 million dollars due to a decrease in prices by 7.4% with an almost unchanged volume of natural supplies. Note that the price of Czech malt in the Russian market is lower than the average for non-CIS countries ($ 0.51 / kg versus the average $ 0.52 / kg). At the same time, Czech malt occupies 10% of the non-CIS supply market, second place after Germany (20.5% at a price of $ 0.65 / kg). With proper product

quality, it can be assumed that the price of Czech malt may well grow along with the value of supply.

In general, it can be noted that Czech products of the 4th group and others (outside the four selected groups) do not have a sufficient level of competitiveness and so far do not have a noticeable impact on the overall results of APF trade on the Russian market. Here, the center of trade interests is undoubtedly concentrated in the first three groups of Czech goods (Table 4.8), which have significant volumes of trade and have promising growth characteristics for expanding their presence in the Russian market.

P.S. The above text was published by authors (Yurik & Pushkin, 2018) based on the results of the analysis of statistics for 2015-2017. When preparing the dissertation, Table 4.8 and Figure 4.7 were updated with data for 2018. The updated version is presenedt below (Table 4.8.1 and Fig. 4.12.1):

Table 4.8.1 Russian APF import from the Czech Republic:
set of main goods with rising and decreasing of value (with 2018)

HS		2015		2018		2018-2015 thou $	Indices 2018/2015		
		Value, thou $	Share	Value, thou $	Share		price	volume	value
01-24 Agricultural products and foodstuffs		100 532	100%	157 069	100%	56 537			1,562
29 main goods		96794	96,3%	154930	98,6%	58 136	1,151	1,390	1,601
- 12 main goods with the largest share of value		85760	85,3%	147868	94,1%	62108	1,162	1,483	1,724
- GROUP 1 *(increase in price, quantity, value)*		27333	27,2%	54983	35,0%	27651	1,160	1,735	2,012
2309	Animal feed	17056	17,0%	34769	22,1%	17714	1,099	1,855	2,039
2208	Spirits, liqueurs and other spirituous, beverages	3596	3,6%	5708	3,6%	2112	1,099	1,444	1,587
1905	Pastry, cakes, biscuits and other bakers'wares	2016	2,0%	5330	3,4%	3313	1,218	2,170	2,643
1210	Hop cones	2778	2,8%	3832	2,4%	1054	1,360	1,014	1,379
1302	Vegetable saps and extracts	1564	1,6%	3689	2,3%	2125	1,528	1,544	2,359
2202	Waters mineral and aerated	323	0,3%	1 656	1,1%	1 333	1,180	4,348	5,129
- GROUP 2 *(increase in value, decrease in price)*		35878	35,7%	62833	40,0%	26955	0,972	1,802	1,751
2203	Beer	14570	14,5%	36629	23,3%	22059	0,976	2,575	2,514
0407	Birds'eggs	21308	21,2%	26204	16,7%	4896	0,969	1,269	1,230
- GROUP 3 *(increase in value, decrease in quantity)*		19025	18,9%	27127	17,3%	8102	1,562	0,913	1,426
2106	Reparations not elsewhere specified or included	3723	3,7%	5088	3,2%	1365	1,433	0,954	1,367
1704	Sugar confectionery (including white chocolate)	3684	3,7%	3847	2,4%	163	1,258	0,830	1,044
1207	Other oil seeds and oleaginous fruits	11618	11,6%	18193	11,6%	6574	1,700	0,921	1,566
- GROUP 4 *(decrease in value)*		3525	3,5%	2925	1,9%	-600	0,962	0,862	0,830
1107	Malt; whether or not roasted	3525	3,5%	2925	1,9%	-600	0,962	0,862	0,830
- other 17 main goods		11034	11,0%	7063	4,5%	-3972	1,064	0,601	0,640

Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2019

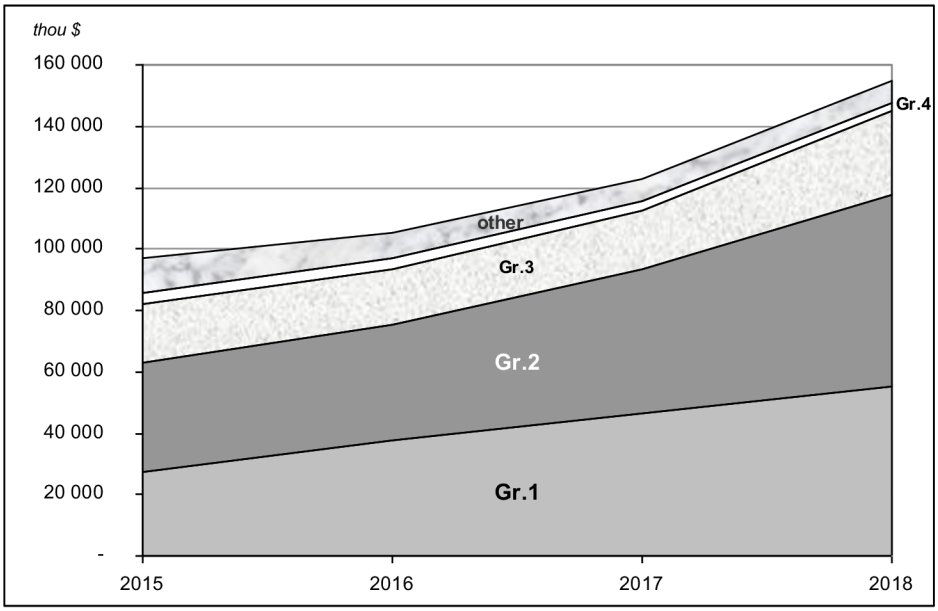


Figure 4.12.1. Groups of Czech APF imported to Russia
Source: own calculations on the basis of data of the Federal Customs Service of Russia for publication (S. Yurik, 2019)

As follows from Table 4.8.1, in 2015-2018, 12 main goods from groups 1-4 (their share in total imports amounted to 94.1% in 2018) provided an increase in the value by 72.4% or 62.1 mln USD (a year earlier this figure was $ 29.8 million - table 4.8). At the same time, natural volumes of supplies increased by almost 1.5 times, while average prices increased by 16%. In other words, the growth in the value of supplies to the Russian market was growing, since all three general FT-indices were positive.

Note that by the groups the increase of value was observed in the first three, respectively, by $27.7; $ 27 and $ 8.1 million. The composition of goods in groups 1 and 3 increased over the year from 3 to 6 products and from 2 to 3 products, respectively. Group 2 remained unchanged and still included 2 products, only beer moved to the first place in the list of main products, pushing Animal feed to the second position.

Figure 4.12.1 clearly shows that the share of groups 1-2 in total exports increased in 2018 to 75% (in 2017 it was 69.9%) with an annual increase in supplies for two groups by $ 25 million.

Thus, our forecast for the first three groups of goods came true - «the center of trade interests is undoubtedly concentrated in the first three groups of Czech goods (Table 4.8), which have significant volumes of trade and have promising growth characteristics for expanding their presence in the Russian market». The 2018 results also confirmed this estimate even more.

Further, having determined, within the framework of benchmarking, the position of the Czech Republic as the V4 leader in the restoration and growth of supplies to the Russian market, taking into account the current statistics for 2015-2018 with the addition of 2018-2019, we will dwell on the commodity composition and analyze the supply of Czech APFs to the Russian market by main goods, taking into account the current statistics data for 2015-2018 with the addition of 2018-2019.

4.3.3.1 Discussion

Thus, the following conclusions can be drawn:

1. The analysis of the groups of the main Czech APF products showed an increase in deliveries for 9 of the 11 most important commodities (92% of the value of deliveries), which fall into three main groups with different values of FT-indexes. These goods have a sufficient level of competitiveness and ensure the expansion of APF trade in the Russian market.

2. The position of three main commodities (bird eggs, animal feed, beer) was noted, providing almost 2/3 of the supply of APF. For each product from the top 3, we determined its position in the relevant product market among similar imported products from other countries, taking into account the price, quantity and value of supplies.

3. Taking into account the specific weight of the top 3 and the large gap from other goods, we decided to focus further research on the group of top 3 main goods.

4.4 Stage 4. Czech APF exports in the mirror of Russian import statistics: top 3 leading goods and prospects for expanding trade

At the final fourth stage, a broad analysis of the trade positions of Czech APFs on the Russian market in the period 2015-2018 was carried out with the development of recommendations for trade development. Based on the results of the analysis, three articles were published (Yurik, S. & Pushkin, N., 2019; Yurik, S., Pushkin, N., Yurik, V., Halík, J., & Smutka, L., 2020; Yurik, S., Pushkin, N., Halik, J., Yurik, V., 2020 – see below).

LITERATURE REVIEW

Studies about problems of mirror statistics are scarce, which is explained by the difficulties of the gathering of initial data and the problematic subsequent interpretation of results of mirror comparison of information. The main volume of publications focuses on the topic of increasing the reliability of statistics (Markowicz & Baran, 2019). What predominates the field are macroeconomic comparisons of data of the total value of trade results with the recording of the largest deviations, including between countries; e.g. see publications of the Central Bank of Russia (BOPR-CMD, 2019), but also Javorsek (2016), Valiev (2016), Seltsovsky (2009). Moreover, we also note publications that conduct a wide mirror comparison of the value results of trade at the level of trade partners of the country, including mirror comparison by product groups and sometimes by selected goods (CCSKR, 2014; Troshina & Kislitsyna, 2008; Korolev, Zhukovskaya, Trofimova & Chertko, 2007; EIFRF, 2003).

From our viewpoint, the common drawback of mirror statistics research is its wide focus, when asymmetry studies are conducted on the almost complete composition of product groups with the comparison of values of trade. In this case, due to the large amount of infor- mation, the interpretation of results is difficult and often remain at the level of fixing the fact of asymmetry and determining its size, followed by an assessment of the estimated losses of budget revenues. Based on mirror comparisons, a rather large number of different estima- tion techniques have also been proposed on this subject; e.g. see the discussion of data com- parison techniques and a list of sources in Mantusov and Tibekin (2015; 2016), Bartokova (2019), Borak and Vacek (2018), Ferto (2018). Furthermore, as a general drawback, we note that data on natural supplies of

goods and prices remain unused in almost all publications devoted to the topic of comparing mirror statistics.

We conclude that the practical use of mirror statistics has its own characteristics and is not always possible due to large discrepancies or asymmetries in the volumes of com- parable flows of national statistics and statistics of the host country, when the reliability of the data is doubtful (asymmetry is higher than the permissible values) and requires ad- ditional checks. However, large discrepancies in mirror data are not recorded everywhere; in a number of publications this fact is noted both for goods and for countries. Neverthe- less, we did not find any publications that would consider the further use of "normal" mir- ror statistics as an additional source of information – along with national statistics – for studying goods trade between countries.

Let us note that mirror statistics as a full-fledged information base is closer to the real conditions of the sales market, because accounts for the cost and quantity of goods of different countries for sale on the domestic market of the importing country, taking into account logistics and insurance cost.

The focus of the study was narrowed down to the group of APF (HS 01-24)[1], for which we examined exports from the Czech Republic to the Russian market and investi- gated the possibilities of its analysis based on data from mirror statistics of Russian im- ports. To solve this problem, the article will firstly assesses the acceptability of using mirror statistics for APF in terms of existing methodological standards. Here, in the con- text of the classical analysis of foreign trade flows (by sections, product groups, list of main goods, and the behaviour of trade leaders), we will conduct the comparison of mirror value data at the level of all product APF groups (HS 01-24), then according to the list of main import goods, and finally by leading products. In conclusion, we will consider the asymmetry of not only cost but also natural deliveries for the leader of trade in the Russian market – Czech beer – along with its possible causes, emerging trade problems, suggestions for solutions.

MATERIAL AND METHODS

Mirror Statistics.

As we know, international trade between two countries is simultaneously monitored and registered by the customs services of these countries. The result is a two- sided display of trade data, which is commonly referred to as mirror statistics. Theoretically, in the mirror statistics, the export of goods from country A to country B should equal the import from country B from country A, whereas the import from country B to country A should equal the export from country A to country B. However, in practice the mentioned trade volumes usually differ and, at times, they differ

dramatically. In general, experts associate the pres- ence of differences or *asymmetry* in the data of mirror statistics with two groups of rea- sons: the customs methodology for fixing flows and various errors in determining the cus- toms value of goods, including those associated with understating customs value to reduce budget deductions and organise capital flight (cf. IMTS, 2010).

What is considered a normal asymmetry of mirror flows? First of all, the asymmetry of the data is associated with the difference in prices of recorded flows. As we know, according to customs statistics methodology (IEMD, 2018), the value of exporting goods of country A to the market of country B is represented by statistics of country A in Free On Board (FOB) prices, while imports of goods from country A to country B are represented by statistics of country B at Cost, Insurance, and Freight (CIF) prices, which additionally include costs of insurance and transportation of goods. According to the International Monetary Fund (IMF), the world av- erage CIF/FOB value is 1.06 (DOTS, 2018, p. xii; Bogdanova & Chuplanov, 2010, p. 47), alt- hough earlier studies use the coefficient of 1.10 (EIFRF, 2003; DOTS, 2011). Currently, the Cen- tral Bank of Russia at the mirror comparing statistics for countries outside of the Common- wealth of Independents States (CIS) applies coefficient 1.0588 (BOPR-C, 2018, p. 1). Moreo- ver, we note that permissible differences in estimates depend on the specifics of goods and are determined by the amount of expenses not only for transportation and insurance but also losses during transportation and calendar differences in sending and receiving goods.

Thus, we may conclude that, in general, the permissible discrepancy in estimates for trade with non-CIS countries is usually taken equal to 6-10%. In the future, when assessing the acceptability of the asymmetry of value flows, we will focus on the indicated values.

What is registered more precisely: export or import? To this question, the United Nations statistics experts answer that, for a given country, imports are usually recorded with more accuracy than exports, because imports are the main revenue base of the state budget and exports are not (IEMD, 2018). The general view of experts on the ac- curacy of data collected by customs offices is that import data are more reliable than export data because customs services are more serious about recording imported goods for purposes of budget revenue from duties collection, taxes, and other regulatory con- trols (Hamanaka, 2011, p.1; EIFRF, 2003).

The conclusion about the smaller asymmetry of import flows of mirror statistics was practically confirmed when comparing Czech export statistics on APF and mirror statis- tics on the import of Czech goods to Belarus (Yurik, 2017). Indeed, the mirror data of Czech imports from Belarus and Belarusian exports to the Czech Republic had

rather large differences, while data on the opposite flow to Belarus differed within the limits of methodologically permissible norms.

Research Design with Mirror Statistics.

Within the framework of the designated topic, the study focused on the APF group (HS 01- 24). In the beginning, to assess the practical use of mirror statistics in the analysis of com- petitive positions of Czech APF goods in the Russian market, we compared the statistics of Czech exports to the Russian Federation and statistics of Russian imports from the Czech Republic. Next, on the basis of the Federal Customs Service of the Russian Federation data- base (FCSR), we compiled a list of imports of Czech APF goods to Russia from 29 items (99% of the trade volume), within which we distinguished 12 main goods (more than 90% of trade) and three leading goods (60% of trade volume). We then calculated foreign trade (FT) indices of price, quantity, and value for the selection of groups of goods using the proposed meth- ods. Based on FT-indices and mirror statistics, we estimated the position of the leaders' prod- ucts surrounded by similar imported goods from other countries and the prospects for ex- panding trade on the Russian market. In conclusion, we compared the asymmetry of mirror statistics of natural supplies for the three leading products of Czech APF imports to Russia (more than 60% of trade) and commented on possible causes of deviations.

Methods of FT-Indices Calculation.

In Russian statistics, FT-indices are calculated based on the Laspeyres formula:

$$I^p = \frac{\sum p^1 q^0}{\sum p^0 q^0} \quad (1)$$

where:

p^0, p^1 - is the price per unit of goods in the reference and reporting years;

q^0, q^1 - is the quantity of goods in the reference and reporting years;

I^p - Laspeyres average price index.

For calculating FT-indices, we used methods of aggregation and disaggregation of indices that are a modification of general methods (Pushkin & Yurik, 2018), adapted to solve the problems under consideration.

To describe the algorithm for calculating FT-indices, we will use the following notation:

n, k – the quantity of goods in the sample and in the selected group;
p^0_i, p^1_i – the price of goods i in the reference and reporting years;
q^0_i, q^1_i – the quantity of goods i in the reference and reporting years;
s^0_i, s^1_i – the value of goods i in the reference and reporting years;
S^0_n, S^1_n – the value of all n goods in the reference and reporting years;
S^{01}_n – the value of all n goods in the reference year at the prices of the reporting year (numerator of the Laspeyres formula (1));
I^s_n, I^p_n, I^q_n – value index, average price index and quantity index of the reporting year to the reference year for a group of n goods.

Aggregation: total FT-indices for a list of n products.

Initially known: s^1_i, s^0_i, q^1_i, q^0_i, i = 1,2…, n.

Moreover, we calculate the total value of n goods:

$$S^1_n = \sum_{i=1}^n s^1_i, \quad S^0_n = \sum_{i=1}^n s^0_i \tag{2}$$

Next, we note that the denominator of formula (1) is equal to S^0_n:

$$\sum_{i=1}^n p^0_i q^0_i = \sum_{i=1}^n s^0_i = S^0_n \tag{3}$$

and the numerator can be calculated by the formula:

$$S^{01}_n = \sum_{i=1}^n p^1_i q^0_i \tag{4}$$

Then the value index, average price index and quantity index for a list of n products are calculated using formulas:

$$I^s_n = \frac{S^1_n}{S^0_n} \tag{5}$$

$$I^p_n = \frac{S^{01}_n}{S^0_n} \tag{6}$$

$$I^q_n = \frac{I^s_n}{I^p_n} \tag{7}$$

Disaggregation: total indices for a group of k products and a group of other (n - k) products.

For a group of k products (k < n), initially known: s^1_j s^0_j q^1_j q^0_j, j = 1,2…, k. To determine FT-indices using formulas (2) - (4), we calculate the required total parameter values for n = k, and then the final value index, the average price index, and the quantity index for the group using formulas (5) - (7) for n = k.

For the group of other (n - k) goods, the total values of formulas (2) - (4) – necessary for calculating the three indices – are defined as the difference between the corresponding amounts for n and k goods. Then, the value index, the average price index, and the quan- tity index for the remaining (n - k) goods are calculated according to formulas (8) - (10):

$$I_k^S = \frac{S_k^1}{S_k^0} = \frac{(S_n^1 - S_k^1)}{(S_n^0 - S_k^0)} \quad (8)$$

$$I_k^P = \frac{S_k^{01}}{S_k^0} = \frac{(S_n^{01} - S_k^{01})}{(S_n^0 - S_k^0)} \quad (9)$$

$$I_k^q = \frac{I_k^S}{I_k^P} \quad (10)$$

Using the formulas (1) - (10), we calculated the indices in Table 2.

Initial Data. The interval of presentation of all indicators is 2015-2018. The study simultaneously used the United Nations database (UN COMTRADE, 2019; general asymmetry) and the database of the Federal Customs Service of the Russian Federation (FCSR, 2019; main goods). Note that the data from the two indicated databases are identical, while possible minor deviations are associated with technical adjustments at the level of national statistical services, which are not always promptly reflected in the UN COMTRADE database.

RESULTS AND DISCUSSION

The Asymmetry of Mirror Statistics of the Czech Republic and Russia for APF. Mirror comparison of the data of export and import of Czech goods to the Russian market is presented in Table 1.

The comparison of the overall results shows that from 2015 to 2018 shows the total Czech exports to Russia (FOB prices minus Czech statistics) were higher than the volumes of Russian imports from the Czech Republic (CIF prices minus FCS of the Russian Federa- tion) by 11% on average. This unnatural asymmetry of data indicates problems with errors in reporting and determining the customs value of goods that may mask shadow opera- tions, taxes minimisation, and capital flight, which requires additional analysis by both statisticians and customs officers should it reach critical volumes.

Table 1. Mirror comparison of APF trade data

HS	CIF: Russian import from the Czech Rep.			FOB: Czech export to Russia			CIF/FOB		
	2015	2017	2018	2015	2017	2018	2015	2017	2018
	thous USD			thous USD					
Total	2 679 134	3 216 554	3 775 324	3 199 490	3 539 595	4 116 618	84%	91%	92%
01-24	100 324	125 876	156 776	95 556	115 661	143 593	105%	109%	109%

Source: own elaboration of data from UN COMTRADE (2019).

In contrast to the overall results, a mirror comparison of APF trade data (Table 1) shows a generally normal situation with an average valuation excess of CIF prices over FOB by 6-7%, which is comparable to the ratio of 1.0588 of the Central Bank of Russia for cal- culating the balance of payments (BOPR-C, 2018). Noteworthy, focus on a specific APF product group allowed us to find a positive result for the asymmetry of mirror data.

Thus, we may conclude that the use of import statistics of the Federal Customs Service of the Russian Federation for the analysis of mirror data on the Czech APF trade in the Rus- sian market is generally possible in view of methodologically permissible differences in data.

Czech Exports in the Mirror of Russian Statistics: Main APF Goods and Trade Development Prospects.

According to the statistics (Figure 1), Russian APF import from the Czech Republic in 2018 reached the maximum pre-crisis level – before the introduction of Russian countersanc- tions for the EU countries in August 2014 – and exceeded it.

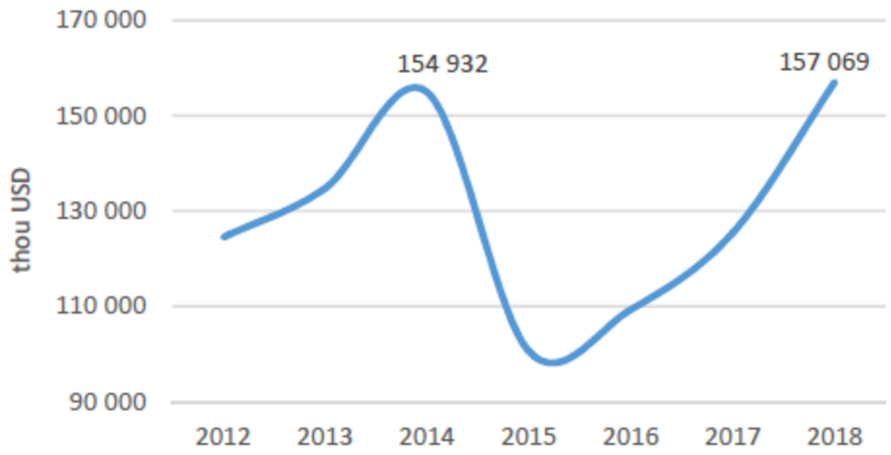


Figure 1. Russian APF import from the Czech Republic
Source: own elaboration of the FCSR data (2019).

We will analyze the dynamics of the commodity structure of Czech APF supplies to the Russian market in 2015-2018 after the introduction of Russian countersanctions.

Main APF Goods and the Top Three Products.

To analyse trends and patterns of Czech APF exports to the Russian market, we selected the interval 2015-2018; that is, the period after the introduction of Russian

sanctions on agricultural products against EU countries. Based on the data of the Federal Customs Ser- vice of the Russian Federation, we compiled a list of imports of Czech APF goods to Russia, which includes 29 products (sample depth 98.6% for 2018). Using the aggregation method described above, total indices were calculated for 29 main goods, including the group of 12 goods with the largest share of value, but also for other goods (Table 2).

As Table 2 reveals, the centre of trade interests of Czech APF exports to Russia con- centrates on the group of the main 12 goods (94% of the total in 2018). Deliveries of these goods had an upward growing dynamic (all indices are more than one) and for 2015-2018 they increased in value on average by 1.7 times (by 62 million USD), based on rising prices and physical volumes by 16% and 48%.

It should be noted that almost 3/4 of the growth in exports was achieved due to the three leading products: beer, animal feed, birds' eggs. By 2018, their share amounted to 2/3 of the export volume (Figure 2).

Let us consider these products in more detail in increasing order of importance. FCSR mirror statistics of imports allows us to analyse the position of Czech goods on the Russian market in comparison with similar goods imported from other countries. We should note that Czech export statistics do not have such data for comparative analysis.

The third place – position 0407, birds' eggs – after 2015 increased sales volumes by 23% with a slight decrease in prices (by 3%) and an increase in natural supplies (by 27%). However, already in 2018, while maintaining the growth in value (by 13%), a noticeable increase in prices (by 19%) was recorded with a decrease in natural supplies (by 4%). How- ever, Russian statistics on imports of these products from other non-CIS countries (Table 3) shows that among the four non-CIS countries with a market share of more than 75%, Czech products have the lowest price, despite its growth from 3.44 to 4.10 USD/kg.

This means that the prospects for trading in the birds' eggs market for the Czech Repub- lic are stable: the market share is high – second or third place among non-CIS countries – while prices are lower than most of competitors' prices. In the future, one should pay atten- tion to the increase in natural supplies while prices continue to rise; possibly to the leader level of the Netherlands 4.28 USD/kg and then to the average non-CIS price of 5.59 USD /kg. The second place – position 2309, animal feed – increased trade volume for 2015- 2018 more than twofold, while the price and natural supplies increased by 10% and 1.9 times, respectively. Although the price slightly decreased for this position (by 7%) in 2018, the increase in natural supplies by almost 20% ensured an increase in trade volume by 12%. In this case, the assortment is

probably changing towards cheaper and more demanded types of feed. However, this conclusion is not certain.

Russian statistics on imports of animal feed suppliers from non-CIS countries show an increase in average prices from 1.83 to 1.99 USD/kg. As Table 4 reveals, feed prices in 2018 rose in all countries on the list, except for the Czech Republic. This is a hint to Czech mar- keters from the Russian market: it is possible and necessary to increase the price up to the level average for the market (1.99 USD/kg) and even higher.

Table 2. Russian APF import from the Czech Republic: the set of main goods with the largest share of value

HS	Product groups, products	2015		2018		2018-2015, thou USD	Indices 2018/2015			Indices 2018/2017		
		Value, thou USD	Share	Value, thou USD	Share		*price*	*volume*	*value*	*price*	*volume*	*value*
01-24	Agricultural products and foodstuffs	100 532	100%	157 069	100%	56 537	–	–	1.562	–	–	1.252
29	main goods	96 794	96.3%	154 930	98.6%	58 136	1.151	1.390	1.601	1.093	1.153	1.260
- 12	*main goods with the largest share of value*	85 760	85.3%	147 868	94.1%	62 108	1.162	1.483	1.724	1.092	1.170	1.277
2203	Beer	14 570	14.5%	36 629	23.3%	22 059	0.976	2.575	2.514	1.046	1.470	1.538
2309	Animal feed	17 056	17.0%	34 769	22.1%	17 714	1.099	1.855	2.039	0.932	1.197	1.116
0407	Birds' eggs	21 308	21.2%	26 204	16.7%	4 896	0.969	1.269	1.230	1.194	0.949	1.133
1207	Other oil seeds and oleaginous fruits	11 618	11.6%	18 193	11.6%	6 574	1.700	0.921	1.566	1.684	0.927	1.562
2208	Spirits, liqueurs and other spirituous, beverages	3 596	3.6%	5 708	3.6%	2 112	1.099	1.444	1.587	0.990	1.113	1.102
1905	Pastry, cakes, biscuits and other bakers'wares	2 016	2.0%	5 330	3.4%	3 313	1.218	2.170	2.643	0.741	2.644	1.959
2106	Reparations not elsewhere specified or included	3 723	3.7%	5 088	3.2%	1 365	1.433	0.954	1.367	0.687	1.805	1.241
1704	Sugar confectionery (including white chocolate)	3 684	3.7%	3 847	2.4%	163	1.258	0.830	1.044	1.151	0.937	1.078
1210	Hop cones	2 778	2.8%	3 832	2.4%	1 054	1.360	1.014	1.379	1.112	0.765	0.851
1302	Vegetable saps and extracts	1 564	1.6%	3 689	2.3%	2 125	1.528	1.544	2.359	0.966	1.777	1.717
1107	Malt; whether or not roasted	3 525	3.5%	2 925	1.9%	-600	0.962	0.862	0.830	1.039	0.862	0.896
2202	Waters mineral and aerated	323	0.3%	1 656	1.1%	1 333	1.180	4.348	5.129	1.166	2.439	2.844
- other	*17 main goods*	11 034	0.3%	7 063	1.1%	-3 972	1.064	0.601	0.640	1.112	0.883	0.982

Source: own elaboration of the FCSR data (2019), using formulas (1)-(10).

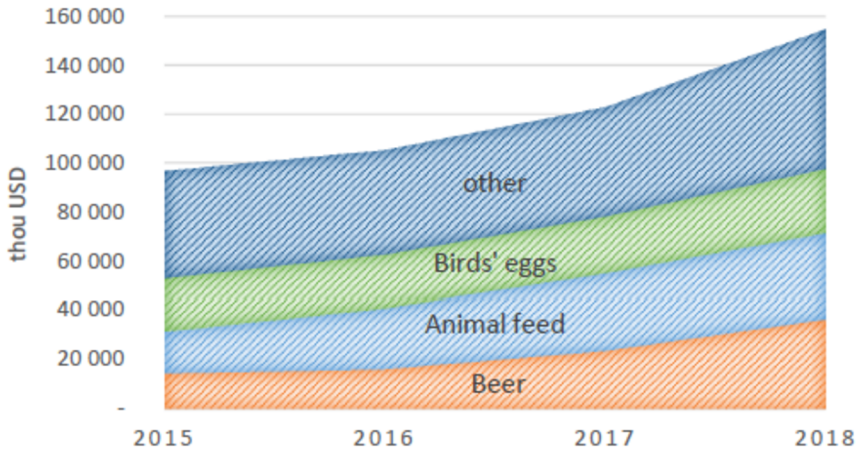


Figure 2. Czech APF in the Russian market: The top three products
Source: own elaboration of the FCSR data (2019).

Table 3. The Russian birds' eggs market: main supplies from non-CIS countries

Groups of countries, countries	thous, USD	Price, USD/kg	Share (vol.)	thous, USD	Price, USD/kg	Share (vol.)
	2017			2018		
	0407 Birds' eggs					
non-CIS	178 561.3	5.28	100.0%	214 658.4	5.59	100.0%
NL	49 055.9	3.94	36.8%	60 308.6	4.28	36.7%
DE	33 516.4	5.43	18.3%	39 028.3	5.89	17.2%
CZ	23 127.1	3.44	19.9%	26 203.6	4.10	16.6%
FR	26 828.3	12.17	6.5%	23 031.8	13.17	4.6%
Other	46 033.6	7.38	18.5%	66 086.1	6.90	24.9%

NL – Netherlands; DE – Germany; CZ – Czech Republic; FR – France.
Source: own elaboration of the FCSR data (2019).

In general, the prospects for growth in the supply of Czech animal feed on the Russian market are not disturbing. Czech producers use modern technology for the manufacture of animal feed, up to the premium segment. These products are in demand and have no Russian counterparts that can satisfy domestic demand.

The first place takes the leader of the APF trade – Czech beer – whose supplies value for 2015-2018 generally rose 2.5 times, with an increase in natural volumes of 2.6 times and a slight decrease in prices (by 2%). We note that in 2018 an average price increase of 5% was recorded with a good increase in natural supplies (1.5 times). The indicated quality of dynamics (all indices are more than one) indicates a steady increase in the competitive- ness of Czech beer in the Russian market.

Russian statistics on beer imports from non-CIS countries recorded the Czech Repub- lic's second place in this market with a share of natural supplies in 2018 of 16%. The first and third places were occupied by Germany and Belgium (44% and 9% respectively). As Table 5 shows, the average price of beer from non-CIS countries in 2018 decreased by 4 cents to 1.05 USD/L, including German and Belgian reduction of beer prices by 6 cents, respectively, to 0.97 USD/L and 9 cents to 1.3 USD/L.

Table 4. The Russian market of animal feed: main deliveries from non-CIS countries

Groups of countries, countries	thous, USD	Price, USD/kg	Share (vol.)	thous, USD	Price, USD/kg	Share (vol.)
	2017			2018		
	2203 Beer made from malt					
non-CIS	167 629.6	1.09	100.0%	267 572.7	1.05	100.0%
DE	64 550.6	1.03	40.9%	108 639.3	0.97	44.1%
CZ	23 814.3	0.88	17.6%	36 629.1	0.92	15.6%
BE	20 763.4	1.39	9.7%	30 479.1	1.30	9.2%
LT	5 513.1	0.69	5.2%	10 787.1	0.70	6.0%
GB	10 127.5	1.36	4.8%	15 202.0	1.41	4.2%
Other	42 860.7	1.28	21.7%	65 836.1	1.25	20.8%

FR – France; DE – Germany; IT – Italy; NL – Niderlands; DK – Denmark; CN – China; CZ – Czech Republic; NO – Norway.
Source: own elaboration of the FCSR data (2019).

Table 5. Russian beer market: main deliveries from non-CIS countries

Groups of countries, countries	thous, USD	Price, USD/kg	Share (vol.)	thous, USD	Price, USD/kg	Share (vol.)
	2017			2018		
	2309 Animal feed					
non-CIS	686 911.1	1.83	100.0%	727 080.4	1.99	100.0%
FR	100 495.2	1.99	13.5%	103 758.2	2.28	12.5%
DE	76 989.7	1.71	12.0%	66 319.5	2.02	9.0%
IT	53 292.2	1.68	8.4%	56 169.0	1.89	8.2%
NL	56 491.0	1.94	7.7%	52 222.3	1.98	7.2%
DK	41 987.7	1.43	7.8%	42 185.7	1.58	7.3%
CN	26 658.4	1.11	6.4%	35 396.0	1.47	6.6%
CZ	31 160.1	1.88	4.4%	34 769.1	1.75	5.4%
NO	8 432.3	1.43	1.6%	34 640.7	1.46	6.5%
Other	291 404.5	2.04	38.1%	301 619.9	2.22	37.3%

DE – Germany; CZ – Czech Republic; BE – Belgium; LT – Lithuania; GB – Great Britain.
Source: own elaboration of the FCSR data (2019).

At the same time, the price of Czech beer grew by 4 cents to 0.92 USD/L. As a result, the price gap between Czech and German beer was reduced to 5 cents (in 2017, it equalled 15 cents), which is quite risky and does not correspond to the current dynamics and price structure in the beer market.

According to our estimates, the demand for original Czech beer in the Russian market will continue a growth tendency in both the number of deliveries and prices, since the closest competitors from non-CIS countries still have a price gap for Czech beer. Moreover, it is possible to recommend the supply expansion of premium Czech beer. Judging by the prices for German and Belgian beer, the Russian market is ready to pay more for high- quality original beer brewed and bottled in the Czech Republic.

Furthermore, for group 2203 (beer) the calculations show that the coefficient of devi- ation of value indicators of mirror data to be higher than permissible values: 1.17 and 1.13 in 2017 and 2018, respectively, instead of the average norm of 1.05. Since beer tops the list of main products (see Table 2), we continued to analyse mirror statistics to discover the possible reasons for this asymmetry.

The Analysis of the Asymmetry of Mirror Data by Quantity on the Example of Beer.

The Czech Republic is proud of its national drink, and Czech beer is famous around the world. Moreover, since January 2008, "Czech beer" is a protected designation of the European Union (PGI; protected geographical indication). This mark is considered to be intellectual property and is protected by the EU law in order to preserve the good name and quality of beer produced in the Czech Republic. Moreover, the entry of the designa- tion "Czech beer" in the EU registry provides an opportunity to protect the traditions of Czech brewing and production technology, not to mention prevent the emergence of fakes that breweries could sell as Czech beer and, thereby, abuse the unique qualities of the original product (CAFIA, 2019).

According to the EU protected designation, "Czech beer cannot be considered a prod- uct made in the Czech Republic in an unconventional way or produced in the traditional way, but abroad" (Czech beer, 2008). As explained by the Czech Ministry of Agriculture regarding the PGI designation, "the purpose of certification was to clearly identify the spe- cifics of the product under the name "Czech beer". Excluded were drinks made according to the traditional recipe, but not in the Czech Republic, as well as drinks made in the Czech Republic without following the classic recipe" (Our brand, 2009).

Let us analyse the data of mirror statistics for beer. Obviously, when comparing mirror flows, the norm is considered to be an almost complete coincidence of the physical vol- umes of supplies; a slight difference may be due to possible losses during transportation.

A comparison of Czech exports to Russia (Czech statistics) and Russian imports from the Czech Republic (Russian statistics) on beer in physical terms (in litres) revealed by the following results (Table 6).

Table 6. Mirror comparison of Czech beer data (in litres)

Commodity flows	*2015*	*2017*	*2018*
Russian import from the Czech Republic	15 437 391	27 061 624	39 750 351
Czech export to Russia	15 226 590	24 216 116	37 434 856
Import / Export	101%	112%	106%
Import - Export	210 801	2 845 508	2 315 495

Source: own elaboration of the UN COMTRADE data (2019).

As follows from Table 6, the import of Czech beer to Russia from the Czech Republic was higher than the Czech export of these volumes to the Russian market: in 2015, 2017, and 2018 by 1%, 12%, and 6%, respectively. This unnatural asymmetry of the data indicates that along with the original Czech beer from the Czech Republic, "Czech beer" was also imported to the Russian market from other countries, and the amount of this beer is growing year to year. Over the past two years, the volume of supplies of "Czech beer" not from the Czech Republic generally exceeded the mark of 2 million litres per year and fixed at this level.

Deliveries of goods from one country to another through other countries – including for sale – are not prohibited and are called re-exports. In the final country, according to the methodology of customs statistics and the rule of the country of origin, these goods are attributed to imports from the first country; in our case, Russian customs refer the volumes of beer re-export to imports from the Czech Republic to the Russian Federation. We do not question the figures of Russian statistics on beer, since these figures are repeatedly checked by the customs and tax authorities of the Russian Federation in the process of calculating customs duties, excise tax, and VAT. Czech statistics do not see these volumes. From this we can conclude that the volume of Czech beer exports to Russia is underestimated in Czech statistics by at least 2 million litres due to the neglect of re-export.

Marketing Strategies for Expanding International Sales at Special Market Prices and Mirror Asymmetry.

It is known that re-export often occurs due to the fault of the manufacturer itself, as a result of the implementation of a regional marketing strategy with a special reduction in prices to expand sales and consolidate in the new market; in our case, one of the EU coun- tries. A future re-exporter buys this product and exports it abroad (in our case, to Russia). At the same time, the manufacturer-supplier of goods at a special price may not even know about the existence of a re-exporter. The manufacturer-supplier will report on the successful implementation of the strategy and expand sales in the regional market (EU country), while the re-exporter will also expand his business and be proud of his personal sales success; in our case, in the Russian market. As a result, it is precisely on the Russian market that two sellers of the same product compete, while a re-exporter has more op- portunities to lower prices on this market than the original manufacturer. It is practically impossible to counteract such unfair competition, since the re-exporter legally acquired the goods and legally supplies them for export. There is only one exception: if a beer has an Intellectual Property (IP) marking – registered trademark, including the one protected in the EU by the PGI designation or similar – it is equivalent to a trademark in the legislative area. Thus, in

the absence of permission from the copyright holder, re-export turns into parallel imports, the counteractions of which are quite well known, including in judicial practice. In this case, the copyright holder may hold the seller liable for the sale of goods without his consent to the export ban and significant fines (Losev, 2019).

Therefore, the marketing services of Czech beer producers in the Czech Republic must take into account the indicated features of the Czech beer trade with IP-marking when preparing plans (marketing strategies) for expanding regional sales with a special price for the product.

For beer without an IP marking, low prices can provoke the organisation of re-export of goods, including with unfair competition in the foreign market of the same product. In this case, it is almost impossible to identify a re-exporter and oppose re-export, which is what Czech producers must take into account up to and including refusal of such trading schemes. For beer with an IP marking, the actions of the re-exporter are unlawful – they violate intellectual property rights – and can be classified as the organisation parallel im- port by unauthorised copyright holders. Here, re-export can be suppressed by customs and prohibited by the court. On the Russian market for beer in particular, the IP marking (PGI Czech beer) should be included in the register of intellectual property of the FCS of the Russian Federation. So far as we know, this is not the case, and PGI Czech beer intel- lectual property rights are not protected on the Russian market.

At the same time, large international companies provide legal protection for parallel imports through registered brands and trademarks. For example, in Russia, lawsuits by

Heineken (the owner of the Krušovice brand) were satisfied against parallel importers of Krušovice beer to the Russian market with compensation for losses and the prohibition of importing beer without permission from the Heineken copyright holder (Parallel import, 2013). However, small Czech breweries that produce PGI-labelled beer should also be able to protect their Intellectual Property (IP) when exporting to the Russian market. So far, PGI marking as an IP-object for markets outside of the EU remains a decoration element.

The Czech state should not remain aloof from the problems of national business and pro- vide assistance in registering and maintaining the PGI-marking Czech beer on the Russian mar- ket. The Czech state should work to activate the intellectual property factor when exporting Czech PGI beer to the market of the EAEU countries (Russia, Belarus, Armenia, Kazakhstan, and Kyrgyzstan), so that the Czech national world-quality product can earn more revenue for both the state and producers-copyright

holders of the PGI-marking, through which the tradi- tions and technologies of unique Czech brewing are legally protected and supported.

Thus, we achieved the goal of the study. We showed the possibilities of using mirror statistics to identify export problems of APF to the Russian market. Within the framework of the study, we proved the methodological acceptability of using mirror statistics for re- search tasks and conducted an analysis of the supply of the most important Czech APF products to Russian market. We developed recommendations for expanding their sales taking into account prices for similar products imported to the Russian market from other countries were developed. Moreover, the study identified a new problem of beer (trade leader) re-export at the macro level, investigated its root causes, and prepared recom- mendations for Czech statistics: the need to adjust statistics and increase beer export vol- umes to Russia by taking re-export into account. Moreover, we formulated recommenda- tions to expand trade in the Russian market for business and trade policies based on the reinforcement of the role of the intellectual property factor.

The conducted research is original. Prior to this research, there were no studies that would use mirror statistics as an additional database and tool for identifying export prob- lems unobserved by national statistics.

CONCLUSIONS

The analysis of a country's exports is traditionally based on national statistics. However, the analysis of the same stream on the basis of the host country's mirror statistics in the form of its imports is no less important.

In mirror statistics, the export of goods from one country to another should theoreti- cally be equal to the import of goods to the latter country from the former one, and vice versa. However, the mentioned trade volumes usually differ in practice. The asymmetry of the data is due to the difference in prices of the recorded flows. As is known, according to the customs statistics methodology, the value of exporting goods of country A is repre- sented in FOB prices, while that of imported goods – at CIF prices, which additionally in- cludes the costs of insurance and transportation of goods. Moreover, the asymmetry of mirror data can also be associated with various errors in determining the customs value, masking shadow operations and capital flight.

Currently, the general view of expert statisticians on the accuracy of data collected by customs offices is that import data are more reliable than export data, because cus- toms services are more serious about recording imported goods for the purpose of tariff revenue collection, taxes, etc. This fact was confirmed by us on the

example of the im- port of Czech APF goods to the Russian market. The mirror comparison of APF trade data showed a generally normal situation with an average valuation excess of CIF prices over FOB by an average of 6%, which is comparable to the ratio of 1.0588 of the Central Bank of Russia for calculating the balance of payments for non-CIS countries. Based on the results, we concluded that – taking into account the methodologically permissible dif- ferences in the mirror data – statistics on Russian imports can be used to analyse the export of Czech APF goods to the Russian market.

To analyse the supply of Czech APF to the Russian market, we proposed algorithms for aggregating and disaggregating FT-indices based on the Laspeyres formula. The aggrega- tion algorithm allows us to calculate the total FT-index, including by the group of goods. The disaggregation algorithm allows for the isolation of additional groups of goods and the calculation of group indices by recounting the remaining aggregated indices without in- volving goods outside of the selected group.

For the 2015-2018 interval, using the database of the Federal Customs Service of the Russian Federation, we compiled a list of 29 main products (sample depth 99%) and their FT-indices, including the indices of the 12 main products (94%) with the highest weight and the top three (62 % of trade).

The analysis showed that the Czech Republic in APF trade in 2018 could achieve and overcome the historical maximum of trade in 2014; i.e. after the introduction of Russian countersanctions on agricultural products in August 2014. The basis of growth was formed by the upward (increasing) dynamics of supply growth: FT-indices of the group of 12 main goods were more than one, i.e. the increase in the value of supplies of the group was ensured by a simultaneous increase in prices and natural supplies. Herewith, the top three in four years provided more than 70% of the increase in the value of APF supplies to the Russian market.

For the three leaders, we conducted a market analysis of similar goods supplied from non-CIS countries and formulated recommendations on trade development. Thus, for po- sition 0407 (birds' eggs), we noted that it holds one of the lowest prices among competi- tors in the market and recommended the further increase of trade volumes on the basis of rising prices that are below the average market price. The dynamics of supply growth at position 2309 (animal feed) is not a concern. However, the analysis showed that prices for all suppliers are rising, while prices for Czech products in 2018 fell below the average mar- ket level. Therefore, we recommended to increase trade volumes on the basis of rising prices and expanding the supply of premium feeds in demand on the Russian market, the production technologies of which have been mastered in the Czech Republic. For position 2203 (beer), the quality of supply growth

(all indices are greater than one) indicates a growing demand for products. The price of Czech beer is lower than the market average and the prices of the closest competitors from Germany and Belgium, so they can be in- creased, since the Russian consumer is willing to pay more for the original Czech beer.

In conclusion, mirror data comparison of beer in litres showed that beer exports from the Czech Republic were significantly lower than Czech imports registered by Russian cus- toms. First of all, this difference in mirror data reveals that Czech beer exports to Russia in the Czech statistics are underestimated by at least 2 million litres, due to the neglect of re- exports (in volumes in litres, re-export flow is comparable to beer trade in countries such as

Finland, Netherlands, Austria, or Poland). These deliveries pose a real threat of unfair com- petition on the Russian market for the same product at different prices from a direct supplier and the re-exporter who legally bought the product on the market of one of the EU countries with a special reduced price. Czech companies can only protect themselves from such re- export schemes if the beer has an IP-marking registered on the Russian market.

For business, we recommend to form special prices for external markets taking an unfair competition into account, while developing marketing strategies. In the case of uncontrolled sales strategies, there is a high risk of overall losses due to the re-export of cheaper beer. If there is a registered intellectual property trademark (PGI-mark), one should apply the possi- bility of legislative restriction and prohibition of deliveries to the Russian market due to the lack of permission of the manufacturer-holder of the intellectual property trademark.

For trade policy, we deem necessary state-level action aiming to enhance the intellec- tual property factor in the production and export of Czech beer – assistance in registering trademarks and PGI-marking Czech beer on the Russian market – so that Czech beer pro- ducers who use traditional technologies can get fair profit for the quality of their goods and have the opportunity to defend themselves against unfair competition in export.

In our opinion, an analysis of the post-sanctioned development of APF trade in the countries of the Visegrad Group – in which Poland occupies the first place in terms of trade volume – could be an interesting area for future research.

The texts of these articles were used below in this stage. In addition, additional analysis was carried out using up-to-date data for 2019 to confirm the correctness of the authors' assumptions regarding trading trends. In general, the tasks of the final analysis of stage 4 are given below (Fig. 4.13).

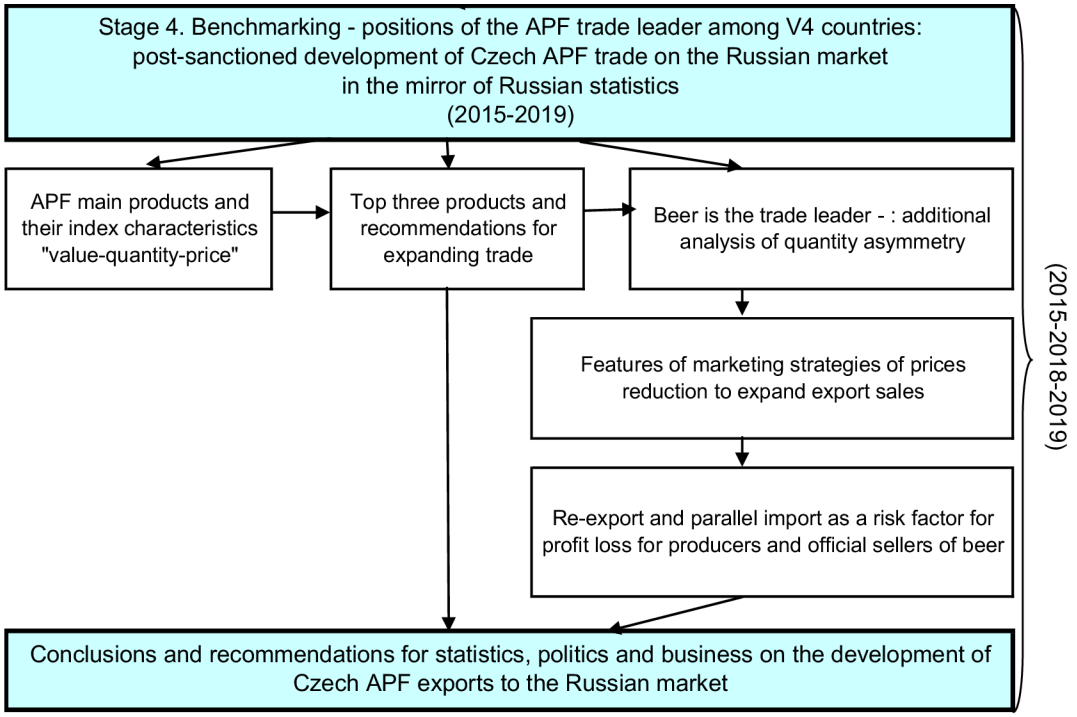


Figure 4.13 Stage 4. Outline of presentation of results
Source: author, fragment of figure 4.1

4.4.1 Czech APF trade on the Russian market: dynamics and main goods

According to the statistics (Fig. 4.14), Russian APF import from the Czech Republic in 2018 reached the maximum pre-crisis level (before the introduction of Russian counter-sanctions for the EU countries in August 2014) and exceeded it.

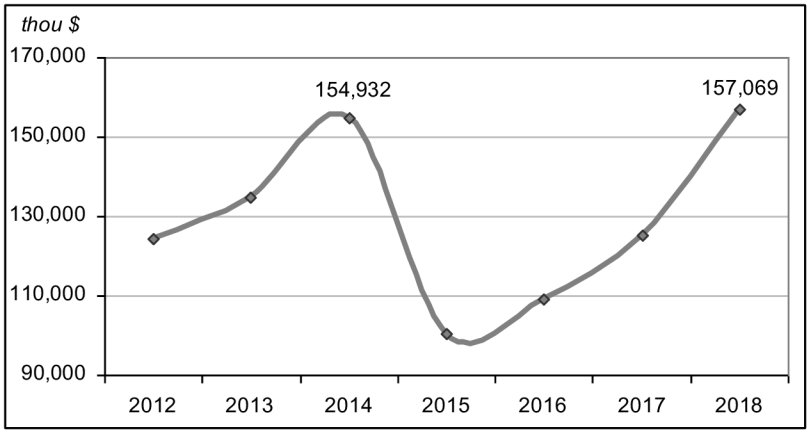


Fig. 4.14. Russian APF import from the Czech Republic
Source: own figure for (Yurik & Pushkin, 2019) based on the data of the FCSR, 2019

In 2019 (Fig. 4.14.1), the growth in the volume of Czech imports of APF to Russia remained, although the growth rate slowed down.

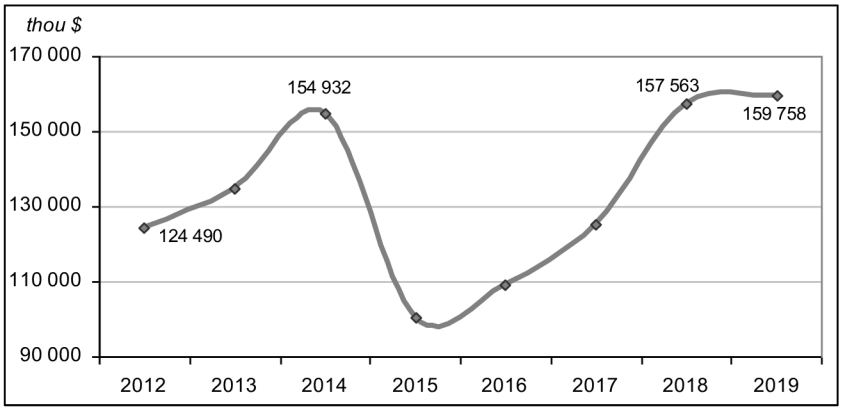


Fig. 4.14.1 Russian APF import from the Czech Republic (2012-2019)
Source: own data based on Table 4.5.1 and FCSR database, 2020-2021

We will analyze the dynamics of the commodity structure of Czech APF supplies to the Russian market in 2015-2018 after the introduction of Russian counter-sanctions.

To analyze the trends and patterns of Czech APF exports to the Russian market, the interval 2015-2018 was chosen (after the introduction of Russian sanctions against EU countries on agricultural products). Based on the data of the Federal Customs

Service of the Russian Federation, we have compiled a list of imports of Czech APF goods to Russia, which includes 29 products (sample depth 98.6% for 2018). Using the aggregation method described above, total indices were calculated for 29 main goods, including the group of 12 goods with the largest share of value, as well as for the other goods (Tab. 4.11).

As follows from Tab. 4.11, the center of trade interests of Czech APF exports to Russia is concentrated in the group of the main 12 goods (94% of the total in 2018). Deliveries of these goods had an upward growth dynamics (all indices are more than one) and for 2015-2018, on average, they increased in value by 1.7 times (by $ 62 million) based on rising prices and physical volumes by 16% and 48%.

Tab. 4.11. Russian APF import from the Czech Republic: set of main goods with the largest share of value

HS		2015		2018		2018-2015 thou $	Indices 2018/2015			Indices 2018/2017		
		Value, thou $	Share	Value, thou $	Share		price	volume	value	price	volume	value
01-24 Agricultural products and foodstuffs		100,532	100%	157,069	100%	56,537			1.562			1.252
29 main goods		96794	96.3%	154930	98.6%	58,136	1.151	1.390	1.601	1.093	1.153	1.260
- 12 main goods with the largest share of value		85760	85.3%	147868	94.1%	62108	1.162	1.483	1.724	1.092	1.170	1.277
2203	Beer	14570	14.5%	36629	23.3%	22059	0.976	2.575	2.514	1.046	1.470	1.538
2309	Animal feed	17056	17.0%	34769	22.1%	17714	1.099	1.855	2.039	0.932	1.197	1.116
0407	Birds'eggs	21308	21.2%	26204	16.7%	4896	0.969	1.269	1.230	1.194	0.949	1.133
1207	Other oil seeds and oleaginous fruits	11618	11.6%	18193	11.6%	6574	1.700	0.921	1.566	1.684	0.927	1.562
2208	Spirits, liqueurs and other spirituous, beverages	3596	3.6%	5708	3.6%	2112	1.099	1.444	1.587	0.990	1.113	1.102
1905	Pastry, cakes, biscuits and other bakers'wares	2016	2.0%	5330	3.4%	3313	1.218	2.170	2.643	0.741	2.644	1.959
2106	Reparations not elsewhere specified or included	3723	3.7%	5088	3.2%	1365	1.433	0.954	1.367	0.687	1.805	1.241
1704	Sugar confectionery (including white chocolate)	3684	3.7%	3847	2.4%	163	1.258	0.830	1.044	1.151	0.937	1.078
1210	Hop cones	2778	2.8%	3832	2.4%	1054	1.360	1.014	1.379	1.112	0.765	0.851
1302	Vegetable saps and extracts	1564	1.6%	3689	2.3%	2125	1.528	1.544	2.359	0.966	1.777	1.717
1107	Malt; whether or not roasted	3525	3.5%	2925	1.9%	-600	0.962	0.862	0.830	1.039	0.862	0.896
2202	Waters mineral and aerated	323	0.3%	1,656	1.1%	1,333	1.180	4.348	5.129	1.166	2.439	2.844
- other *17 main goods*		11034	0.3%	7063	1.1%	-3972	1.064	0.601	0.640	1.112	0.883	0.982

Source: own calculations on the basis of data of the FCSR, 2019, using formulas (1)-(10)

Tab. 4.11.1 Russian APF import from the Czech Republic: set of main goods with the largest share of value with 2019

HS		2018		2019		2019-2018, thou $	Indices 2019/2018		
		Value, thou $	Share	Value, thou $	Share		price	quantity	value
01-24	Agricultural products and foodstuffs	157 563	100%	159 758	100%	2 195			1,014
29 main goods		154 930	98,3%	148 522	93,0%	-6 409	0,989	0,970	0,959
- 12 main goods with the largest share of value		147 868	93,8%	141 395	88,5%	-6 473	0,986	0,969	0,956
2203	Beer made from malt	36 629	23,2%	35 090	22,0%	-1 539	0,956	1,002	0,958
2309	Animal feed	34 769	22,1%	36 820	23,0%	2 051	1,110	0,954	1,059
0407	Birds' eggs	26 204	16,6%	29 845	18,7%	3 641	0,974	1,169	1,139
1207	Oil seeds and oleaginous fruits	18 193	11,5%	14 234	8,9%	-3 958	1,114	0,703	0,782
2208	Spirits, liqueurs and other spirituous beverages	5 708	3,6%	1 030	0,6%	-4 679	0,070	2,566	0,180
1905	Bread, pastry, cakes, biscuits	5 330	3,4%	4 667	2,9%	-662	0,853	1,027	0,876
2106	Food preparations	5 088	3,2%	5 536	3,5%	448	1,105	0,985	1,088
1704	Sugar confectionery not containing cocoa	3 847	2,4%	4 267	2,7%	420	0,992	1,118	1,109
1210	Hop cones	3 832	2,4%	2 618	1,6%	-1 215	0,961	0,711	0,683
1302	Vegetable saps and extracts	3 689	2,3%	3 386	2,1%	-302	0,949	0,968	0,918
1107	Malt	2 925	1,9%	2 874	1,8%	-51	1,074	0,915	0,982
2202	Waters mineral and aerated waters	1 656	1,1%	1 030	0,6%	-626	1,051	0,591	0,622
	- Other (17 goods)	7 063	4,5%	7 126	4,5%	64	1,038	0,972	1,009

Source: own calculations on the basis of data of the FCSR, 2020

4.4.2 Top 3 Czech APF goods on the Russian market

It should be noted that almost 3/4 of the growth in exports was achieved due to the three leading products - beer, animal feed, birds' eggs. By 2018, their share amounted to almost 2/3 of the export volume (Fig. 4.14).

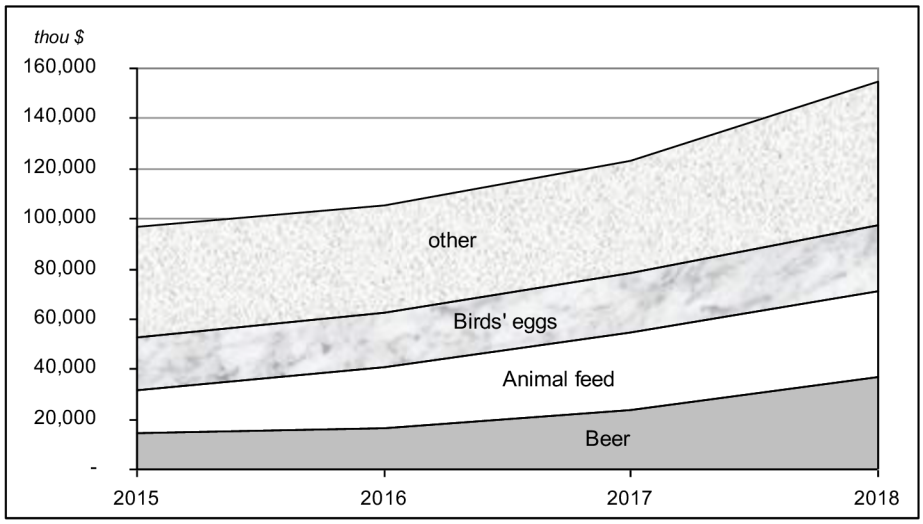


Fig. 4.15. Czech APF in the Russian market: the top 3 products
Source: own figure based on the data of the FCSR, 2019

Asymmetry. Before proceeding to the analysis of each product from the top three, let's comment on the asymmetry indicators, i.e. discrepancies between Czech export statistics and Russian import statistics for the products of the top three.

Above in table 4.1 and in the text of paragraph 4.1, the author noted that the CIF / FOB ratio for all APF goods of commodity groups 01-24 falls into the range of admissibility, i.e. the values of deviations of mirror flows of Czech exports and Russian imports of APF do not exceed 10%. For the top three products and for each product, the author calculated the values of the CIF / FOB coefficients and placed them in tables 4.12–4.12.1.

Table 4.12 Indicators of asymmetry of mirror statistics for goods 2015-2018

HS		CIF / FOB				Share			
		2015	*2016*	*2017*	*2018*	*2015*	*2016*	*2017*	*2018*
01-24	APF	1,05	1,04	1,09	1,05	100%	100%	100%	100%
	12 Main goods	1,08	1,07	1,10	1,11	85%	89%	92%	94%
	- Top 3	1,00	1,01	1,04	1,04	53%	57%	62%	62%
2203	Beer	1,10	1,06	1,17	1,13	14%	15%	19%	23%
2309	Animal feed	0,90	0,94	0,98	0,97	17%	23%	25%	22%
0407	Birds' eggs	1,04	1,06	1,01	1,02	21%	20%	18%	17%

Source: own calculations on the basis UN Comtrade Database, 2019

Table 4.12.1 Indicators of asymmetry of mirror statistics for goods with 2019

HS		CIF / FOB					Share				
		2015	*2016*	*2017*	*2018*	*2019*	*2015*	*2016*	*2017*	*2018*	*2019*
01-24	APF	1,05		1,10	1,09	1,03	100%	100%	100%	100%	100%
	12 Main goods	1,08	1,07	1,10	1,11	1,07	85%	89%	92%	94%	89%
	- Top 3	1,00	1,01	1,04	1,04	1,03	53%	57%	62%	62%	64%
0407	Birds' eggs	1,04	1,06	1,01	1,02	1,01	14%	15%	19%	23%	19%
2203	Beer	1,10	1,06	1,17	1,13	1,09	17%	23%	25%	22%	22%
2309	Animal feed	0,90	0,94	0,98	0,97	0,98	21%	20%	18%	17%	23%

Source: own calculations on the basis UN Comtrade Database, 2021

From table 4.12 it follows that in general for the top three products, the deviation of mirror data statistics remains within the established standards, although there are some differences for each product.

So, for position 0407 - birds' eggs, the statistical deviations are insignificant (from 1% to 4% with a standard of up to 10%), in contrast to positions 2309 (feed) and 2203 (beer), where the CIF/FOB coefficient went beyond the tolerance interval - in the first case, it was even less than unity over the entire interval, in the second it exceeded the allowable values and was more than 1.1 in 2017-2018. We will comment on these cases of asymmetry below separately for each goods.

For position 2309 - animal feed, apparently, the value of imports is underestimated, although the difference has decreased by 2017-2019, but is still present. Note that the value of the CIF / FOB coefficient is less than one, which means that the value of the goods sent from the Czech Republic is greater than its value at the border with Russia, taking into account transportation costs and insurance. In other words, it

turns out that the goods are delivered at a loss. Usually, one of the reasons for such an underestimation of the cost of imports may be an underestimation of customs payments, which should be checked by the customs authorities of Russia directly with the importers of these products. In addition, a similar situation may arise in case of loss of cargo in transit (shrinkage, etc.). However, an analysis of the asymmetry of physical deliveries shows that for this position, over the past two years (2018-2019), more goods were brought to the Russian market in terms of quantity than Czech statistics show by 71 and 4 tons, respectively (here it is possible to re-export Czech feed to Russia through other countries). However, this increased amount of feed was estimated to be lower than Czech statistics show. At the same time, the corresponding valuation of goods imported into Russia, compared with the Czech statistics, was lower by 980 and 680 thousand dollars, which is not normal. Such a discrepancy in figures confirms the assumption that the customs value of these goods is underestimated to reduce budget payments (import duty 5% of the customs value plus VAT 20%), which should be controlled by Russian customs from importers of goods. We also note that this position 2306 moved to the first place in the list of goods in 2019 after the second place in 2018 (table 4.11.1). Further, for position 2203 - Beer, in the last two years (2017-2018), an excess of permissible deviations is recorded by 17% and 13%, respectively, with a standard of 10%. By 2019, the asymmetry has slightly decreased and fell into the acceptable range. We will continue the study of this situation for beer further in paragraph 4.4.3 with an additional analysis of the asymmetry of natural supplies.

4.4.3 Top 3 Czech APF goods surrounded by similar import goods from other countries in the Russian APF market

Let's consider the top three products in more detail in increasing order of importance.

4.4.3.1 Import subgroup 0407 (bird' eggs)

This group takes 3rd place in the TOP 3. Thus, the *position 0407 – birds' eggs* after 2015 increased sales volumes by 23% with a slight decrease in prices (by 3%) and an increase in natural supplies (by 27%). However, already in 2018, while maintaining the growth in value (by 13%), a noticeable increase in prices (by 19%) was recorded with a decrease in natural supplies (by 4%). However, Russian statistics on imports of these products from other non-CIS countries (Tab. 13) shows that among the four non-CIS countries with a market share of more than 75%, Czech products have the lowest price, despite its growth from 3.44 to 4.10 dollars / kg.

Table. 4.13 The Russian birds' eggs market: main supplies from non-CIS countries

	thous, $	Price, $/kg	Share *(vol.)*	thous, $	Price, $/kg	Share *(vol.)*
	2017			2018		
0407 Birds' eggs						
non-CIS	178561.3	5.28	100%	214658.4	5.59	100%
NL	49055.9	3.94	36.8%	60308.6	4.28	36.7%
DE	33516.4	5.43	18.3%	39028.3	5.89	17.2%
CZ	23127.1	3.44	19.9%	26203.6	4.10	16.6%
FR	26828.3	12.17	6.5%	23031.8	13.17	4.6%
Other	46033.6	7.38	18.5%	66086.1	6.90	24.9%

Source: own calculations on the basis of data of the FCSR, 2019

During the preparation of the dissertation text, data on this position for 2019 appeared, which were placed in the table below:

Table. 4.13.1 The Russian birds' eggs market: main supplies from non-CIS countries (2017- 2019)

	thous, $	Price, $/kg	Share (vol.)	thous, $	Price, $/kg	Share (vol.)	thous, $	Price, $/kg	Share (vol.)
	2017			2018			2019		
0407 Birds' eggs									
non-CIS	178561,3	5,28	100%	214658,4	5,59	100%	256948,2	5,41	100%
NL	49055,9	3,94	36,8%	60308,6	4,28	36,7%	75264,4	4,34	29,3%
DE	33516,4	5,43	18,3%	39028,3	5,89	17,2%	32818,2	5,59	12,8%
CZ	23127,1	3,44	19,9%	26203,6	4,10	16,6%	29844,5	4,00	11,6%
FR	26828,3	12,17	6,5%	23031,8	13,17	4,6%	30464,1	12,49	11,9%
Other	46033,6	7,38	18,5%	66086,1	6,90	24,9%	88557	6,18	34,5%

Source: own calculations on the basis of data of the FCSR, 2020

As follows from supplementary Table 4.13.1, the Czech Republic still has a price for item 0407 Birds' eggs below the market average, as a result of which the Czech Republic surpassed France in terms of the value of deliveries, whose product price was much higher ($ 4 / t against $ 5.59 / t). Note that this fact did not prevent the growth of the value of supplies for this item by 3.6 million dollars.

This means that the prospects for trading in the birds' eggs market for the Czech Republic are stable: the market share is high (second or third place among non-CIS countries), prices are lower than most competitors' ones. In the future, attention should be paid to the increase in natural supplies while prices continue to rise (possibly to the leader level of the Netherlands $ 4.28 / kg and then to the average non-CIS price of $ 5.59 / kg).

As noted above, the asymmetry of mirror data for this position is included in the tolerance interval (up to 10%), which can be seen in Figure 4.16, where the line of import prices is located above export prices (calculated according to Czech statistics of exports to the Russian market), and the positive price gap corresponds to the difference in the coefficients of asymmetry in 1-2 percentage points (table. 4.13.1).

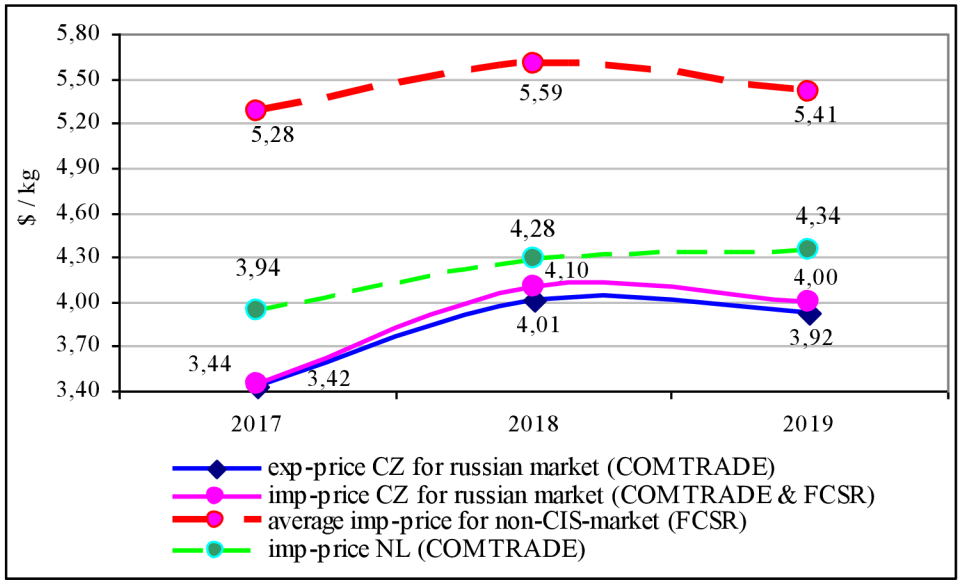


Figure 4.16 Subgroup 0407 (bird eggs): price dynamics in the Russian market
Source: own calculations on the basis of data of the FCSR, COMTRADE, 2020

4.4.3.2 Discussion (0407 Bird' eggs)

Thus, we can conclude that the prospects for trade in the poultry eggs market for the Czech Republic are stable: the market share is high (3-4 place among non-CIS countries), prices are lower than those of most competitors. Here the export price corresponds to the trend of the average price on the market, and also almost repeats the trend of the main competitor - the Netherlands, where prices are closest to the Czech ones.

It should be noted here that, in our opinion, the price in 2019 should not have been reduced, but safely left at the level of 2018, since the Netherlands predictably increased the price in 2019. In the future, attention should be paid to the growth of natural supplies with an increase in prices (possibly up to the level of the Netherlands leader 4.28-4.34 dollars per kg, and then to the average price non-CIS of 5.59-5.41 dollars per kg). At the moment, when choosing a price, you can safely focus on the trend of the average import price of the Netherlands.

4.4.3.3 Import subgroup 2309 (animal feed)

This group takes 2rd place in the TOP 3. Position *2309 - animal feed* increased the trade volume for 2015-2018 by more than 2 times, while the price and natural supplies increased by 10% and in 1.9 times, respectively. Although the price slightly decreased for this position (by 7%) in 2018, the increase in natural supplies by almost 20% ensured an increase in trade volume by 12%. Perhaps, in this case, the assortment is changing towards cheaper and more demanded types of feed. However, this conclusion is not certain.

Tab. 4.14. The Russian market of animal feed: main deliveries from non-CIS countries

	thous, $	Price, $/kg	Share (vol.)	thous, $	Price, $/kg	Share (vol.)
	2017			2018		
2309 Animal feed						
non-CIS	686911.1	1.83	100%	727080.4	1.99	100%
FR	100495.2	1.99	13.5%	103758.2	2.28	12.5%
DE	76989.7	1.71	12.0%	66319.5	2.02	9.0%
IT	53292.2	1.68	8.4%	56169	1.89	8.2%
NL	56491	1.94	7.7%	52222.3	1.98	7.2%
DK	41987.7	1.43	7.8%	42185.7	1.58	7.3%
CN	26658.4	1.11	6.4%	35396	1.47	6.6%
CZ	31160.1	1.88	4.4%	34769.1	1.75	5.4%
NO	8432.3	1.43	1.6%	34640.7	1.46	6.5%
Other	291404.5	2.04	38.1%	301619.9	2.22	37.3%

Source: own calculations on the basis of data of the FCSR, 2019

Russian statistics on imports of animal feed suppliers from non-CIS countries show an increase in average prices from $ 1.83 to $ 1.99 / kg . As follows from Tab. 4.14 in 2018, feed prices rose in all countries of the list, except for the Czech Republic. And this is a hint to Czech marketers from the Russian market – it is possible and necessary to increase the price up to the level average for the market ($ 1.99 / kg) and even higher.

In general, the prospects for growth in the supply of Czech animal feed on the Russian market are not disturbing. Czech producers use modern technology for the

manufacture of animal feed, up to the premium segment. These products are in demand and have no Russian counterparts that can satisfy domestic demand.

During the writing of the dissertation text, statistics for 2019 appeared, which were included in an additional table below:

Tab. 4.14.1 The Russian market of animal feed: main deliveries from non-CIS countries 2017-2019

	thous, $	Price, $/kg	Share (vol.)	thous, $	Price, $/kg	Share (vol.)	thous, $	Price, $/kg	Share (vol.)
	2017			2018			2019		
2309 Animal feed									
non-CIS	686911,1	1,83	100%	727080,4	1,99	100%	736986,3	1,98	100%
FR	100495,2	1,99	13,5%	103758,2	2,28	12,5%	106039,6	2,22	14,4%
DE	76989,7	1,71	12,0%	66319,5	2,02	9,0%	57949,2	2,08	7,9%
IT	53292,2	1,68	8,4%	56169	1,89	8,2%	58190,7	1,90	7,9%
NL	56491	1,94	7,7%	52222,3	1,98	7,2%	48568,7	1,92	6,6%
DK	41987,7	1,43	7,8%	42185,7	1,58	7,3%	38812,4	1,43	5,3%
CN	26658,4	1,11	6,4%	35396	1,47	6,6%	37012,1	1,51	5,0%
CZ	31160,1	1,88	4,4%	34769,1	1,75	5,4%	36820,3	1,94	5,0%
NO	8432,3	1,43	1,6%	34640,7	1,46	6,5%	42535,2	1,43	5,8%
Other	291404,5	2,04	38,1%	301619,9	2,22	37,3%	311058,1	2,20	42,2%

Source: own calculations on the basis of data of the FCSR, 2020

It follows from additional table 4.14.1 that, as recommended by the author, the price for this product in 2019 was increased to $ 1.94 / kg (an increase of 11%) with a decrease in the physical volume of supplies by 5%, while due to increase in price, the value of supplies increased by 2 million dollars or 5%. At the same time, author note that among the 8 leading sales countries presented in the table, the Czech Republic is in third place in terms of price, which requires careful monitoring of prices and a smoother price growth. Although, if the supply of demanded products of the elite segment expands, then such an increase in prices will be justified.

4.4.3.4 Discussion (2309 Animal feed)

Comments on asymmetry. At the end of the analysis, we recall that the mirror statistics of supplies of subgroup 2309 (animal feed), as follows from Table 4.12-4.12.1, has an unnatural asymmetry when the deviations of the CIF prices from the FOB are

fixed at a level less than one This means that the value of goods sent from the Czech Republic goods more than their cost at the border with Russia, taking into account transport costs and insurance, which is unnatural. Figure 4.17 shows that the Czech import price line is below export prices.

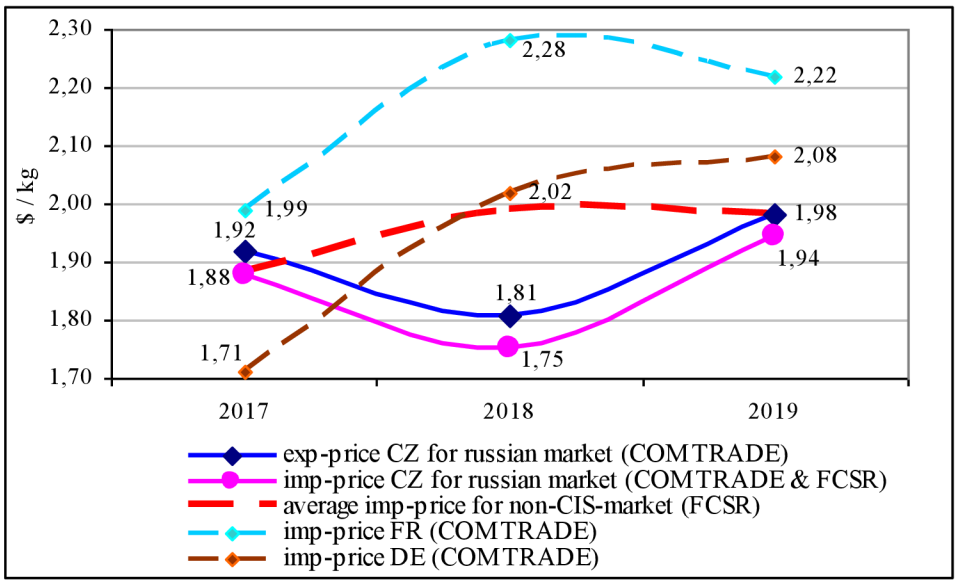


Figure 4.17 Subgroup 2309 (animal feed): price dynamics in the Russian market
Source: own calculations on the basis of data of the FCSR, COMTRADE, 2020

A similar situation can arise in case of loss of cargo along the way (shrinkage, transport accidents, etc.). In addition, one of the reasons for such a decrease in the valuation of imports in dollars may be the underestimation of the customs value when declaring goods at the Russian border in order to reduce the amount of customs payments to the budget. Such actions in any country are interpreted as tax evasion and are severely punished by law. In order to identify possible variants of the reasons, we additionally checked the asymmetry (data deviations) of Czech and Russian statistics on natural volumes of supplies. As a result of the analysis, we found that for this subgroup, over the past two years (2018-2019), more goods were imported to the Russian market in terms of quantity than the Czech statistics show (by 71 and 4 tons, respectively), i.e. during transportation, the weight of the cargo increased, and did not decrease, as it

should be in the case of losses. This means that our data mismatch is not related to losses.

Having excluded losses, it can be argued that the indicated discrepancy of figures (the volume of the value falls - the quantity grows) is associated with a massive (noticeably at the macro level in statistics) underestimation of the customs value of these goods by suppliers in order to reduce their budgetary payments (import duty 5% of the customs value plus VAT 20%). This has been going on for several years and sooner or later Russian customs will be interested in this discrepancy, especially since the subgroup 2309 (animal feed) moved in 2019 to the first line of the list of main APF products supplied to the Russian market.

Recommendations. Further, we will clarify our recommendations for the development of trade in the subgroup, taking into account the analysis performed. Figure 4.17 shows that the Czech import price line is below the export price line, which, as we have shown above, is abnormal. In addition, one can notice a major mistake in the selection of Czech export prices for these products in 2018, when the trends in the average market price and prices of the main competitors in France and Germany (with comparable prices and product quality) were ignored and the Czech price was unjustifiably sharply reduced. In 2019, the situation was normalized and the export price returned to the line of the average market price.

Recommendations for business: when choosing an export price (including in the case of asymmetry), it is necessary to be guided not by its last year value, but to proceed from the trends in the average market price, taking into account the prices of goods from other countries.

4.4.3.5 Import subgroup 2203 (Beer)

This group takes 1rd place in the TOP 3. The leader of the APF trade is Czech beer. For 2015-2018, in general, the value of beer supplies rose 2.5 times with an increase in natural volumes of 2.6 times and a slight decrease in prices (by 2%). We

note that in 2018, an average price increase of 5% was recorded with a good increase in natural supplies (1.5 times). The indicated quality of dynamics (all indices are more than one) indicates a steady increase in the competitiveness of Czech beer in the Russian market.

Russian statistics on beer imports from non-CIS countries (Tab. 4.15) recorded the Czech Republic's second place in this market with a share of natural supplies in 2018 of 16%. The first and third places were occupied by Germany and Belgium (44% and 9% respectively). As follows from tab. 5, the average price of beer from non-CIS countries in 2018 decreased by 4 cents to $ 1.05 / L, including German and Belgian beer reduced prices by 6 cents, respectively, to $ 0.97 / L and 9 cents to $ 1.3 / L.

Tab. 4.15. Russian beer market: main deliveries from non-CIS countries

	thous, $	Price, $/L	Share *(vol.)*	thous, $	Price, $/L	Share *(vol.)*
	2017			2018		
2203 Beer made from malt						
non-CIS	167629.6	1.09	100%	267572.7	1.05	100%
DE	64550.6	1.03	40.9%	108639.3	0.97	44.1%
CZ	23814.3	0.88	17.6%	36629.1	0.92	15.6%
BE	20763.4	1.39	9.7%	30479.1	1.30	9.2%
LT	5513.1	0.69	5.2%	10787.1	0.70	6.0%
GB	10127.5	1.36	4.8%	15202	1.41	4.2%
Other	42860.7	1.28	21.7%	65836.1	1.25	20.8%

Source: own calculations on the basis of data of the FCSR, 2019

At the same time, the price of Czech beer grew by 4 cents to $ 0.92 / L. As a result, the price gap between Czech and German beer was reduced to 5 cents (in 2017 it was equal to 15 cents), which is quite risky and does not correspond to the current dynamics and price structure in the beer market.

According to our estimates, the demand for original Czech beer in the Russian market will continue with a tendency of growth in both the number of deliveries and prices, since the closest competitors from non-CIS countries still have a price gap for Czech beer. In addition, it is possible to recommend the expansion of the supply of

premium Czech beer. Judging by the prices for German and Belgian beer, the Russian market is ready to pay more for high-quality original beer brewed and bottled in the Czech Republic.

These recommendations were formulated by author based on the analysis of the beer market 2017-2018. During the preparation of the thesis text, data for 2019 appeared (included in the updated table 4.15.1). Let's discuss the situation on the Russian market of imported beer.

Tab. 4.15. 1 Russian beer market: main deliveries from non-CIS countries 2017-2019

	L	thous, $	Price, $/L	Share (vol.)	L	thous, $	Price, $/L	Share (vol.)	L	thous, $	Price, $/L	Share (vol.)
	2017				2018				2019			
2203 Beer made from malt												
non-CIS	153835151	167629,6	1.09	100%	254529618	267572,7	1,05	100%	308394733	305202,2	0,99	100%
DE	62968072	64550,6	1.03	40,9%	112264727	108639,3	0,97	44,1%	139052516	125177,4	0,90	41,0%
CZ	27037780	23814,3	0.88	17,6%	39750351	36629,1	0,92	15,6%	45333500	35090,3	0,77	11,5%
BE	14941712	20763,4	1.39	9,7%	23505992	30479,1	1,30	9,2%	21844730	31932,5	1,46	10,5%
LT	8048022	5513,1	0.69	5,2%	15338508	10787,1	0,70	6,0%	26796658	16981,2	0,63	5,6%
GB	7456429	10127,5	1.36	4,8%	10804606	15202	1,41	4,2%	11423383	15461,6	1,35	5,1%
Other	33383136	42860,7	1,28	21,7%	52865434	65836,1	1,25	20,8%	63943946	80559,2	1,26	26,4%

Source: own calculations on the basis of data of the FCSR, 2021

4.4.3.6 Discussion (2203 Beer)

It should be noted that there are some strange tendencies in beer trade among the three leaders, when the price of German and Czech beer is decreasing, while the price of Belgian beer (the only price in the top five that has grown) is growing quite significantly. At the same time, the market share of Germany and the Czech Republic decreases in favor of Belgium. The positions of other countries will not be discussed, but the position of the Czech Republic on the Russian import beer market requires a more detailed analysis to clarify this situation with the incomprehensible behavior of prices.

In addition, for group 2203 (Beer), the CIF / FOB deviation coefficient, as shown by calculations, turned out to be higher than the permissible values (1.17 and 1.13 in 2017 and 2018, respectively, instead of the average norm of 1.06-1.10).

However, in 2019, the CIF / FOB ratio was 1.09, i.e. began to return to the acceptable range of values 1.05-1.10.

Below is a figure showing the prices of Czech beer on the Russian import market compared to the Czech export price (Figure 4.18).

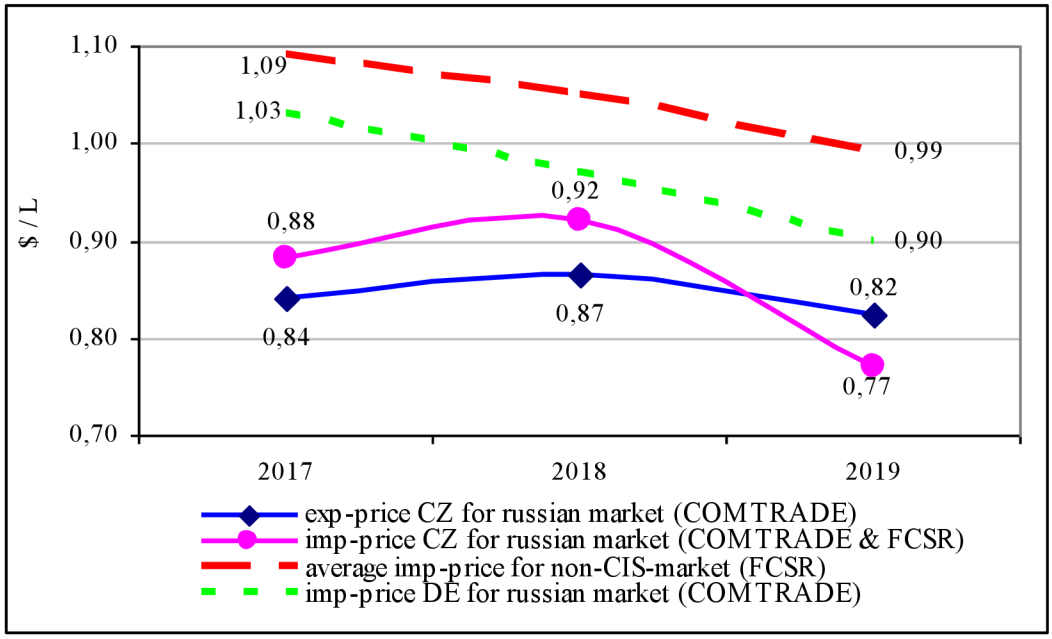


Figure 4.18 Subgroup 2203 (beer): price dynamics in the Russian market
Source: own calculations on the basis of data of the FCSR, COMTRADE, 2020

As Figure 4.18 shows, the dynamics of beer prices leaves questions about both asymmetry and chaotic price changes, especially in 2019, when the price of imports fell below the price of Czech exports. One gets the impression that someone else has joined bilateral trade and significantly influences the price of a direct supplier of Czech beer to the Russian market.

Since beer tops the list of main goods, we continued to analyze the mirror statistics for natural supplies of beer (in liters).

4.4.4 The analysis of the asymmetry of mirror data by quantity (on the example of beer)

4.4.4.1 On the quality of Czech beer as a unique product

First, let's recall the following facts about Czech beer and its quality. As you know, the Czech Republic is proud of its national drink, and Czech beer is world famous. In addition, since January 2008 "Czech beer" is a protected designation of the European Union (PGI - protected geographical indication). This mark is considered to be intellectual property and is protected by EU law in order to preserve a good name and the quality of beer produced in the Czech Republic. In addition, the entry of the designation "Czech beer" in the EU registry provides an opportunity to protect the traditions of Czech brewing and production technology, as well as to prevent the emergence of fakes that breweries can give out for Czech beer and thereby abuse its unique qualities (CAFIA, 2019).

According to the EU protected designation, “Czech beer cannot be considered a product made in the Czech Republic in an unconventional way or produced in the traditional way, but abroad” (Czech beer, 2008). As explained by the Czech Ministry of Agriculture regarding the PGI designation, “the purpose of certification was to clearly identify the specifics of the product under the name “Czech beer”. Excluded were drinks made according to the traditional recipe, but not in the Czech Republic, as well as drinks made in the Czech Republic without following the classic recipe” (Our brand, 2009).

4.4.4.2 Analysis of natural deliveries of Czech beer to the Russian market

Let us analyze the data of mirror statistics of beer. Obviously, when comparing mirror flows, the norm is considered to be almost complete coincidence of the physical volumes of supplies (a slight difference may be due to possible losses during transportation).

A comparison of Czech exports to Russia (Czech statistics) and Russian imports from the Czech Republic (Russian statistics) on beer in physical terms (in liters) revealed the following results (Tab. 4.16).

Tab. 4.16 Mirror comparison of Czech beer data (in liters)

	2015	*2017*	*2018*
Russian import from the Czech Republic	15,437,391	27,061,624	39,750,351
Czech export to Russia	15,226,590	24,216,116	37,434,856
Import / Export	101%	112%	106%
Import - Export	210,801	2,845,508	2,315,495

Source: own calculations on the basis of data of UN COMTRADE, 2019

As follows from Tab. 4.16, the import of Czech beer to Russia from the Czech Republic was higher than the Czech export of these volumes to the Russian market: in 2015, 2017 and 2018 by 1%, 12% and 6% respectively. This unnatural asymmetry of the data indicates that along with the original Czech beer from the Czech Republic, "Czech beer" was also imported to the Russian market from other countries, and the amount of this beer is growing from year to year. In general, over the past two years, the volume of supplies of "Czech beer" not from the Czech Republic exceeded the mark of 2 million liters per year and fixed at this level.

The statistics of 2019 confirmed this conclusion, since the asymmetry of natural beer supplies increased by 16% (a record) and the difference amounted to over 6 million liters and almost tripled compared to 2018. An updated table 4.16.1 with 2019 data and revised figures is shown below:

Tab. 4.16.1 Mirror comparison of Czech beer data (in liters)

	2015	*2017*	*2018*	*2019*
Russian import from the Czech Republic	15 644 571	27 037 787	39 750 350	45 333 500
Czech export to Russia	15 226 590	24 216 116	37 434 856	39 192 666
Import / Export	103%	112%	106%	116%
Import - Export	417 981	2 821 671	2 315 494	6 140 834

Source: own calculations on the basis of data of UN COMTRADE, 2021

4.4.4.3 Re-export and recommendations for statistics

Deliveries of goods from one country to another through other countries, including for sale, are not prohibited and are called re-exports. In the final country, according to the methodology of customs statistics and the rule of the country of origin, these goods are attributed to imports of the first country (in our case, Russian customs refers the volumes of beer re-export to imports from the Czech Republic to the Russian Federation). We would not question the figures of Russian statistics on beer, since these figures are repeatedly checked by the customs and tax authorities of the Russian Federation in the process of calculating customs duties, excise tax and VAT. Czech statistics do not see these volumes. From this we can conclude: in Czech statistics, the volume of Czech beer exports to Russia is underestimated at least from 2 to 6 million liters due to the neglect of re-export. Hence the following recommendations follow:

Recommendations for statistics. Czech statistics should take into account the volume of re-export of Czech beer and accordingly adjust the data of export statistics to Russia (based on mirror data of Russian imports from the Czech Republic).

4.4.5 Marketing strategies to increase export sales at special prices and their dangerous complements with re-exports and/or parallel imports

It is known that quite often re-export occurs due to the fault of the manufacturer itself as a result of the implementation of a regional marketing strategy with a special reduction in prices to expand sales and consolidate in the new market (in our case, this is one of the EU countries). A future re-exporter buys this product at a special price and exports it abroad (in our case, to Russia). At the same time, the manufacturer-supplier of goods at a special price may not even know about the existence of a re-exporter. The manufacturer-supplier will report on the successful implementation of the strategy and expand sales in the regional market (EU country), and the re-exporter will also expand his business and be proud of his personal sales success (in our case, in the Russian market).

4.4.5.1 Discussion and recommendations for business and for trade policy

As a result, it is precisely on the Russian market that two sellers of the same product compete, while a re-exporter has more opportunities to lower prices on this market than the original manufacturer. It is practically impossible to counteract such unfair competition, since the re-exporter legally acquired the goods and legally supplies it for export.

There is only one exception - if beer has an Intellectual Property (IP) marking (registered trademark, including the one protected in the EU by the PGI designation, etc.) - they are equivalent to the trademark in the legislative area. Then, in the absence of permission from the copyright holder, re-export turns into parallel imports, the counteractions of which are quite well known, including in judicial practice. In this case, the copyright holder may hold the seller liable for the sale of goods without his consent to the export ban and significant fines (Losev, 2019).

Recommendations for business. Therefore, the marketing services of Czech beer producers in the Czech Republic must take into account the indicated features of the Czech beer trade with IP-marking when building plans (marketing strategies) for expanding regional sales with a special price for the product.

Here, for beer without IP-marking, low prices can provoke the organization of re-export of goods, including with unfair competition in the foreign market of the same product. In this case, it is almost impossible to identify a re-exporter and oppose re-export, and this must be taken into account, up to and including refusal of such trading schemes. For beer with IP-marking, the actions of the re-exporter are unlawful (violation of intellectual property rights) and can be classified as organizing parallel import by unauthorized copyright holders. Here, re-export can be suppressed by customs and prohibited by the court. In particular, on the Russian market for beer, the IP-marking (PGI Czech beer) should be included in the register of intellectual property

of the FCS of the Russian Federation. So far, as we know, this is not the case, and PGI Czech beer intellectual property rights are not protected on the Russian market.

At the same time, large international companies provide legal protection for parallel imports through registered brands and trademarks. For example, in Russia, lawsuits by Heineken (the owner of the Krušovice brand) were satisfied against parallel importers of Krušovice beer to the Russian market with compensation for losses and the prohibition of importing beer without permission from the Heineken copyright holder (Parallel import, 2013). However, small Czech breweries that produce PGI-labeled beer should also be able to protect their *Intellectual Property (IP)* when exporting to the Russian market. So far, PGI marking as an IP-object for markets outside the EU remains a decoration element.

Recommendations for trade policy. The Czech state should not remain aloof from the problems of national business and provide assistance in registering and maintaining the PGI-marking Czech beer on the Russian market. At the state level, it is necessary to work to activate and activate the intellectual property factor when exporting Czech PGI beer to the market of the EAEU countries (Russia, Belarus, Armenia, Kazakhstan and Kyrgyzstan), so that the Czech national world-quality product can earn more revenue for both the state and producers copyright holders of the PGI-marking, through which the traditions and technologies of unique Czech brewing are legally protected and supported.

5 Discussion

In this section, we will comment on the results obtained from the point of view of scientific novelty. Recall that in the framework of the study we considered the following three sub-topics.

1. *The first sub-topic* explores mirror statistics as an information base for the analysis of Czech APF exports. When reviewing publications on mirror statistics first of all we noted that a common drawback of these studies is a wide statistical coverage of data when asymmetry is studied for almost the entire composition of product groups, interpretation of the discrepancy results is difficult and remains at the level of fixing and indicating the amount of asymmetry (discrepancies) in value terms.

In addition, in this approach the problem of the asymmetry of the physical volumes of deliveries remains outside the scope of the study, since generalized information on natural deliveries is not provided by statistics at the level of commodity groups. It was noted that it would be useful for practice to investigate not only cost asymmetries but also to supplement these studies at the level of goods with the study of asymmetries in natural supplies with the identification of their possible causes. We subsequently used this approach for the first time when analyzing the supplies of TOP-3 Czech APFs to the Russian market with comments on the possible causes of the "physical" asymmetry.

Also, within the framework of the first sub-topic we studied the quantitative standards for the deviation of mirror export-import flows due to the methodology for their assessment at different prices (exports in FOB prices, imports in CIF prices). It turned out that at present when assessing an acceptable level of asymmetry of mirror flows the balance of payments statistics of the Central Bank of Russia uses the CIF / FOB coefficient equal to 1.0588. General assessments by statisticians of international organizations (IMF) for the CIF/FOB ratio remain in the range from 1.06 to 1.10. This

means that the transport, logistics and insurance costs for the delivery of goods from the exporting country to the market of the consumer country with normal asymmetry should not exceed 10% of the volume of exports in FOB prices. In this case mirror statistics can be used as an information base for analyzing a country's exports based on mirror import statistics of the country receiving the export. We checked the group of Czech APF products exported to Russia for standard acceptability and made sure that the CIF/FOB asymmetry coefficient for it falls within the admissibility interval. This meant that shipments of Czech APFs could be researched based on mirror statistics of Russian imports.

Here we noted that we did not find any publication that considered the use of mirror statistics as an additional source of information - along with national statistics - to study trade between countries. Thus, for the analysis of Czech exports of APF to the Russian market, we applied this approach for the first time.

2. The second sub-topic is devoted to the consideration of foreign trade (FT) indices as a tool for quantitative analysis of changes in foreign trade. Variants of using statistics of FT-indices for the simultaneous analysis of not only the cost flows of goods, but also the amount of physical stocks and their average prices were studied.

It was concluded that there is no statistical information on FT-indices for solving various practical problems of the study. For these purposes, we have proposed general methods for aggregating and disaggregating FT-indices with a description of the formulas and considerштп economic formulations of the problem with the identification of groups of significant goods with different characteristics of changes in value indicators, prices and physical volumes of goods.

The methods proposed by us calculate index indicators within the framework of a single statistical methodology which is used in the foreign trade statistics of all IMF countries. In practice this means that the calculated indicators do not differ from those that would be calculated by the statistics itself for our case. From a mathematical point

of view the methods of aggregation and disaggregation proposed by us with the selection of groups of significant goods are based on equivalent transformations of traditional index formulas used by FT-index statistics (Paasche, Laspeyres, Fisher formulas).

The specified methods of aggregation and disaggregation with the allocation of groups of significant goods in the general form of mathematical formulas were proposed for the first time. Also, for the first time, based on the proposed general methods and algorithms for solving the problems of our study and quantitative calculations of analytical tables were developed.

The undoubted advantage of the methods we proposed for calculating FT-indices for groups of significant goods is that they provide an opportunity to quantitatively analyze groups of goods that are significant for research in dynamics taking into account the influence of not only the cost of supply but also the quantity of goods and the dynamics of their prices. This can provide new opportunities for quantitative marketing analysis (e.g., within the well-known Boston matrix), when an increase in the market share of goods in value terms can occur, for example, due to a decrease in the quantity of goods and an increase in price, or other combinations of "quantity - price" factors. We consider this direction of marketing analysis to be promising and plan to continue research on this in the future.

3. The third sub-topic is the analysis of APF deliveries of Czech goods to the Russian market using Russian import statistics and FT-indices. Having noted the main conclusions and recommendations that we presented in detail in the previous section 5 below we will discuss the features of the analysis for problems that are not observed by Czech statistics on the example of TOP-3 products, which account for almost 2/3 of the supply of Czech APF to the Russian market.

It should be noted that the specified task setting for identifying export problems that are not observed by Czech statistics was carried out by us for the first time which

made it possible to develop, among other things, new practical recommendations for expanding the supply of Czech APF products to the Russian market.

At the beginning first of all we note the problem of pricing for exported goods on the Russian market surrounded by similar goods imported to Russia from other countries. When analyzing the supply of TOP-3 Czech goods to the Russian market the prices of these goods in comparison with the prices of similar imported products on the Russian market were analyzed. This made it possible to develop practical recommendations for the TOP-3 goods to expand exports to the Russian market.

Thus, for group 0407 Bird eggs (third place in the TOP-3), the asymmetry of mirror data was acceptable, which did not require additional analysis. In the field of pricing for these Czech goods, it was recommended to focus on changes in the prices of imports from the Netherlands, the main competitor of the Czech Republic within this group in the Russian market.

Further, for *group 2309 Animal feed* (second place in the TOP-3), we interpreted the recorded asymmetry of mirror statistics data as customs duty evasion due to understating the customs value of goods. To substantiate these conclusions, we used data from mirror statistics on the number of goods. Also, a comparison of the price dynamics of the Czech Republic and the main competitors in the pet food market showed an error in the pricing of Czech products in 2018 (an unjustified price reduction with an increase in the prices of the main competitors). It was recommended that when choosing the price of this product, focus not on its last year's value, but proceed from the dynamics of the average market price in this market and the prices for goods of the main Czech competitors with comparable product quality - France and Germany.

For the *group 2203 Beer* (first place in the TOP-3), we found an asymmetry in the number of supplies, when the export of Czech beer in liters was significantly less than the import recorded by the Russian customs, which we classified as re-export (deliveries of Czech products to the Russian market through other countries). We

determined the volume of these re-export shipments based on mirror data on the number of shipments. Taking into account the presence of re-exports, we formulated recommendations for Czech statistics (registration of re-export operations). In addition, on the example of the supply of Czech beer with the PGI (appellation of origin) mark, we recommended that this IP-mark be officially registered on the Russian market in the customs register.

In principle, these recommendations can be extended to other Czech goods exported to Russia – high-quality products should have manufacturer's intellectual property protection signs in the form of trademarks (for example, Czech pet food Brit), brand names, including appellations of origin. As practice has shown, while the trademark PGI Czech beer is not included in the customs register and is not protected by law, i.e. essentially used as a decorative element. This situation must be corrected as soon as possible.

6 Conclusions and recommendations

1. *The subject of the research* was the export of the Czech APF to the Russian market, and the Russian mirror statistics of the import of the Czech APF to the Russian market was used as *an information base*.

But, as you know, the practical use of mirror statistics has its own peculiarities, since in this case it is necessary to check the admissibility of deviations (asymmetries) of two mirror flows so that imports (CIF prices, including transportation and insurance) do not exceed exports (FOB prices) within the acceptable average CIF / FOB deviation of 10%. In this case, mirror statistics can serve as a full-fledged information base, on the basis of which it is possible to study exports from one country to another using the mirror statistics of the import of another country. At the same time, according to experts, the mirror statistics on the import of goods deserve more confidence than export ones, since in any country their formation as sources of budget revenues is very carefully controlled.

Thus, as a result, the selected research information base - mirror statistics of Czech APF imports (01-24 HS) met all the specified conditions for asymmetry, and the use of mirror data on imports made it possible to study more widely the Czech APF export to the Russian market, including using data not available for Czech statistics.

2. As you know, to analyze the dynamics of foreign trade, statistics calculates FT-indices, which determine a kind of "speed of movement" of exports and imports of goods over a given period of time and are presented in the form of three indices: "value - physical volume - price". The methodology for calculating FT-indices is well known and is based on the recommendations of international organizations (primarily the IMF and the UN) in charge of international trade statistics (IMTS-CM, 2013). This methodology is used to calculate FT-indices by national statistical services, including in Russia, where FT-indices are published in the form of aggregated indices, as well as for

consolidated HS commodity groups. However, for our research, such a too global detailing of statistics was clearly not enough, in view of which we have developed new methods for solving research problems.

In the field of ***methodological support***, the author proposed methods for calculating FT-indices for selected goods and product groups. Generally, universal algorithms for calculating FT-indices based on aggregation and disaggregation of indices, as well as matrix-table analogs of these algorithms for computer implementation in EXCEL, were described. These general algorithms were adapted by the author to solve a series of research problems.

The author noted that the undoubted advantage of the methods they proposed is that they provide the ability to analyze commodity groups (for example, based on the well-known method of the Boston Matrix (BCGM, 2018)), while calculations are carried out within the framework of a unified statistical methodology (IMTS-CM, 2013), which is used in foreign trade statistics for almost all IMF member countries. From a mathematical point of view, the methods of aggregation and disaggregation proposed by the author with the allocation of groups of goods are based on equivalent transformations of the corresponding formulas of FT-indices and do not change the initial standards and prerequisites of the calculation methodology used by statistics. In other words, the methods proposed by the author make it possible to calculate FT-indices as if the statistics itself had done it.

In addition, our proposed methods made it possible to calculate methodologically comparable FT-indices, which were used to identify trade trends for groups of goods, as well as for comparative analysis and assessment of trade dynamics for V4 and non-CIS countries (within the framework of benchmarking), which made it possible to correctly compare trade dynamics by countries in order to identify the leader and analyze his trade performance in terms of "value-quantity-price".

3. To reveal the topic, the author used the concept of benchmarking, which is currently has now found wide application in business in the comparative analysis of results and the search for the best ways of development. To this end, V4 countries were selected as focus groups to compare trade performance due to their geographic proximity, similar natural and economic conditions (new EU members) and traditional trade relations with Russia, which has the largest commodity market in the CIS and Europe.

The author adapted the benchmarking scheme for the V4 countries (Czech Republic, Hungary, Poland and Slovakia) in order to carry out a comparative analysis of the results of APF-trading in the Russian market after the introduction of Russian counter-sanctions and then determine the trade leader, as well as study his practice of APF-trading.

The main analysis was carried out in the monitoring mode in stages using statistics from 2015-2018 (with additional involvement of 2019). The analysis included three stages which were carried out sequentially as official statistics became available. The results obtained for each stage were published using the statistics available at the time of the study.

4. *At the initial stage of benchmarking (2014-2016),* the author analyzed the dynamics of the decline in trade. In general, as the calculations showed, in comparison with the non-CIS countries, the V4 countries in 2015–2016 had a more preferable competitive position, since their volumes of APF trade as a whole decreased less significantly (by 2% versus 8%).

At the same time, it was noted that some countries (primarily Poland, as well as Slovakia) continued to reduce trade, albeit with a slowdown in its pace. Other countries (Hungary and the Czech Republic) by 2016 were able to stop the decline in trade and began to restore the growth of APF supplies to the Russian market.

It was noted that, at the same time, only in two countries from V4 (Czech Republic and Hungary), after the fall due to sanctions, the volume of APF trade in the Russian market began to recover. At the same time, only one country – the Czech Republic, by the end of 2016 was able to approach the pre-crisis level of trade of 2012, which was reached and surpassed by already in the next 2017.

5. At the next stage (2016-2017), the growth of APF-trade volumes of the V4 countries resumed, including for each country separately. Here, for the V4 countries, an analysis was carried out of the commodity structure of the supply reduction in comparison with the pre-crisis level of 2012 within commodity groups after the introduction of Russian counter-sanctions (List of Russian counter sanctions, 2014, 2021).

The analysis showed that Russian sanctions to one degree or another caused a reduction in APF supplies to the Russian market of all V4-countries and changed the commodity structure of supplies. But some countries were forced to completely stop the supply of sanctions products (Poland), others (the Czech Republic, Slovakia and Hungary), stopping the supply of sanction goods, reoriented to the supply of other products not included in the sanction list, as well as increase the supply of goods from unsanctioned groups.

In addition, the Czech Republic and Hungary, after the imposition of sanctions, were able to stop the decline in trade, while only the Czech Republic by 2017 was able to reach the level of supplies of the pre-crisis 2012, slightly exceeding it. Other V4 countries were still below the pre-crisis level of trade.

As a result, based on the results obtained, the Czech Republic was identified as the leader among the V4 countries in terms of the recovery of APF trade in the Russian market after the introduction of Russian counter-sanctions.

6. Further, for the Czech Republic, the trade leader in 2015-2017, the author analyzed the commodity structure of APF supplies to the Russian market and calculated the composite FT-indices (for a sample of 32 main goods, which accounted for 98% of 2017 imports). Among the 11 main goods (92% of imports), depending on the values of the FT-indices, three groups were distinguished (9 goods or 87% of supplies) with an increase in supplies and one group (2 goods or 2% of supplies) with a decrease in trade.

The analysis showed that for the *1st group* (33% of the volume of 2017 with 3 goods), all three indices "value-quantity-price" were more than one, i.e. the growth in the value of supplies (1.7 times) was ensured by a simultaneous rise in prices (by 17%) and natural supplies (1.5 times). For the *2nd group* (37% of deliveries with 2 goods), deliveries also increased (by 31%), but based on an increase in physical volumes (by 1.5 times) with a decrease in average prices (by 14%). In the *3rd group* (4 goods and 16% of the supply volume), deliveries increased (by 9%) with an increase in average prices (by 34%) and a decrease in physical volumes (by 18%). In the last *4th group* (5% of deliveries with two goods), a 5% decrease in deliveries was recorded, with a drop in physical volumes by 6% and a slight increase in average prices by 1%.

In general, it was noted that the center of trade interests is undoubtedly concentrated in the first three groups of Czech goods, which have significant volumes of trade and have promising growth characteristics for expanding their presence in the Russian market. At the same time, the share of the top three goods of trade leaders was growing steadily and at the end of 2017 amounted to 62% of supplies, which gave grounds to continue the analysis of these three goods. The three leaders included commodity items 2309 (animal feed), 2203 (beer) and 0407 (bird eggs).

7. At the final stage (2015-2018 with 2019), the author continued the analysis of the three main products of the Czech trade of the APF, the share of which in the supply volume continued to grow (up to 64% in 2018).

The analysis showed that in 2018 the Czech Republic in APF trade was able to reach an all-time high of $ 157 million (the previous high of $ 155 million was recorded in 2014). The basis of growth was formed by the upward (increasing) dynamics of supply growth (FT-indices of the group of 12 main goods are more than one, i.e. the increase in the value of supplies of the group was ensured by a simultaneous increase in prices and natural supplies, which was the characteristics of excellent growth quality).

Further, for the top three leading goods, the author determined the prices on the Russian market (according to the methodology, they are higher than national prices by the amount of transport costs and insurance) and their market share for similar goods supplied to Russia from other countries. An analysis of information for 2017-2019 was carried out and recommendations were formulated for the development of trade for each product from the TOP-3.

So, for position *0407 (bird eggs)*, with an increase in the cost of supplies, one of the lowest prices among competitors on the market was noted and a further increase in trade volumes was recommended based on price increases, which in 2017-2019 were below the market average.

The dynamics of supply growth at position *2309 (animal feed)* is not a concern. However, the analysis showed that prices for all suppliers are rising, while prices for Czech products in 2018-2019 were fixed below the average market level. It was recommended to increase trade volumes on the basis of rising prices and expanding the supply of premium feeds in demand on the Russian market, the production technologies of which have been mastered in the Czech Republic.

For position *2203 (beer)*, the quality of supply growth (all indices are more than one in 2018) indicates a growing demand for products. The price of Czech beer is lower than the market average, including the price lower than that of the closest competitors from Germany and Belgium. We can recommend increasing the price, since the Russian consumer is ready to pay more for the original Czech beer.

8. When analyzing group *2203 (beer)*, we found the presence of a mismatch in the mirror data on natural supplies, which required additional research.

Thus, a comparison of mirror data on natural beer supplies (in liters) showed that Czech beer exports to the Russian market, according to Czech statistics, were significantly lower than beer imports from the Czech Republic registered by the Russian customs. Quantitatively, this difference in mirror data shows that the export of Czech beer to Russia in Czech statistics is underestimated by at least 2 million liters due to the neglect of re-export (by volumes in liters, the indicated re-export flow is comparable to the total foreign trade in beer in countries such as Finland, Netherlands, Austria, Poland).

These re-export deliveries pose a real threat of unfair competition in the Russian market when the same product is sold at different prices. These prices are higher for a direct supplier (due to additional costs for advertising, warranty support, etc.), and for a re-exporter - lower, since he does not bear additional costs and legally bought the product on the market of one of the EU countries at a special reduced price for this country. At the same time, the direct supplier and manufacturer may not even know about the existence of such a "competitor" and incur losses due to their indiscretion in developing marketing strategies for selling beer at a reduced price for individual countries. Legislative protection against such re-export schemes is possible only if the beer has an IP-marking registered on the Russian market (in this case, the court will prohibit the re-exporter from supplying goods in parallel with direct exporters of beer with a registered IP-marking). In the absence of IP-labeling, manufacturers and sellers are better off abandoning risky strategies to expand sales with price reductions in the markets of individual countries.

For businesses it is recommended to take into account the possibility of unfair competition when developing marketing strategies for expanding sales based on reduced prices for individual countries, since there are high risks of general losses due to the organization of uncontrolled re-export of cheaper beer from these countries. These

strategies can only be applied with a registered intellectual property trademark (for beer, this is a PGI mark). In this case, it is possible to legally restrict and prohibit supplies due to the lack of permission for the sale of goods from the manufacturer-holder of the intellectual property trademark. In the absence of such IP-marking, it is better to abandon risky strategies for lowering export prices for individual countries.

For statistics, it is necessary to include re-export in the volume of Czech beer export to Russia, at the same time, if possible, clarify the statistics of trade with countries through which Czech beer is re-exported to Russia.

For trade policy, it is necessary to carry out work at the state level to activate the intellectual property factor in the production and export of demanded Czech goods (assistance in the registration of trademarks and IP-marks, including on export markets). As shown by the example of Czech beer, in this case Czech beer producers using traditional technologies (with PGI-marking registered on the Russian market) will be able to receive a fair profit for the quality of their products and be able to legally protect themselves from unfair competition when exporting original Czech beer to Russia market.

Thus, we achieved the goal of the study. We showed the possibilities of using mirror statistics to identify export problems of APF to the Russian market. Within the framework of the study, we proved the methodological acceptability of using mirror statistics for research tasks and conducted an analysis of the supply of the most important Czech APF products to Russian market.

We developed recommendations for expanding their sales considering prices for similar products imported to the Russian market from other countries were developed. Moreover, the study identified a new problem of beer (trade leader) re-export at the macro level, investigated its root causes, and prepared recommendations for Czech statistics: the need to adjust statistics and increase beer export volumes to Russia by

taking re-export into account. Moreover, we formulated recommendations to expand trade in the Russian market for business and trade policies based on the reinforcement of the role of the intellectual property factor.

The conducted research is original. Prior to this research, there were no studies that would use mirror statistics as an additional database and tool for identifying export problems unobserved by national statistics. This made it possible to develop recommendations for improving statistics (accounting for re-exports), as well as recommendations for business and trade policy based on the activation of the intellectual property factor in the production and export of Czech goods.

In the end, we also note the *weaknesses of the proposed methodology for using mirror statistics related to environmental factors.* Due to the fragmentary closure of Russia's own statistical databases, including on foreign trade, since 2020 it becomes difficult and not always possible to analyze trade between countries using mirror statistics due to the growing distrust of published statistical data. Currently, all data on Russia's foreign trade of the current year (2022), starting from January, have not been published on the FCSR website, and the data of the previous year (2021) are published in a reduced volume as it was in previous years.

In addition, in the COMTRADE database some data provided by the Russian side does not pass elementary checks on the total amount of trade and its components (e.g. the total components may be greater than the total trade volumes presented). This significantly complicates any data analysis and casts doubt on its results obtained using unreliable information.

This problem has political roots and statistics has become a hostage to this situation in recent years. It is obvious that no models and methods, including those proposed by us, can level out (smoothen) the incorrectness and incompleteness of statistics in the context of escalating political confrontation between countries and the constant growth of sanctions pressure due to Russian military operations in Ukraine.

Thus, the conducted studies allow us to draw the following main conclusions:

- selected research information base - mirror import statistics of Czech APFs (01-24 HS) met all normative indicators of asymmetry (CIF / FOB ratio was generally less than 10%, which corresponds to the tolerance interval used in the IMF research and in the development of the balance of payments the Central Bank of Russia);

- the use of mirror data on imports made it possible to study the supply of Czech goods to the market more widely, including using data that are not available for Czech statistics goods of other countries and recommendations are given regarding pricing and prospects for the growth of supplies to the Russian market;

- for quantitative analysis, the author proposed new general methods for calculating FT-indices for selected goods and product groups, which were adapted by the author to solve a number of research problems. The undoubted advantage of the methods proposed by them is that they expand the possibilities of quantitative analysis within the framework of a unified statistical methodology (IMTS-CM, 2013), which is used in international statistics. From a mathematical point of view, the aggregation and disaggregation methods proposed by the author are based on equivalent transformations of statistical formulas and allow calculating FT-indices as if statistics itself did it. Thus, in the dissertation, the proposed methods made it possible to calculate methodologically comparable FT-indices for a comparative analysis of trade dynamics for V4 countries in order to identify the leader of trade and analyze its trading performance in terms of the "value-quantity-price" indices;

- for the V4 countries, the analysis showed that Russian sanctions to one degree or another caused a reduction in the supply of APF to the Russian market, since some countries were forced to completely stop the supply of sanctioned goods (Poland), others (Czech Republic, Slovakia and Hungary), to stop the supply of sanctioned goods and refocus on the supply of other goods outside the sanctions list. According to the results of trade, the Czech Republic and Hungary, after the imposition of sanctions, by

2017 were able to stop the decline in trade volumes, while only the Czech Republic was able to reach the level of deliveries of the pre-crisis 2012. As a result, the Czech Republic was identified as the leader among B4 countries in restoring APF trade in the Russian market after the introduction of Russian counter-sanctions .

- for the leader of the Czech Republic, with the help of FT indices, a list of main goods was formed (32 goods - 98% of deliveries) and three groups of goods were identified and analyzed (9 goods, 92% of imports) with an increase in the cost of trade. In general, it was noted that the center of trade interests is undoubtedly concentrated in these three groups of goods, which have significant trade volumes and promising growth characteristics for expanding their presence in the Russian market.

- TOP-3 Czech goods were selected for a separate analysis (their share was steadily growing and amounted to almost 2/3 of exports). The top three included commodity items 2309 (animal feed), 2203 (beer) and 0407 (bird eggs). For the TOP-3, an analysis was made of the dynamics and trends of trade, including in comparison with similar imported goods from other countries, and the indicators of the physical asymmetry of mirror data for each product were commented in detail. In this presentation above for the TOP-3, we presented the main results and recommendations (for statistics, business and trade policy).

Originality and novelty of the research. Thus, we can conclude that the study is original. Prior to this, there were no studies that used mirror statistics as an additional database and tool for identifying export problems not observed by national statistics. This made it possible to develop recommendations for improving statistics (accounting for re-exports), as well as recommendations for business and trade policy based on the activation of the intellectual property factor in the production and export of Czech goods.

Restrictions. In conclusion, we also note the limitations of the proposed methodology for using mirror statistics related to environmental factors - Russian statistics.

Due to the fragmented closure of Russia's own statistical databases, including those on foreign trade, it has become difficult and not always possible to analyze trade between countries using mirror statistics since 2020 due to the growing distrust of published statistical data.

Currently, all data on Russia's foreign trade for the current (2022) year, starting from January, are not published on the FCSR website, and data for the previous year (2021) are published in a reduced volume. In addition, in the COMTRADE database, some data provided by the Russian side does not pass elementary checks on the total amount of trade and its components (for example, the total components may be greater than the total trade volumes presented). This significantly complicates any data analysis and casts doubt on its results obtained using unreliable information.

This statistical problem has political roots, and statistics has become a hostage to this situation in recent years. It is obvious that no models and methods, including those proposed by us, can level (smooth out) the incorrectness and incompleteness of statistics in the context of an escalation of political confrontation between countries and a constant increase in sanctions pressure due to Russian military operations in Ukraine.

Possible main directions for future research:

1. The proposed methodology for analyzing Czech APF exports based on Russian import statistics can be successfully applied to other V4 countries (Poland, Slovakia, Hungary) as well as any other country trading with Russia. As shown by the analysis carried out on the example of the Czech Republic significant practical results and recommendations can be obtained in this direction for other countries as well.

2. The second direction is designated as re-export and parallel import as a tool to counter the sanctions pressure on trade. Currently this issue is actively developing and

requires effective economic solutions and strategic recommendations to influence mutual and international trade already today.

3. A separate study should be devoted to the problems of classical marketing in terms of developing a strategy for entering regional markets with lower prices. Part of such a marketing strategy should contain the control of risks associated with the use of re-exports and parallel imports to the markets of other countries.

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Appendices

A List of names of APF product groups 01-24 with HS codes

The full 2-digit HS codes list

HS Code	4 digit categories	Product descriptions
1	0101 – 0106	Live animals
2	0201 – 0210	Meat and edible meat offal
3	0301 – 0307	Fish and crustaceans, molluscs and other aquatic invertebrates
4	0401 – 0410	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included
5	0501 – 0511	Products of animal origin, not elsewhere specified or included
6	0601 – 0604	Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage
7	0701 – 0714	Edible vegetables and certain roots and tubers
8	0801 – 0814	Edible fruit and nuts; peel of citrus fruit or melons
9	0901 – 0910	Coffee, tea, mate and spices
10	1001 – 1008	Cereals
11	1101 – 1109	Products of the milling industry; malt; starches; inulin; wheat gluten
12	1201 – 1214	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal plants ; straw and fodder
13	1301 – 1302	Lac; gums, resins and other vegetable saps and extracts
14	1401 – 1404	Vegetable plaiting materials; vegetable products not elsewhere specified or included
15	1501 – 1522	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes
16	1601 – 1605	Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates
17	1701 – 1704	Sugars and sugar confectionery
18	1801 – 1806	Cocoa and cocoa preparations
19	1901 – 1905	Preparations of cereals, flour, starch or milk; pastrycooks' products
20	2001 – 2009	Preparations of vegetables, fruit, nuts or other parts of plants
21	2101 – 2106	Miscellaneous edible preparations
22	2201 – 2209	Beverages, spirits and vinegar
23	2301 – 2309	Residues and waste from the food industries; prepared animal fodder
24	2401 – 2403	Tobacco and manufactured tobacco substitutes

Source: HS codes list, 2021

B Consolidated FT-indices: Laspeyres, Paasche and Fisher formulas

Currently, the main formulas for calculating FT-indices in the statistics of most countries are the Laspeyres and Paasche formulas (together with their derivative Fisher's formula in the form of the geometric mean of the values obtained by the Laspeyres and Paasche formulas). A review of the calculation practices for 77 countries around the world that support the statistics of foreign trade price indices showed that statistical offices of more than 70% of countries use the three main formulas of Laspeyres, Paasche or Fisher in their calculations of FT-indices (NPCD, 2005; PQMET, 1983) as the most successful and methodically tested calculation formulas with acceptable economic interpretation. Also note that these three formulas are used by the statistical offices of countries and in calculating the consumer price index (CPIM, 2004; XMPI Manual, 2009). All this in total makes it possible to study the indices of internal and external prices calculated in a unified methodology, as well as to carry out a comparative analysis of the dynamics of foreign trade between countries.

Foreign trade indices allow to research the dynamics of commodity flows taking into account changes in average prices and physical volumes of exports and imports. As a rule, foreign trade indices are included in the standard data set of national statistical systems and are calculated using the well-known formulas of Laspeyres, Paasche and Fisher, which have the following form.

Denote q_0, q_1 - the quantity of goods in the reference and reporting years; p_0, p_1 - the price per unit of goods in the reference and reporting years, respectively. Foreign trade indices are aggregated and are usually calculated by the average price index I^p. The quantity index is then calculated by dividing the value index by the price index. Summation is made by the number of goods exported and imported by the country and included in the sample.

To build a consolidated index, a collection (basket) of goods is usually formed (they are called representative goods) and, based on information about their prices and quantities, a corresponding consolidated index is constructed. When forming the sample, the main array method is used, according to which the most significant and typical representatives of export or import goods are introduced into the sample.

The Laspeyres price index (Laspeyres, 1871) assumes the use of weights of the reference period and is calculated by the formula:

$$I^{p}_{lps} = \frac{\sum p_1 * q_0}{\sum p_0 * q_0}, \quad \text{(B.1)}$$

$\sum p_1 * q_0$ — the cost of products of the reference period at the prices of the reporting period;

$\sum p_0 * q_0$ — the actual cost of products in the reference period.

The Paasche price index (Paasche, 1874) is an aggregate price index with weights of the reporting period and is calculated by the formula:

$$I^{p}_{psch} = \frac{\sum p_1 * q_1}{\sum p_0 * q_1}, \quad \text{(B.2)}$$

$\sum p_1 * q_1$ — actual cost of products of the reporting period;

$\sum p_1 * q_0$ — the value of goods sold in the reporting at the prices of reference period.

Fisher Price Index (Fisher, 1922) calculation formula:

$$I^{p}_{fish} = (I^{p}_{psch} * I^{p}_{lps})^{1/2}. \quad \text{(B.3)}$$

The Laspeyres price index shows how much the average prices in the reporting period have changed compared to the reference period for the goods sold in the reference period. The Paasche price index characterizes the change in the prices of the reporting period comparing to the reference one for the goods sold in the reporting period. The Fisher index does not have a clear economic interpretation, but it makes it

possible to "smooth out" the discrepancy between the Laspeyres and Paasche indices at the level of the geometric mean.

As noted by statisticians in the "Export and import price index manual: theory and practice" (see table below), the Laspeyres index is usually slightly higher than the Pasche index, while the Fisher index is between the indicated indices.

Table 23.16. Annual Chained Laspeyres, Paasche, and Fisher Price Indices

Year	P_L	P_P	P_F
1970	1.0000	1.0000	1.0000
1971	1.1008	1.0961	1.0984
1972	1.2052	1.1949	1.2001
1973	1.3994	1.3791	1.3892

Source: EIPIM (2009), p. 557

index		
1.05000	1.04762	1.04881

Source: Dorin and all, 2020, p. 46.

It should be noted that when calculating foreign trade indices we obtain a macroeconomic indicator of the change in the average prices of exports and imports (as one aggregated commodity), in which cost indicators, physical volumes and average prices of exports and imports are involved.

Russian FT-indices statistics

Methodologically, the development of FT-indices is carried out by the FCS of Russia on the basis of cargo customs declarations. To calculate the FT-indices, the methodology approved by the Federal Customs Service of Russia., ORDER of December 18, 2006 N 1329 is used (FCSR-methFTI, 2006-2010). It is based on the use of Laspeyres formulas. Information on FT-indices is provided and published monthly on the website of the Federal Customs Service of the Russian Federation in the form of statistical series of consolidated indices by months and quarters (a screenshot of the series is presented in Table B.1), as well as in the form of annual FT-indices of average prices and physical volumes for export and import for enlarged commodity groups of the HS (Table B.2).

Table B.1 Screenshot of FT-index statistics data series

Source: FCSR-FTI, 2021

Table B.2 Representations of FT-indices by commodity groups of exports / imports in Russian statistics

Код ТН ВЭД (HS)	Наименование товарной группы (Product group name)	Индекс средних цен (average price index)			Индекс физического объема (volume index)		
		Во все страны (total)	дальнее зарубежье (non-CIS)	СНГ (CIS)	Во все страны (total)	дальнее зарубежье (non-CIS)	СНГ (CIS)
	Всего (Total)	97,7	97,2	100,7	96,1	96,5	93,3
01-24	Продовольственные товары и сельскохозяйственное сырье	104,3	105,2	101,7	106,9	102,2	124,3
25-27	Минеральные продукты	96,0	95,6	102,3	92,4	94,6	67,7
27	Топливно-энергетические товары	98,6	98,4	102,4	90,2	92,0	68,0
28-40	Продукция химической промышленности, каучук	93,6	92,3	97,8	101,1	99,0	108,7
41-43	Кожевенное сырье, пушнина и изделия из них	93,8	94,8	92,3	71,3	56,8	111,6
44-49	Древесина и целлюлозно-бумажные изделия	96,9	97,2	95,6	89,2	86,7	100,9
50-67	Текстиль, текстильные изделия и обувь	97,2	96,8	97,3	120,4	113,5	122,5
72-83	Металлы и изделия из них	96,0	95,6	97,8	83,3	80,4	97,8
84-90	Машины, оборудование и транспортные средства	107,6	111,2	101,9	81,5	70,8	107,2
68-70, 91-97	Другие товары	95,0	93,3	104,3	130,6	134,1	114,1

Source: FCSR-FTI, 2021

C Commentary to the data comparison tables of the external merchandise trade mirror data

Bank of Russia

https://www.cbr.ru/eng/statistics/macro_itm/svs/mirror/

The results of comparisons of Russia's foreign trade statistics with the rest of the world data are represented in the attached tables. Regular comparisons conducted by the Bank of Russia on the basis of the Federal Customs Service of Russia data (from „Customs Statistics of Foreign Trade of the Russian Federation"), the IMF's data (from „Direction of Trade Statistics"), EUROSTAT's data (from „Intra- and extra-EU trade"), and the CIS Interstate Statistics Committee data, demonstrate both the existence of systemic discrepancies and the variability of the magnitudes thereof. The main reasons for such differences could be conditionally combined in the following groups:

1. Methodological:

a) Russia's external merchandise trade statistics are based on the principles of „general system of trade", according to which goods are recorded as exports/imports at the moment of crossing the national frontier. A number of Russia's trade partners (including certain EU countries) apply principles of „special trade system", according to which goods are registered as exports/imports only after the customs clearance. Different approaches to the registration of foreign trade transactions lead to the appearance of timing lags, and also they heighten the possibility of incorrect recording of the country of goods origin/destination;
b) in accordance with international standards, countries determine statistical value of imported merchandise on the CIF terms of delivery, and on the FOB terms with respect to exported goods.

The transformation coefficient from CIF to FOB prices applied by the Bank of Russia in mirror data comparisons (for non-CIS countries and CIS countries which do not have common frontiers with Russia, it was estimated to be equal to 5.88% and 10.2%, respectively) is an average for the total volume of imports, while for certain countries and merchandise groups it may vary significantly from factual data;

c) a number of goods exist whose nature makes it difficult to apply a common approach to their registration by customs authorities of different countries. In particular, it relates to gold, electricity, bunker fuel, and fish caught in the high seas;
d) differences in approaches to registering natural persons' transactions. In the Russian practice, it relates mostly to car imports that are not included in customs statistics totals. At the same time, the country from which the automobile has been imported may have registered it as exports if its price has exceeded a set threshold value.

2. Technical:

a) a time lag arises in the period between the date of shipping goods for exports in the country of origin and the date of registration of goods in the recipient country, which averages in world trade 3-4 weeks and varies depending on countries' geographical situation, employed modes of transport, nature of transported goods, etc.;
b) while converting merchandise values to a single currency, countries may use different exchange rates;
c) geographical classification of transactions in the case of imports of goods is made by country of origin (for the EAEU countries — by country of consignment), in the case of exports of goods — by country of last known destination. If the country of origin or the country of destination is unknown at the time of delivery, then the country of consignment is used for imports of goods, and the country of sale (the trading country) — for exports of goods. In case of Russia — EU transactions the latter may register the country where the outer frontier of the Union has been crossed by the goods as the counterparty of Russia. In such case discrepancies in bilateral data arise;
d) participation in export/import transaction of a counterparty country reselling the merchandise;
e) customs authorities of most of countries of the world set different value thresholds for recording imported and exported goods;
f) in some cases goods registered by the exporting country do not reach the country of destination due to a damage or confiscation thereof in one of the transit countries;
g) in most countries limitations exist on disclosure of information on certain merchandise items;
h) as a rule, aggregate data compilation, publication, and updating rules of national statistical services and those of international organizations do not coincide in time.

3. Associated with intentional distortion of statistical data:

a) counterparties of one partner country can intentionally avoid registering the goods crossing the national border whilst the goods are registered in another country;
b) importers can use a second set of invoices showing lower than actual goods' quantities and/or prices thereof with the purpose of reducing the amount of payable customs duties. As a result, export and import values of goods will differ;

c) importers can declare the goods under fake merchandise codes in order to minimize the customs tariffs' charges;
d) exporters can intentionally state higher quantities and values of the exported goods with the purpose of increasing their VAT refunds;
e) counterparties in trade relations can intentionally misstate their partner country.

While the array of the reasons for discrepancies arising in the mirror data is sufficiently stable, their composition and the extent of influence within each period of time are different. This eventually determines the dynamics of absolute and relative dimensions of discrepancies.

The bulk of the aforementioned reasons may be recognized as objective factors leading to inconsistencies in statistical data.

D Original working tables and enlarged duplicates of tables

Table 4.2.1*(working original).*
Russian imports from the Czech Republic: basic goods

	HS code			2015			2016			Indices 2016/2015			2016-2015, thous. $
				к-во	ст-ть тыс.$	уд.вес	Quantity	Value, thous. $	Share	price	volume	value	
		Russian import from non-CIS countries											
		- total			161,692,700			162,724,500	100%	0.978	1.026	1.003	1,031,800
		- HS (01-24)			22,213,700	13.7%		20,428,500	12.6%	0.971	0.947	0.920	-1,785,200
		Russian import from the Czech Rep.											
		- HS (01-24) from the Czech Rep.			100,532			109,323	100%	-	-	1.089	
		- share (01-24) from non-CIS			*0.45%*			*0.54%*					
		- 32 main goods			99,460	98.9%		108,393	99.3%	0.989	1.102	1.090	8,933
1	2309	Animal feed	t	10701	17,056	17.0%	13630	24,704	22.6%	**1.137**	**1.274**	**1.448**	7,648
2	0407	Birds'eggs	t	5032	21,308	21.2%	6627	21,556	19.7%	0.768	1.317	1.012	248
3	2203	Beer made from malt	l	15437391	14,570	14.5%	17635211	16,301	14.9%	0.979	1.142	1.119	1,731
4	1207	Other oil seeds and oleaginous fruits	t	6160	11,618	11.6%	7376	12,011	11.0%	0.863	1.197	1.034	393
5	2208	Spirits, liqueurs and other spirituous, be	l	325546	3,596	3.6%	358817	3,672	3.4%	0.926	1.102	1.021	76
6	1302	Vegetable saps and extracts	t	160	1,564	1.6%	249	3,530	3.2%	**1.451**	**1.556**	**2.258**	1,966
7	1704	Sugar confectionery (including white ch	t	1500	3,684	3.7%	1392	3,375	3.1%	0.987	0.928	0.916	-310
8	1210	Hop cones	t	276	2,778	2.8%	342	3,352	3.1%	0.974	1.239	1.207	574
9	1107	Malt, whether or not roasted	t	6375	3,525	3.5%	6230	3,343	3.1%	0.970	0.977	0.948	-182
10	2106	Other food products	l	630	3,723	3.7%	300	2,792	2.6%	1.575	0.476	0.750	-931
11	2101	Extracts of coffee, tea or mate'	t	709	2,151	2.1%	808	2,495	2.3%	**1.018**	**1.140**	**1.160**	344
12	1602	Other prepared or preserved meat	t	1319	3,544	3.5%	898	2,397	2.2%	0.994	0.681	0.676	-1,147
13	1905	Pastry, cakes, biscuits and other	t	670	2,016	2.0%	401	1,826	1.7%	1.513	0.599	0.906	-190
14	1209	Seeds of a kind used for sowing	t	113	780	0.8%	138	1,080	1.0%	**1.134**	**1.221**	**1.385**	300
15	0106	Live animals oth.	pcs.	1418	307	0.3%	2405	893	0.8%	**1.716**	**1.696**	**2.910**	586
16	1904	Prepared foods obtained	t	370	1,192		205	694	0.6%	1.050	0.554	0.582	-498
17	1901	Malt extract	t	266	1,043	1.0%	221	640	0.6%	0.738	0.931	0.613	-403
18	2008	Fruit, nuts and other	t	242	623	0.6%	187	510	0.5%	1.060	0.773	0.819	-113
19	2201	mineral water without sugar	l	970462	496	0.5%	818039	427	0.4%	1.022	0.843	0.861	-69
20	2202	Waters mineral, containing sugar	l	469206	323	0.3%	575304	401	0.4%	**1.013**	**1.226**	**1.242**	78
21	2206	Other fermented beverages	l	824323	1,362	1.4%	219650	328	0.3%	0.904	0.266	0.241	-1,034
22	0105	Live poultry	pcs.	341827	221	0.2%	421560	301	0.3%	**1.102**	**1.233**	**1.360**	80
23	2007	Jams, fruit jellies, marmalades	t	389	519	0.5%	280	301	0.3%	0.807	0.720	0.581	-218
24	2209	Viengar and substitutes	l	546000	182	0.2%	798000	258	0.2%	0.970	1.462	1.418	76
25	1902	Pasta	t	157	127	0.1%	271	225	0.2%	**1.028**	**1.726**	**1.774**	98
26	2005	Other vegetables prepared	t	145	254	0.3%	141	214	0.2%	0.868	0.972	0.844	-40
27	1514	Rape	t	128	171	0.2%	119	166	0.2%	1.047	0.930	0.974	-5
28	1001	Wheat	t	305	152	0.2%	183	159	0.1%	1.740	0.600	1.044	7
29	2103	Sauces and preparations therefor	t	84	185	0.2%	61	142	0.1%	1.059	0.726	0.769	-43
30	0208	Other meat and edible meat offal	t	20	68	0.1%	40	135	0.1%	0.996	2.000	1.993	67
31	1520	Glycerol	t	380	197	0.2%	240	115	0.1%	0.923	0.632	0.583	-82
32	1806	Chocolate and other food	t	23	129	0.1%	11	52	0.0%	0.845	0.478	0.404	-77

Source: own calculations based on the FCSR database

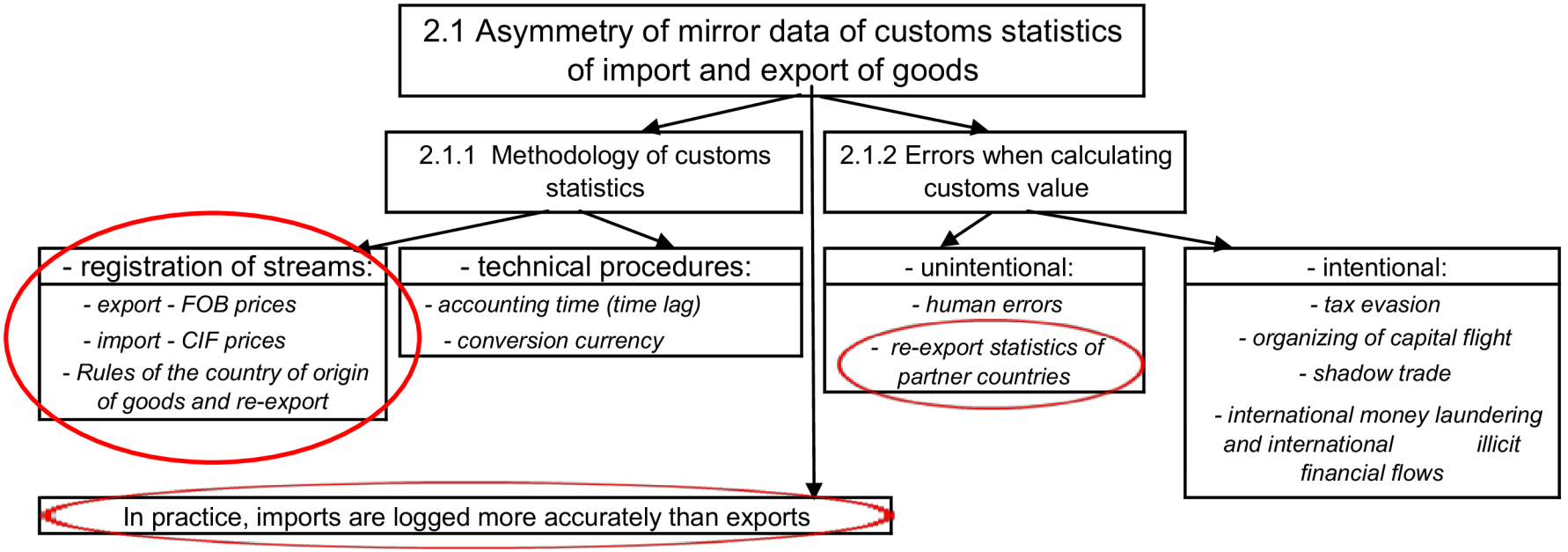

Figure 2.1. The main causes of asymmetry in mirrored data
Source: Author

Table 3.1 Initial data and calculations Laspeyres price index using method A (aggregation)

		A	B	C	D	E	F	G	H	I	J	K	L
		t=0	t=1	t=0	t=1	t=0	t=1	Average price index	Volume index (I^p_{vlm})	Value index (I^p_{vl})	Laspeyres price index		
		Value, thousand $		Volume, unit		Price, $/unit					$p_0 * q_0$	$p_1 * q_0$	I^p_{Lps}
0	Total by goods	$S^0=\sum s_i^0$	$S^1=\sum s_i^1$	-	-	-	-	I^p_{Lps}	$=(S^1/S^0)/I^p_{lps}$	$=S^1/S^0$	S^0	$=\sum p_i^1 * q_i^0$	=K0/J0
1	- goods 1	s_i^t, i=1,N, t=1.2		q_i^t, i=1,N, t=1,2		$p_i^t = s_i^t / q_i^t$, i=1,N, t=1.2						$=p_i^1 * q_i^0$, i=1,N	
2	- goods 2												
…	…….												
N	- goods N												

Source: Author

Table 3.2 Initial data and calculations Laspeyres price index using method D (disaggregation)

		A	B	C	D	E	F	G	H	I
		t=0	t=1	t=0	t=1	t=0	t=1	Average price index (I^p_{Lps})	Volume index (I^p_{vlm})	Value index (I^p_{vl})
		Value, thousand $		Volume, unit		Price, $/unit				
0	TOTAL	S^0	S^1	-	-	-	-	$I^p_{Lps}{}^0$	$=(S^1/S^0)/I^p_{lps}$	$=S^1/S^0$
1	- goods 1	$s_1{}^0$	$s_1{}^1$	$q_1{}^0$	$q_1{}^1$	$p_i{}^t = s_i{}^t / q_i{}^t$		…	…	$= s_i{}^1 / s_i{}^0$
2	Other *	$=S^0 - s_1{}^0$	$=S^1 - s_1{}^1$							

Source: Author

Table 3.3 Calculations Laspeyres price index using method D

		A	B	G	H	I	J	K	L
		t=0	t=1	Average price index (I^p_{Lps})	Volume index (I^p_{vlm})	Value index (I^p_{vl})	Laspeyres price index		
		Value, thousand $					$p_0 * q_0$	$p_1 * q_0$	I^p_{Lps}
0	TOTAL	S^0	S^1	I^p_{Lps}	$=(S^1/S^0)/I^p_{lps}$	$=S^1/S^0$	$= S^0$	$=I^p * S^0$	$I^p_{Lps}{}^0 = G0$
1	- goods 1	$s_1{}^0$	$s_1{}^1$	…	…	$= s_i{}^1 / s_i{}^0$	$= s_1{}^0$	$= p_i{}^1 * q_i{}^0$	-
2	Other *	$=S^0 - s_1{}^0$	$=S^1 - s_1{}^1$	$I^p_{Lps} * = L2$	=I2 / G2	=B2 / A2	=J0 – J1	= K0 – K1	= K2 / J2

Source: Author

Table 3.4. The calculation algorithm of the general FT-indices for the goods of the general sample using the A-method

		A	B	C	D	E	F	G	H	K
		t=0		t=1		Average price index (I^L)	Volume index (I^q)	Value index (I^S)	Price, $/unit	Numerator of the formula (1) Laspeyres (Num^L)
		Value, thou $	Volume, unit	Value, thou $	Volume, unit					
0	Total by goods	$S^0=\sum s_i^0$, i=1,N		$S^1=\sum s_i^1$, i=1,N		$I^L = Num^L_N / S^0$	$I^q = I^S / I^L$	$I^S = S^1/S^0$	-	$Num^L_N = \sum p_i^1 * q_i^0$, i=1,N
1	- goods 1									
2	- goods 2	s_i^0, i=1,N	q_i^0, i=1,N	s_i^1, i=1,N	qi^1, i=1,N				$p_i^t=s_i^1/q_i^1$, i=1,N	$=p_i^1*q_i^0$, i=1,N
…	…….									
N	- goods N									

Source: Author

Table 3.5. The calculation algorithm of indices of the group of main and the rest of goods in the framework of the general sample using the combined A&D method

		A	B	C	D	E	F	G	H	K
		t=0		t=1		Average price index (I^L)	Volume index (I^q)	Value index (I^s)	Price, $/unit	Numerator of the formula (1) Laspeyres (Num^L)
		Value, thou $	Volume, unit	Value, thou $	Volume, unit					
	Total by N goods	$S^0=\sum s_i^0$, i=1,N		$S^1=\sum s_i^1$, i=1,N		$I^L = Num^L_N / S^0$	$I^q = I^S / I^L$	$I^s = S^1/S^0$	-	$Num^L_N = \sum p_i^1 * q_i^0$, i=1,N
0	- k goods	$S^0_k=\sum s_i^0$, i=1,k	-	$S^1_k=\sum s_i^1$, i=1,k	-	$I^L_k = Num^L_k / S^0_k$	$I^q_k = I^S_k / I^L_k$	$I^s = S^1/S^0$	-	$Num^L_k = \sum p_i^1 * q_i^0$, i=1,k
1 2 … k	- goods 1 - goods 2 …… - goods k	s_i^0 , i=1,k	q_i^0 , i=1,k	s_i^1 , i=1,k	qi^1 , i=1,k	-	-	-	$p_i^t=s_i^1 / q_i^1$, i=1,k	$=p_i^1 * q_i^0$, i=1,k
k+1	- other (N-k) goods	$= S^0 - S^0_k$	-	$= S^1 - S^1_k$	-	$I^L_{N-k} = Num^L_{N-k} / (S^0 - S^0_k)$	$I^q_{N-k} = I^S_{N-k} / I^L_{N-k}$	$I^s = S^1/S^0$	-	$Num^L_{N-k} = Num^L_{N-k} - Num^L_{N-k}$

Source: Author

Table 3.6. The calculation algorithm of indices of other countries of the region
with known common indices of this base country and the entire region using the D-method

		A	C	E	F	G	K
		t=0	t=1	Average price index (I^L)	Volume index (I^q)	Value index (I^s)	Numerator of the formula (1) Laspeyres (Num^L)
		Value, thou $	Value, thou $				
1	Countries of the region - total	S^0_R	S^1_R	I^L_R	I^q_R	$I^s = S^1_R/S^0_R$	$Num^L_R = I^L_R * S^0_R$
2	Country *(or group of countries)*	S^0	S^1	I^L	$I^q = I^S / I^L$	$I^s = S^1/S^0$	$Num^L = I^L * S^0$
3	Other countries in the region	$S^0_{oth} = S^0_R - S^0$	$S^1_{oth} = S^1_R - S^1$	$I^L_{oth} = Num^L_{oth} / S^0_{oth}$	$I^q_{oth} = I^S_{oth} / I^L_{oth}$	$I^s_{oth} = S^1_{oth} / S^0_{oth}$	$Num^L_{oth} = Num^L_R - Num^L_N$

Source: Author

Table 4.6. Changes in the volume of APF supplies of V4 countries by 01-24 product groups

CZECH REP.		SLOVAKIA		HUNGARY		POLAND	
HS	*2017-2012 thou $*	*HS*	*2017-2012 thou $*	*HS*	*2017-2012 thou $*	*HS*	*2017-2012 thou $*
01-24	1 010	*01-24*	-16 834	*01-24*	-46 034	*01-24*	-911 690
Reduction		Reduction		Reduction		Reduction	
22	-10 743	*11*	-7 197	*02*	-48 996	*07*	-234 032
17	-6 790	*16*	-6 021	*20*	-34 267	*04*	-113 654
11	-5 484	*04*	-2 884	*16*	-18 881	*02*	-99 586
21	-2 320	*01*	-2 814	*08*	-11 494	*03*	-99 586
01	-1 730	*18*	-1 026	*19*	-7 431	*18*	-30 042
08	-728	*15*	-705	*22*	-5 558	*21*	-24 183
16	-353	*17*	-365	*04*	-4 841	*01*	-18 582
20	-263	*21*	-174	*07*	-4 116	*16*	-11 583
07	-177	*20*	-76	*09*	-530	*17*	-10 712
18	-116	Growth		*15*	-299	*24*	-9 856
24	-35	*23*	1 648	*06*	-189	*09*	-6 829
Growth		*10*	1 511	*11*	-104	*22*	-1 460
23	21 307	*19*	1 127	Growth		*11*	-1 308
12	3 364	*22*	89	*10*	47 116	*15*	-1 217
19	1 882			*23*	21 307	*13*	-264
04	1 869			*23*	10 813	*05*	-91
13	717			*21*	9 122	Growth	
15	307			*18*	8 346	*19*	49 126
10	164			*17*	6 655	*06*	12 768
06	54			*01*	4 430	*23*	11 439
02	50			*12*	3 222	*20*	7 888
09	35			*24*	966	*12*	1 383
05	0					*10*	510
						14	62

Source: own calculations based on the data base of the Federal Customs Service of Russia for the publication (Yurik S., 2019).

Note. Yellow highlighted commodity groups from the sanctions list (List of Russian counter sanctions, 2014).

Table 4.7.0 *(working original).*
Russian import from Czech Republic food and agricultural products: goods with growing value

	HS code			2015			2016			2016-2015, thou $	Indices 2016/2015		
				Quantity	Value, thou $	Share	Quantity	Value, thou $	Share		price	volume	value
		32 main goods			99,460	100%		108,393	100%	8,933	0.989	1.102	1.090
		- 5 goods with growing value			21,856	22.0%		32,701	30.2%	10,845	1.156	1.294	1.496
1	2309	Animal feed	t	10701	17,056	17.1%	13630	24,704	22.8%	7,648	1.137	1.274	1.448
2	1302	Vegetable saps and extracts	t	160	1,564	1.6%	249	3,530	3.3%	1,966	1.451	1.556	2.258
3	2101	Extracts of coffee, tea or mate'	t	709	2,151	2.2%	808	2,495	2.3%	344	1.018	1.140	1.160
4	1209	Seeds of a kind used for sowing	t	113	780	0.8%	138	1,080	1.0%	300	1.134	1.221	1.385
5	0106	Live poultry	pcs.	1418	307	0.3%	2405	893	0.8%	586	1.716	1.696	2.910
6	2203	- Beer made from malt	l	15437391	14,570	14.6%	17635211	16,301	15.0%	1,731	0.979	1.142	1.119
		- Other 26 goods			63,034	63.4%		59,392	54.8%	-3,642	0.942	1.000	0.942

Source: own calculations based on the FCSR database

Table 4.4. *(working original).* .
Russian import of agricultural products and foodstuffs (HS 01-24): trade indices

	2015		2016		2016-2015, thous. $	Indices 2016/2015		
	Quantity	Share	Quantity	Share		price	volume	value
Russian import from non-CIS countries	22,213,600		20,428,700	100.0%	-1,784,900	0.971	0.947	0.920
Russian import from the Visegrad Group (VG)	713,896	6.9%	702,444	3.44%	-11,452			0.984
- 139 main goods	705,202	6.8%	696,788	3.41%	-8,414	1.058	0.912	0.965
Russian import from the Czech Republic	100,532	100.0%	109,323	0.54%	8,791			1.087
- 33 main goods	99,489	99.0%	108,391	0.53%	8,902	0.989	1.102	1.089
Russian import from non-CIS countries (without VG)	21,499,704		19,726,256	96.6%	-1,773,448	0.968	0.948	0.918

Source: own calculations based on the FCSR database

Table 4.7 *(working original).*
Russian APF import from the Czech Republic:
set of main goods with the largest share of value

№	HS		Unit	2015			2016			2017			2016-2015, thou $	2017-2016, thou $	2017-2015, thou $	Indices 2016/2015			Indices 2017/2016			Indices 2017/2015		
				Quatity	Value, thou $	Share	Quatity	Value, thou $	Share	Quatity	Value, thou $	Share				price	volume	value	price	volume	value	price	volume	value
	01-24	Agricultural products and foodstuffs			100,532	100%		109,323	100%		125,500	100%	8,791	16,177	24,968			1.087			1.148			1.248
	32 main goods				97,339	96.8%		105,897	96.9%		123,429	98.4%	8,558	17,533	26,091	0.988	1.101	1.088	1.058	1.102	1.166	1.053	1.204	1.268
	- 11 main goods with the largest share of value				85,438	85.0%		96,461	88%		115,233	91.8%	11,024	18,772	29795							1.064	1.267	1.349
1	2309	Animal feed	т	10701	17,056	17.0%	13630	24,704	22.6%	16586	31,160	24.8%	7,648	6,456	14105	1.137	1.274	1.448	1.037	1.217	1.261	1.179	1.550	1.827
2	2203	Beer	л	15437391	14,570	14.5%	17635211	16,301	14.9%	27037780	23,814	19.0%	1,731	7,514	9244	0.979	1.142	1.119	0.953	1.533	1.461	0.933	1.751	1.634
3	0407	Birds'eggs	т	5032	21,308	21.2%	6627	21,556	19.7%	6728	23,127	18.4%	248	1,572	1819	0.768	1.317	1.012	1.057	1.015	1.073	0.812	1.337	1.085
4	1207	Other oil seeds and oleaginous fruits	т	6160	11,618	11.6%	7376	12,011	11.0%	6117	11,646	9.3%	393	-366	27	0.863	1.197	1.034	1.169	0.829	0.970	1.009	0.993	1.002
5	2208	Spirits, liqueurs and other spirituous, beverages	л	325546	3,596	3.6%	358817	3,672	3.4%	422432	5,181	4.1%	76	1,509	1585	0.926	1.102	1.021	1.198	1.177	1.411	1.110	1.298	1.441
6	1210	Hop cones	т	276	2,778	2.8%	342	3,352	3.1%	366	4,503	3.6%	574	1,151	1725	0.974	1.239	1.207	1.255	1.070	1.343	1.222	1.326	1.621
7	2106	Reparations not elsewhere specified or included	т	630	3723	3.7%	300	2792.2	2.6%	333	4100	3.3%	-930.5	1308.2	378	1.575	0.476	0.750	1.323	1.110	1.469	2.084	0.529	1.101
8	1704	Sugar confectionery (including white chocolate)	т	1500	3,684	3.7%	1392	3,375	3.1%	1329	3,568	2.8%	-310	193	-116	0.987	0.928	0.916	1.107	0.955	1.057	1.093	0.886	0.968
9	1107	Malt; whether or not roasted	т	6375	3,525	3.5%	6230	3,343	3.1%	6379	3,265	2.6%	-182	-78	-260	0.970	0.977	0.948	0.954	1.024	0.977	0.926	1.001	0.926
10	1905	Pastry, cakes, biscuits and other bakers'wares	т	670	2,016	2.0%	401	1,826	1.7%	550	2,720	2.2%	-190	894	704	1.513	0.599	0.906	1.086	1.372	1.490	1.644	0.821	1.349
11	1302	Vegetable saps and extracts	т	160	1,564	1.6%	249	3,530	3.2%	139	2,149	1.7%	1,966	-1,381	585	1.451	1.556	2.258	1.090	0.558	0.609	1.582	0.869	1.374
	- other *21 main goods*				11901	11.8%		9435.4	8.6%		8197	6.5%	-2465.8	-1238.8	-3705							1.064	0.647	0.689

Source: own calculations on the basis of data of the Federal Customs Service of Russia

Table 4.8 *(working original).*
Russian APF import from the Czech Republic:
set of main goods with rising and decreasing of value

HS		Unit	2015			2016			2017			2016-2015, thou $	2017-2016, thou $	2017-2015, thou $	Indices 2016/2015			Indices 2017/2016			Indices 2017/2015		
			Quatity	Value, thou $	Share	Quatity	Value, thou $	Share	Quatity	Value, thou $	Share				price	volume	value	price	volume	value	price	volume	value
01-24	Agricultural products and foodstuffs			100,532	100%		109,323	100%		125,500	100%	8,791	16,177	24,968			1.087			1.148			1.248
	32 main goods			97,339	96.8%		105,897	96.9%		123,429	98.4%	8,558	17,533	26,091	0.988	1.101	1.088	1.058	1.102	1.166	1.053	1.204	1.268
	- 11 main goods *with the largest share of value*			85,438	85.0%		96,461	88.2%		115,233	91.8%	11023.7	18771.6	29,795							1.064	1.267	1.349
	- GROUP 1 *(increase in price, quantity, value)*			23,430	23.3%		31,728	29.0%		40,844	32.5%	8,298	9,116	17,414							1.173	1.486	1.743
2309	Animal feed	т	10701	17,056	17.0%	13630	24,704	22.6%	16586	31,160	24.8%	7,648	6,456	14105	1.137	1.274	1.448	1.037	1.217	1.261	1.179	1.550	1.827
2208	Spirits, liqueurs and other spirituous, beverage	л	325546	3,596	3.6%	358817	3,672	3.4%	422432	5,181	4.1%	76	1,509	1585	0.926	1.102	1.021	1.198	1.177	1.411	1.110	1.298	1.441
1210	Hop cones	т	276	2,778	2.8%	342	3,352	3.1%	366	4,503	3.6%	574	1,151	1725	0.974	1.239	1.207	1.255	1.070	1.343	1.222	1.326	1.621
	- GROUP 2 *(increase in value, decrease in price)*			35,878	35.7%		37,856	34.6%		46,941	37.4%	1,978	9,085	11,064							0.861	1.519	1.308
2203	Beer	л	15437391	14,570	14.5%	17635211	16,301	14.9%	27037780	23,814	19.0%	1,731	7,514	9244	0.979	1.142	1.119	0.953	1.533	1.461	0.933	1.751	1.634
0407	Birds'eggs	т	5032	21,308	21.2%	6627	21,556	19.7%	6728	23,127	18.4%	248	1,572	1819	0.768	1.317	1.012	1.057	1.015	1.073	0.812	1.337	1.085
	- GROUP 3 *(increase in value, decrease in quantity)*			18,921	18.8%		20,159	18.4%		20,615	16.4%	1,239	455	1,694							1.336	0.816	1.090
1207	Other oil seeds and oleaginous fruits	т	6160	11,618	11.6%	7376	12,011	11.0%	6117	11,646	9.3%	393	-366	27	0.863	1.197	1.034	1.169	0.829	0.970	1.009	0.993	1.002
2106	Reparations not elsewhere specified or include	т	630	3723	3.7%	300	2792.2	2.6%	333	4100	3.3%	-930.5	1308.2	378	1.575	0.476	0.750	1.323	1.110	1.469	2.084	0.529	1.101
1905	Pastry, cakes, biscuits and other bakers'wares	т	670	2,016	2.0%	401	1,826	1.7%	550	2,720	2.2%	-190	894	704	1.513	0.599	0.906	1.086	1.372	1.490	1.644	0.821	1.349
1302	Vegetable saps and extracts	т	160	1,564	1.6%	249	3,530	3.2%	139	2,149	1.7%	1,966	-1,381	585	1.451	1.556	2.258	1.090	0.558	0.609	1.582	0.869	1.374
	- GROUP 4 *(decrease in value)*			7,209	7.2%		6,718	6.1%		6,833	5.4%	-491	115	-377							1.011	0.937	0.948
1704	Sugar confectionery (including white chocolate	т	1500	3,684	3.7%	1392	3,375	3.1%	1329	3,568	2.8%	-310	193	-116	0.987	0.928	0.916	1.107	0.955	1.057	1.093	0.886	0.968
1107	Malt; whether or not roasted	т	6375	3,525	3.5%	6230	3,343	3.1%	6379	3,265	2.6%	-182	-78	-260	0.970	0.977	0.948	0.954	1.024	0.977	0.926	1.001	0.926
	- 21 other main goods *(decrease in value)*			11,901	11.8%		9435.4	8.6%		8,197	6.5%	-2465.8	-1238.8	-3,705							1.064	0.647	0.689

Source: own calculations on the basis of data of the Federal Customs Service of Russia

Tab. 4.16 Mirror comparison of Czech beer data (in liters) – *working original*

	2015	*2016*	*2017*	*2018*
Russian import from the Czech Republic	15 437 391	27 037 780	27 061 624	39 750 351
Czech export to Russia	15 226 590	24 216 116	24 216 116	37 434 856
Import / Export	101%	112%	112%	106%
Import - Export	210 801	2 821 664	2 845 508	2 315 495

Source: own calculations on the basis of data of UN COMTRADE, 2019

Tab. 4.16.1 Mirror comparison of Czech beer data with 2019 (in liters) – *working original*

	2015	*2016*	*2017*	*2018*	*2019*
Russian import from the Czech Republic	15 644 571	27 037 780	27 037 787	39 750 350	45 333 500
Czech export to Russia	15 226 590	24 216 116	24 216 116	37 434 856	39 192 666
Import / Export	103%	112%	112%	106%	116%
Import - Export	417 981	2 821 664	2 821 671	2 315 494	6 140 834

Source: own calculations on the basis of data of UN COMTRADE, 2021

E Other main publications of the author used for the thesis (original page numeration assigned in initial journals/proceedings was saved)

CZECH GOODS IN THE RUSSIAN AGRICULTURAL AND FOOD MARKET: ADDITIONAL ANALYSIS CAPABILITIES USING FOREIGN TRADE INDICES

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Abstract: Foreign trade indices (FTI) are one of the known tools for analyzing foreign trade and are calculated by statistics using the well-known Laspeyres and Paasche formulas by aggregating statistical data on the main goods and presenting them as average price indices and physical volumes indices of the country's exports and imports. In the publication the statements and methods of solving the problems of disaggregation of FTI allowing calculating the indices of groups of significant goods and groups of other goods of export and import are described. The proposed index methods allow analyzing changes in the dynamics of these groups of goods taking into account the factors "price-quantity-value". For approbation of methods the commodity Agricultural products and foodstuffs (APF) group (HS 01-24 codes) and a task of the analysis of export of goods of this group from the Czech Republic to the Russian Federation were considered. The information base for the analysis was the mirror statistics of Russia on the import of Czech goods to Russia. Based on the results of calculations, the analysis of aggregate FTI of goods from groups 01-24 was carried out with the allocation of an additional subgroup of goods with the greatest growth in the value of sales. The analysis of the state of Czech goods and goods of other non-CIS countries in the Russian market was also conducted. It was revealed that unlike the non-CIS countries, where the level of sales of APF in the Russian market as a whole decreased due to falling prices and sales volumes, the Czech Republic was able to ensure sales growth of agricultural products on the basis of practically stable prices and growth of natural supplies.

Key words: Index Numbers, Laspeyres index, Agriculture in International Trade, export and import of goods

JEL Classification codes: C43, F14, Q17

1. Introduction

When carrying out marketing analysis of foreign trade of goods, the study of the value indicators of trade must necessarily be supplemented with information on prices and physical volumes of exports and imports of goods. The information on the development of prices and volumes is generally presented in the form of indices. Currently, foreign trade indices (FTI) are one of the tools for analyzing foreign trade and allow us to examine the dynamics of commodity flows taking into account changes in average prices and physical volumes of exports and imports of goods. All methods of calculating aggregated indices are known and are described more than once in classical textbooks on index methods (Allen, 1975; Koves, 1983). Modern approaches to the development of statistics using FTI are generalized and presented by the experts of IMF, WB, OECD, Eurostat in the joint development of the Export and Import price index manual (XMPI Manual, 2009).

As a rule, FTI are included in the standard data set of national statistical systems and are calculated by the aggregation method (Aggregation, 2018) at the macroeconomic level in the form of average price indices and volume indices of a single universal commodity of the country. For the calculation of FTI, statistics forms a list of main goods of the reference and reporting years (the sample depth in it, as a rule, is not less than 95-99 percent of the volume of goods), on the basis of which, using the known Laspeyres (1871) or Paasche (1874) formulas, the aggregate FTI of the average prices and physical volumes of exports and imports are calculated. These indices are subsequently published

by the statistics, but the list of main goods is usually not published in view of its large size, although statistics show some of the most important commodities, for example, in the standard tables of distribution of the most important goods by countries.

We have noticed that with the help of aggregated FTI, calculated by statistics based on the list of main goods, additional tasks can be formulated, such as an analysis of the influence of individual goods and their groups on the positions of other goods of the country's foreign trade (for example, how much the prices and volumes of energy supplies affect the total import index of the country, including the index of other goods). Similar tasks can be solved by disaggregating of the already calculated total indices (Aggregation, 2018, Disaggregation, 2018), when the list of main goods is conventionally divided into two groups - a group of goods selected for analysis and a group of others. For the selected goods using the Laspeyres or Paasche formulas, the indices of their group are calculated, then for the group of the remaining goods, based on the proposed method, the indices of their group are determined by the formulas. Note that disaggregation method is based on equivalent transformations and expands the analytical capabilities of the index methods, without changing the original standards and prerequisites of the latter. We found no analogues of the disaggregation methods for analysis of foreign trade by other authors similar to those proposed by us.

For the first time the general formulation of such a problem was considered by us (Pushkin, 2004), but a specific method for solving it was given without the description of formulas, although it was applied in practice (Pushkin, 2009; Yurik, 2005). In particular, for the foreign trade of Belarus in the publication (Yurik, 2005), using disaggregation methods it was proved that the group of goods exported by private businesses of Belarus without financial state support demonstrates better opportunities for adaptation to crisis phenomena (due to the optimal price reduction and volume changes and assortment of export supplies) than the group of goods produced by large state-owned enterprises with a full set of state benefits and financing.

In general, the solution of the tasks of selection commodity groups and goods is a natural extension of the classical marketing analysis and allows carrying out foreign trade research, for example, within the classification of commodity groups of the BCG matrix (BCG matrix, 2018). In this publication we, as an example, identified a group of products of sustainable growth and analyzed the dynamics of their prices and supplies, as well as a group of other products with an assessment of the prospects for their sales in the Russian market.

The purpose of this research is to describe methods for calculating disaggregated FTI for cases of significant and other goods and commodity groups and assess their practical capabilities. This implies the following: the formulation of economic analysis tasks using indices, the calculation based on the proposed algorithms and real economic data, the economic interpretation of the results obtained with a demonstration of the possibilities of their practical use. The information basis for the analysis is the data of the Customs statistics of the Russian Federation (2018) on the import of Czech goods to the Russian market, including FTI, calculated according to the formula Laspeyres (1). For the first time, the possibility of using mirror statistics for Czech foreign trade with Belarus and Russia using the example of APF was examined by S.Yurik (Yurik, 2017).

2. Materials and Methods

FTI are aggregated and are usually calculated by the average price index I_p. The volume index is then calculated by dividing the value index by the price index. Summation is made by the number of goods exported and imported by the country. The Laspeyres price index assumes the use of weights of the reference period and is calculated by the formula:

$$I^{p}_{lps} = \frac{\sum p_1 * q_0}{\sum p_0 * q_0}\ , \qquad (1)$$

Denote q_0, q_1 – the quantity of goods in the reference and reporting years; p_0, p_1 – the price per unit of goods in the reference and reporting years, respectively.

The statistics of foreign trade of the Russian Federation represents FTI by the total results for the country, including for the CIS countries and the non–CIS countries, and also calculates FTI for the enlarged commodity sections of the HS.

2.1. Setting the task of identifying the most important (significant) goods and their groups in exports or imports using total foreign trade indices

To describe the calculation algorithm, we use the table–matrix form with the numbering of rows of the matrix from 0 to 3, the columns from A and then alphabetically. The cells of the matrix with known values are marked in blue, description of calculations on the text are given below.

2.2.1. Method A: the allocation of commodity from the total

Given (table 1): FTI total and for the goods. It is required to find: indices of the other goods.

Table 1. Initial data for calculations of variant A

		A	B	C	D	E	F	G	H	I
		t=0	t=1	t=0	t=1	t=0	t=1	Average price index (I^{p}_{Lps})	Volume index (I^{p}_{vlm})	Value index (I^{p}_{vl})
		Value, thousand $		Volume, unit		Price, $/unit				
0	TOTAL	S^0	S^1	-	-	-	-	$I^{p}_{Lps}{}^{0}$	$=(S^1/S^0)/I^{p}_{lps}$	$=S^1/S^0$
1	- goods 1	$s_1{}^0$	$s_1{}^1$	$q_1{}^0$	$q_1{}^1$	$p_i{}^t = s_i{}^t / q_i{}^t$		...	...	$= s_i{}^1 / s_i{}^0$
2	Other *	$=S^0 - s_1{}^0$	$=S^1 - s_1{}^1$							

Source: Authors

We carry out additional obvious calculations of the values of the indices of the average prices $p_1{}^0$ and $p_1{}^1$ (columns E and F) for goods 1 according to the formula:

$$p_i^t = s_i^t / q_i^t\ , \qquad (2)$$

where i = 1, ..., n – the quantity of goods; $p_i{}^t$ – the price of goods i in the year t; $s_i{}^t$ – the value of the commodity i in the year t.

Also for further calculations, we fill in the two line items "Other" A2 and B2 of Table 1 – these are the value of other goods in the reference and reporting years $S^0{}_{oth}$ and $S^1{}_{oth}$:

$$S^0{}_{oth} = S^0 - s_1{}^0 \ ;\ S^1{}_{oth} = S^1 - s^1{}_1\ , \qquad (3)$$

where S^0, S^1 – total value of goods in the reference and reporting years; $s_1{}^0$, $s_1{}^1$ – the value of goods 1 in the reference and reporting years.

We will also recall that the Average price index (in our case this is Laspeyres price index I^{p}_{Lps}) is calculated by the statistics according to the formula (1), Value index (I^{P}_{vlm}) is the ratio of the set values S^1/S^0 (they can also be calculated for all rows by column I of table 1). As a result, the Volume index I^{p}_{vlm} is calculated by the formula:

$$I^{p}_{vlm} = (S^1/S^0) / I^{p}_{lps} = I^{p}_{vl} / I^{p}_{lps}\ . \qquad (4)$$

Having prepared the information, we proceed to the calculation formula Laspeyres price index $I^{P}_{Lps}{}^{*}$ for the line "Other" (position L2 of Table 2). Note that Table 2 is an extension of Table 1 with hidden columns C–F and additional columns J–L.

Table 2. Calculations Laspeyres price index using method A

		A	B	G	H	I	J	K	L
		t=0	t=1	Average price index (I^p_{Lps})	Volume index (I^p_{vlm})	Value index (I^p_{vl})	Laspeyres price index		
		Value, thousand $					$p_0 * q_0$	$p_1 * q_0$	I^p_{Lps}
0	TOTAL	S^0	S^1	I^p_{Lps}	$=(S^1/S^0)/I^p_{lps}$	$=S^1/S^0$	$= S^0$	$=I^p * S^0$	$I^p_{Lps}{}^0 = G0$
1	- goods 1	$s_1{}^0$	$s_1{}^1$	...	...	$= s_i{}^1 / s_i{}^0$	$= s_1{}^0$	$= p_i{}^1 * q_i{}^0$	-
2	Other *	$=S^0 - s_1{}^0$	$=S^1 - s_1{}^1$	$I^p_{Lps}* = L2$	=I2 / G2	=B2 / A2	=J0 – J1	= K0 – K1	= K2 / J2

Source: Authors

Next we calculate the numerator and denominator (1) using the values of matrix-table 2, so that the formula for calculating Laspeyres price index $I^p_{Lps}{}^*$ for the line "Other" will be as follows:

$$I^p_{Lps}{}^* = K2 / J2 = (K0 - K1) / (J0 - J1) , \quad (5)$$

where the elements of formula (5) are the values at the intersection of the indicated columns K, J and rows 0, 1 of the matrix–table 2. Thus, the unknown indices are calculated.

2.2.2. Method B: group N of goods and calculation of the Laspeyres index of the group

Given: all the necessary indicators for a group N of goods (Table 3). It is required to find: total price and volume indices for this group.

In this case the Laspeyres index is calculated by the formula (1), taking into account the statistic values for each commodity (columns A–F) and the additional calculation of the total value of all goods of the reporting year t = 1 in the reference year prices t = 0 (cell K0 of table 3).

Table 3. Initial data and calculations Laspeyres price index using method B

		A	B	C	D	E	F	G	H	I	J	K	L
		t=0	t=1	t=0	t=1	t=0	t=1	Average price index	Volume index (I^p_{vlm})	Value index (I^p_{vl})	Laspeyres price index		
		Value, thousand $		Volume, unit		Price, $/unit					$p_0 * q_0$	$p_1 * q_0$	I^p_{Lps}
0	Total by goods	$S^0=\sum s_i{}^0$	$S^1=\sum s_i{}^1$	-	-	-	-	I^p_{Lps}	$=(S^1/S^0)/I^p_{lps}$	$=S^1/S^0$	S^0	$=\sum p_i{}^1 * q_i{}^0$	=K0/J0
1	- goods 1	$s_i{}^t$, i=1,N, t=1.2		$q_i{}^t$, i=1,N, t=1,2		$p_i{}^t = s_i{}^t / q_i{}^t$, i=1,N, t=1.2						$=p_i{}^1 * q_i{}^0$, i=1,N	
2	- goods 2												
...	.....												
N	- goods N												

Source: Authors

We note that method B can be combined with method A. As a result, we are able to analyze the indices of a certain sample and other goods in a common set of export or import goods. Obviously, it is possible, if necessary, to increase the number of groups of goods, including significant for the analysis goods in them. The calculation algorithms will be similar to methods A and B.

Also it is necessary to make appropriate changes to the formulas in Tables 2–3 (columns J and K), if for the calculation of FTI the statistical bodies the Paasche formula is used:

$$I^p_{psch} = \frac{\sum p_1 * q_1}{\sum p_0 * q_1} , \quad (6)$$

Using methods A and B listed above, the required index indicators of the tables were calculated to analyze the supply of Czech products to the Russian market.

3. Results and Discussion

3.1. Approbation of methods and discussion of results

The initial statistical basis for calculations was the data of "mirror statistics" on the import of Czech goods to the Russian market. Data source – Federal Customs Service of Russia (2018).

It should be noted that, as is known, the value of exporting Czech goods to the Russian market is represented by Czech statistics in FOB prices, while imports of goods from the Czech Republic

to Russia are represented by Russian statistics at CIF prices, which additionally include the costs of insurance and transportation of goods. According to the IMF, the world average CIF/FOB value is 1.06 (Bogdanova, 2010). For Russia the average conversion rate was 1.04 (Seltsovsky, 2004). Thus, values of the mirror flows considered by us at recalculation of the prices of SIF/FOB differ slightly. Moreover, when calculating indices, the difference between Russian and Czech statistics almost disappears, as the conversion factors for APF remain virtually unchanged due to fairly stable prices for international insurance and transportation services and their small share in the final value of production. We turn directly to the analysis of supplies of Czech goods to the Russian market.

3.2. List of Czech goods of groups 01-24: calculation of price indices and natural supplies

As the Russian customs statistics don't show FTI separately for each country, we calculated them ourselves using the Laspeyres formula (1). To calculate the average price index, the following goods were included in the list of the main goods of Czech imports of APF to the Russian market in 2015-2016. At the beginning of Table 4 the data of Czech imports to Russia for APF shown by Russian customs statistics are presented. The list of these products includes 32 items (4–digit HS code) from commodity groups (01–24), which are presented separately in 32 products in table 4, as well as the total result, including FTI calculated using the Laspeyres formula. As follows from Table 4 the list of 32 goods is more than 99% of the value of Czech imports which allows us to consider their aggregated indices as common over the country in the analysis of groups 01-24 of the Czech imports to the Russian market. Table 4 shows that, compared to 2015, the supply of Czech goods of groups 01-24 to the Russian market in 2016 by value increased by 9 percent or by $ 8.9 million. This growth was due to the growth in physical volumes (by 10.2%), which allowed, among other things, to compensate for a slight decrease in average prices (by 1.1%).

Table 4. Russian import from the Czech Republic: main goods

	HS code			2016			Indices 2016/2015			2016-2015, thous. $
				Quantity	Value, thous. $	Share	price	volume	value	
		Russian import from non-CIS countries								
		- total			162 724 500	100%	0.978	1.026	1.003	1 031 800
		- HS (01-24)			20 428 500	12,6%	0.971	0.947	0.920	-1 785 200
		Russian import from the Czech Rep.								
		- HS (01-24) from the Czech Rep.			109 323	100%	-	-	1.089	
		- share (01-24) from non-CIS			*0,54%*					
		- 32 main goods			108 393	99.3%	0.989	1.102	1.090	8 933
1	2309	Animal feed	t	13630	24 704	22.6%	**1.137**	**1.274**	**1.448**	7 648
2	0407	Birds'eggs	t	6627	21 556	19.7%	0.768	1.317	1.012	248
3	2203	Beer made from malt	l	17635211	16 301	14.9%	0.979	1.142	1.119	1 731
4	1207	Other oil seeds and oleaginous fruits	t	7376	12 011	11.0%	0.863	1.197	1.034	393
5	2208	Spirits, liqueurs and other spirituous, beverages	l	358817	3 672	3.4%	0.926	1.102	1.021	76
6	1302	Vegetable saps and extracts	t	249	3 530	3.2%	**1.451**	**1.556**	**2.258**	1 966
7	1704	Sugar confectionery (including white chocolate)	t	1392	3 375	3.1%	0.987	0.928	0.916	-310
8	1210	Hop cones	t	342	3 352	3.1%	0.974	1.239	1.207	574
9	1107	Malt, whether or not roasted	t	6230	3 343	3.1%	0.970	0.977	0.948	-182
10	2106	Other food products	l	300	2 792	2.6%	1.575	0.476	0.750	-931
11	2101	Extracts of coffee, tea or mate'	t	808	2 495	2.3%	**1.018**	**1.140**	**1.160**	344
12	1602	Other prepared or preserved meat	t	898	2 397	2.2%	0.994	0.681	0.676	-1 147
13	1905	Pastry, cakes, biscuits and other	t	401	1 826	1.7%	1.513	0.599	0.906	-190
14	1209	Seeds of a kind used for sowing	t	138	1 080	1.0%	**1.134**	**1.221**	**1.385**	300
15	0106	Live animals oth.	pcs.	2405	893	0.8%	**1.716**	**1.696**	**2.910**	586
16	1904	Prepared foods obtained	t	205	694	0.6%	1.050	0.554	0.582	-498
17	1901	Malt extract	t	221	640	0.6%	0.738	0.931	0.613	-403
18	2008	Fruit, nuts and other	t	187	510	0.5%	1.060	0.773	0.819	-113
19	2201	mineral water without sugar	l	818039	427	0.4%	1.022	0.843	0.861	-69
20	2202	Waters mineral, containing sugar	l	575304	401	0.4%	**1.013**	**1.226**	**1.242**	78
21	2206	Other fermented beverages	l	219650	328	0.3%	0.904	0.266	0.241	-1 034
22	0105	Live poultry	pcs.	421560	301	0.3%	**1.102**	**1.233**	**1.360**	80
23	2007	Jams, fruit jellies, marmalades	t	280	301	0.3%	0.807	0.720	0.581	-218
24	2209	Viengar and substitutes	l	798000	258	0.2%	0.970	1.462	1.418	76
25	1902	Pasta	t	271	225	0.2%	**1.028**	**1.726**	**1.774**	98
26	2005	Other vegetables prepared	t	141	214	0.2%	0.868	0.972	0.844	-40
27	1514	Rape	t	119	166	0.2%	1.047	0.930	0.974	-5
28	1001	Wheat	t	183	159	0.1%	1.740	0.600	1.044	7
29	2103	Sauces and preparations therefor	t	61	142	0.1%	1.059	0.726	0.769	-43
30	0208	Other meat and edible meat offal	t	40	135	0.1%	0.996	2.000	1,993	67
31	1520	Glycerol	t	240	115	0.1%	0.923	0.632	0.583	-82
32	1806	Chocolate and other food	t	11	52	0.0%	0.845	0.478	0.404	-77

Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2018.

3.3. Goods with growing value

As one example of the use of FTI, we will analyze data on goods with the largest growing value in 2016 (the last column of Table 4). In the group of selected products we include only those in which all three indices are greater than one (in Table 4 there are eight such goods, they are marked with a fill). We will include in the group with growing value five products with the largest volume of value growth and the indices of all indices are more than one. In addition, we show the position of beer as a separate line, since the increase in its value has the third result in the list–32 goods, although the average price index of 0.979 is slightly less than one.

The calculated data of Table 5 show that the five allocated goods expand their presence in the Russian market, having high competitiveness, which allows them to simultaneously increase the price and increase natural volumes of supplies. In general prices and natural supplies for selected five goods (30.2% of total imports of goods) increased by 15.6% and 29.4% respectively, which increased the value of supplies by 1.5 times or by $ 10.9 million. As a result, there was a change in the structure of imports, where the share of the five allocated goods–leaders increased from 22% in 2015 to 32.7% in 2016. In a somewhat different way, it was possible to increase the volume of beer sales – this became possible due to a small decrease in prices (by 2.1%) and growth in natural supplies (by 14.2%), with the result that the value of beer sales increased by $1.7 million for the year. The remaining 26 goods from Table 4 were able to keep the volume of natural supplies (the index of quantity is 1) only because of a fall in prices (by 5.8%), which caused a decrease in the value of sales by $3.6 million.

Table 5. Russian import of APF from the Czech Republic: goods with growing value

HS code			2016			2016-2015, thou $	Indices 2016/2015		
			Quantity	Value, thou $	Share		price	volume	value
	32 main goods			108 393	100%	8 933	0.989	1.102	1.090
	- 5 goods with growing value			32 701	30.2%	10 845	1.156	1.294	1.496
2309	Animal feed	t	13630	24 704	22.8%	7 648	1.137	1.274	1.448
1302	Vegetable saps and extracts	t	249	3 530	3.3%	1 966	1.451	1.556	2.258
2101	Extracts of coffee, tea or mate'	t	808	2 495	2.3%	344	1.018	1.140	1.160
1209	Seeds of a kind used for sowing	t	138	1 080	1.0%	300	1.134	1.221	1.385
0106	Live poultry	pcs.	2405	893	0.8%	586	1.716	1.696	2.910
2203	- Beer made from malt	l	17635211	16 301	15.0%	1 731	0.979	1.142	1.119
	- Other 26 goods			59 392	54.8%	-3 642	0.942	1.000	0.942

Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2018.

Thus, the analysis of goods from the group of unconditional sales leaders allows us to indicate their contribution to the growth of exports of goods to the market and a change in the share in exports, as well as to determine the characteristics of the indices of other goods (in our case, there was a drop in sales, comparable to a decrease in average prices).

3.4. Czech Republic, Visegrad Group, non–CIS countries: competitive positions in the Russian agricultural and food market

Table 6 shows the volumes of imports data of APF (groups 01–24) from non–CIS countries, the Visegrad Group (VG), including separately from the Czech Republic. Also, relevant indices of foreign trade are given, which for non-CIS countries are calculated by the Russian statistics, and for the other positions were calculated by us using method A. For the Czech Republic the list of main goods includes 32 items (Table 4), for the VG-countries – 139 items (due to lack of space, we do not list them), while the depth of the sample in the two lists was more than 99% (in accordance with the methodology for calculating indices, the goods delivered in one of the years only were not included in the lists).

Table 6. Russian import of agricultural products and foodstuffs (HS 01-24): trade indices

	2016		2016-2015, thous. $	Indices 2016/2015		
	Quantity	Share		price	volume	value
Russian import from non-CIS countries	20 428 700	100.0%	-1 784 900	0.971	0.947	0.920
Russian import from the Visegrad Group (VG)	702 444	3.44%	-11 452			0.984
- 139 main goods	696 788	3.41%	-8 414	1.058	0.912	0.965
Russian import from the Czech Republic	109 323	0.54%	8 791			1.087
- 33 main goods	108 391	0.53%	8 902	0.989	1.102	1.089
Russian import from non-CIS countries (without VG)	19 726 256	96.6%	-1 773 448	0.968	0.948	0.918

Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2018.

As can be seen from Table 6, in general, imports of APF from non–CIS countries decreased by 8%, while volumes of supplies decreased (by 5.3%) and average prices fell (by 2.9%). Imports of APF from VG for main goods also fell by 3.5% or $ 8.4 million, while natural supplies decreased more significantly by 8.8% than in the non-CIS countries, with an increase in average prices of 5.8%. In other words, the decline in the volume of trade of VG on the Russian market continued in 2016 and affected both cost and natural deliveries with an increase of average prices by 5.8%, while other non-CIS countries (without VG) reduced average prices by 3.2%. Of course, this situation requires a separate analysis for each of the countries of the VG.

At the same time, imports of goods from the Czech Republic, on the contrary, increased by 9%, or by almost $9 million, with an increase in physical volumes of supplies (by 10%) and almost unchanged average prices (they decreased by only 1.1%). In other words, the Czech Republic expanded the presence of its agricultural products on the Russian market, practically without reducing average prices for products. Thus, the competitive position of the Czech Republic on agricultural trade in the Russian market in terms of the ratio of changes in the "price–quantity–value" factors looks more preferable in 2015–2016 than the average for non–CIS countries (without the Czech Republic), because due to its indices the Czech Republic stands significantly higher than the average level of non–CIS countries and has an increase in sales in the Russian market, unlike the rest of the non–CIS countries, where sales decreased in value by 8.1% or $ 1.8 billion due to a 2.9% fall in the average price and a 5.4% decrease in natural supplies.

It is clear that with the availability of information, the analysis can be continued, for example, with the allocation of countries of major competitors. In addition, it can be selected another or other commodity groups. The calculation algorithms for solving these new problems will in principle be the same as in the cases considered above.

4. Conclusion

1. Foreign trade indices (FTI) are calculated using the well-known Laspeyres and Paasche formulas in aggregate form on the basis of a list of the basic export or import goods. From the point of view of foreign trade analysis, it seems interesting to solve the "reverse" problem - the disaggregation of indices, when the influence of the dynamics of changes in trade of significant goods or their groups on general trade changes, as well as on other commodities, is analyzed using statistically calculated FTI. With the help of disaggregation methods, tasks can be formulated and solved, for example, within the framework of BCG matrix classifications, as well as many others.

2. In the research the statements of two basic problems of aggregation FTI for large groups of goods taking into account their importance are considered and the methods of their solution with formulas of calculations in a table–matrix form are described. The first method of calculation allows us to calculate the total price index of group (or groups) of goods, the second method is intended for calculations of price indices of other goods out of the allocated group (or groups). It is noted that the combination of the methods considered makes it possible to select and analyze the state

of the indicators of commodity groups taking into account changes in the "price–quantity–value" factors.

3. For approbation of methods, APF from commodity groups HS 01–24 were included into the study group. For the indicated commodity group of Czech goods it was necessary to analyze the state and conditions of sales in the Russian market. On the basis of the Russian customs statistics (was chosen as the source of data for the solution of the task) calculations of the aggregated price indices for import of all Czech APF to the Russian market were made, as well as calculations with allocation of additional group of the goods which have provided the greatest expansion of sales.

4. Thus, the calculations of the indices and the analysis of the presence of Czech goods and goods of other non–CIS countries on the Russian APF market showed the following: in 2015–2016 the rest of the non–CIS countries (without the Czech Republic) reduced their sales (by 8%) due to a simultaneous fall in prices (by 3%) and volumes of sales (by 5%). At the same time, unlike the rest of the non–CIS countries, the Czech Republic was able to ensure the growth of sales of APF (by 9%) on the basis of growth in supplies (by 10%) and practically stable average prices (a decrease by 1%). Further, the analysis of the list of the main goods of Czech imports to the Russian market showed that the total growth in sales of Czech goods on the Russian APF market was provided by the group of goods of the greatest growth. These commodities have high competitive potential and increase sales volumes with simultaneous price (by 16%) and natural supplies (by 29%) increase. Although the rest of Czech goods preserved volumes of natural supplies, as a whole they reduced the value of sales due to the fall in average prices (by 6%).

In the future, with the use of FTI, we plan to conduct research on the trade of the countries of the VG with Russia in the agricultural and food market. In particular, it is supposed to analyze the state and influence of the Russian sanctions on trade of the countries, as well as assess the possibilities of restoring trade volumes by expanding sales of non-sanction goods.

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Visegrad Group: Analysis of Agricultural Trade in the Russian Market Using Mirror Statistics and Foreign Trade Indices

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Abstract: Traditionally, the analysis of a country's exports is based on national statistics. However, the analysis of the same stream on the basis of the host country's mirror statistics in the form of its imports is no less important. Statistically these flows differ (on average 5-6%) by the size of insurance and transportation expenses.
In general mirror statistics is closer to the real conditions of the sales market. This allows quantifying the competitive position insurance and transportation of foreign goods in the market of the host country taking into account prices and volumes of supplies. It's also possible to study the logistic components of commodity supplies.
In the publication trade supplies of agricultural products and foodstuffs (APF) to the Russian market from V4 on the basis of data from customs statistics of Russiawill be analyzed. The state, dynamics and prospects of trade in the conditions of Russia's sanctions for the supply of agricultural products from EU (2012-2017) will also be analyzed. Using the foreign trade indices (FTI) toolkit on the example of the Czech Republic, the possibilities of restoring and expanding exports of agricultural products from V4 to Russia after the introduction of Russian sanctions (2015-2017) will be assessed taking into account the behavior of competitive groups of goods that ensure growth and expansion of trade on the Russian market.

Keywords: export, import, agricultural products and foodstuffs, mirror international statistics, foreign trade indices

JEL Classification codes: C43, F14, Q17

INTRODUCTION

The Russian market is the largest market for sales of goods from all European countries, including for V4 countries. Therefore, a practical analysis of the state, conditions of sales and prices of goods exported to the Russian market is demanded and relevant for each country trading with Russia, including V4 countries.

Traditionally the analysis of a country's exports is based on national statistics. However the analysis of the same stream on the basis of the host country's mirror statistics in the form of its imports is no less important.

In general mirror statistics is closer to the real conditions of the sales market, as it captures the receipt of goods for sale in the domestic market of the importing country. This allows using the tools of foreign trade indices quantifying the competitive positions of foreign goods and

their dynamics in the market of the host country, taking into account prices and volumes of supplies, which are carefully fixed by the customs service for calculating budget payments.

Foreign trade indices are one of the tools for analyzing foreign trade of goods, which allows us to examine the dynamics of commodity flows, taking into account changes in average prices and physical volumes of export and import. As a rule, foreign trade indices are included in the standard data set of national statistical systems and are calculated using the well-known formulas of Laspeyres and Paasche (see, e.g., Allen, 1975; Koves, 1983). In general, at the macroeconomic level foreign trade indices describe the changes in prices and the number of deliveries of one universal commodity of the country and allow analyzing the conditions for the export and import of this commodity taking into account changes in its supply by price and quantity.

In previous publications (Yurik, 2017; Pushkin, 2018; Yurik, 2018) the possibility and features of the use of mirror statistics for the analysis of foreign trade were considered, and also methods for calculating foreign trade indices with the selection of groups of significant goods were proposed.

This publication, continuing the study of mirror statistics and index methods in the practical analysis of foreign trade, contains the analysis of a state and dynamics of APF deliveries of V4-countries (2012-2017) during imposition of sanctions of the Russian Federation on deliveries from the European Union and an assessment of the possibilities for the growth of APF sales volumes in the Russian market. The main positions of the Czech APF in the Russian market were also studied in detail with the selection of four groups of goods of growth and the assessment of the competitive positions of the main of them in other countries environment of similar goods.

1 METHODOLOGY

Mirror statistics

As known, international trade between two countries is simultaneously monitored by the customs services of these countries. The result is a two-sided display of trade data, which is commonly referred to as mirror statistics. Theoretically in mirror statistics export of goods of one country to the other one should be equal to the import of goods of the latter country from the former one, whereas import of the former country from the latter one should be equal to export of the latter country to the former one. In practice, however, the mentioned trade volumes usually differ.

First of all, this is due to the difference in prices of the recorded flows. As is known, according to customs statistics methodology (WITS, 2010), the value of exporting goods of a country A to the market of a country B is represented by statistics of country A in FOB prices, while imports of goods from country A to country B are represented by statistics of country B at CIF prices, which additionally include the costs of insurance and transportation of goods.

According to the IMF, the world average CIF/FOB value is 1.06 (Bogdanova, 2010). For Russia the average conversion rate was 1.04 (Seltsovsky, 2004). Currently, the Central Bank of Russia at the mirror comparing statistics for non-CIS countries applies coefficient 1.0588 (BOP, 2018, c.40). In general, as experts note (MASR, 2015, p.7) the reasons for the asymmetry of the data (discrepancies in the mirror statistics) should be considered separately in each case.

Regarding the accuracy of registration of exports and imports, the UN statistics experts point out that for a given country, imports are usually recorded with more accuracy than exports because imports generally revenues while exports don't (WITS, 2010).

Overall the general view on the accuracy of data collected by customs offices is that import data are more reliable than export data because customs services are more serious about recording imported goods for purposes of tariff revenue collection, taxes, and other regulatory controls (Hamanaka, 2011, p.1).

The conclusion about a smaller asymmetry of import flows of mirror statistics was practically confirmed when comparing Czech export statistics on APF and mirror statistics on the import of Czech goods to Belarus (Yurik, 2017). Indeed, the mirror data of Czech imports from Belarus and Belarusian exports to the Czech Republic had rather large differences, while data on the opposite flow to Belarus, by contrast, differed slightly.

Foreign trade indices

Foreign trade indices (FTI) are calculated by the statistics of countries using the well–known Laspeyres and Paasche formulas on the basis of data on exports and imports of goods. In Russia the Laspeyres formula is used to calculate foreign trade indices and the data source is the customs statistics (Customs statistics of the Russian Federation – database, 2018).

Denote q0, q1 – the quantity of goods in the reference and reporting years; p0, p1 – the price per unit of goods in the reference and reporting years, respectively. Foreign trade indices are aggregated and are usually calculated by the average price index Ip. The quantity index is then calculated by dividing the value index by the price index. Summation is made by the number of goods exported and imported by the country. Denote q0, q1 – the quantity of goods in the reference and reporting years; p0, p1 – the price per unit of goods in the reference and reporting years, respectively. The Laspeyres price index assumes the use of weights of the reference period and is calculated by the formula:

$$I^{p}_{lps} = \frac{\sum p_1 * q_0}{\sum p_0 * q_0}, \quad (1)$$

The statistics of foreign trade of the Russian Federation represents foreign trade indices by the total results for the country, including for the CIS countries and the non–CIS countries, and calculates foreign trade indices for the enlarged commodity sections of the HS.

For the analysis, we additionally calculated indices of 32 main Czech goods of groups 01-24 using the Laspeyres formula (1) for 2015-2017. Then, depending on the price-quantity-value indices, we divided the 32 main goods into 4 groups and calculated the corresponding group indices, as well as the indices of other goods (Pushkin, 2018; Yurik, 2018). In addition, to assess the competitive positions of separate Czech goods leaders, we used the customs statistics of the distribution of goods by importing countries and calculated the average price and share of each country in the market for the corresponding goods.

When analyzing the dynamics of APF import of V4-countries, statistical series by commodity groups 01-24 for each country from the database of the Federal Customs Service of the Russian Federation for 2012-2017 were also used (FCSR, 2018).

2 RESULTS AND DISCUSSION

2.1 Dynamics of agricultural products and foodstuffs trade of V4-countries in the mirror of Russian statistics

Trading on the Russian APF market for V4 is traditionally included in the foreign trade as one of the most popular business destinations. The share of APF trade in total V4 trade from the

Russian Federation in the last three years has remained at 6–7%, although before the introduction of Russian sanctions in 2014, it was higher (9–10%).

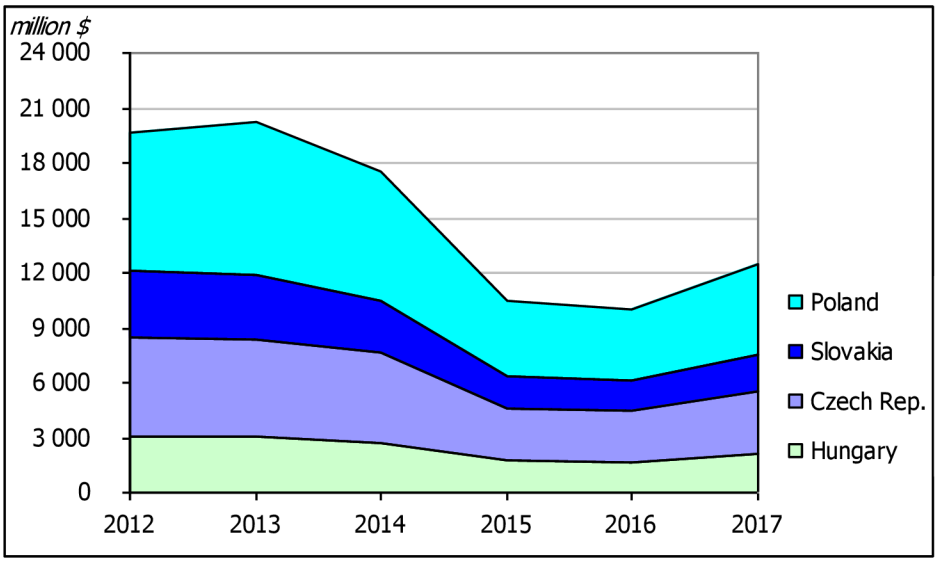
Tab. 1 Dynamics of APF supplies (HS 01-24) of V4 to the Russia Federation in 2012-2017

		2012	2013	2014	2015	2016	2017	2012	2013	2014	2015	2016	2017	2017/ 2012,%	2017-2012, million $
		Value, million $						Share, %							
V4	Total	19 646	20 189	17 583	10 418	10 055	12 428							63,3%	-7 218
	01-24	1 805,2	2 163,9	1 602,6	713,9	702,2	831,6	100%	100%	100%	100%	100%	100%	46,1%	-974
	- share, %	9,2%	10,7%	9,1%	6,9%	7,0%	6,7%								
CZECH REPUBLIC	Total	5 354	5 318	4 898	2 846	2 766	3 422							63,9%	-1 932
	01-24	124,5	134,6	154,9	100,5	109,3	125,5	6,9%	6,2%	9,7%	14,1%	15,6%	15,1%	100,8%	1
	- share, %	2,3%	2,5%	3,2%	3,5%	4,0%	3,7%								
SLOVAKIA	Total	3 715	3 538	2 864	1 760	1 666	2 007							54,0%	-1 708
	01-24	35,4	35,2	24,3	19,8	17,4	18,6	2,0%	1,6%	1,5%	2,8%	2,5%	2,2%	52,5%	-17
	- share, %	1,0%	1,0%	0,8%	1,1%	1,0%	0,9%								
HUNGARY	Total	3 103	3 007	2 740	1 715	1 662	2 091							67,4%	-1 012
	01-24	308,7	369,5	298,2	180,0	196,2	262,6	17,1%	17,1%	18,6%	25,2%	27,9%	31,6%	85,1%	-46
	- share, %	9,9%	12,3%	10,9%	10,5%	11,8%	12,6%								
POLAND	Total	7 474	8 326	7 081	4 097	3 960	4 908							65,7%	-2 566
	01-24	1 336,6	1 624,7	1 125,2	413,6	379,3	424,9	74,0%	75,1%	70,2%	57,9%	54,0%	51,1%	31,8%	-912
	- share, %	17,9%	19,5%	15,9%	10,1%	9,6%	8,7%								

Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2019

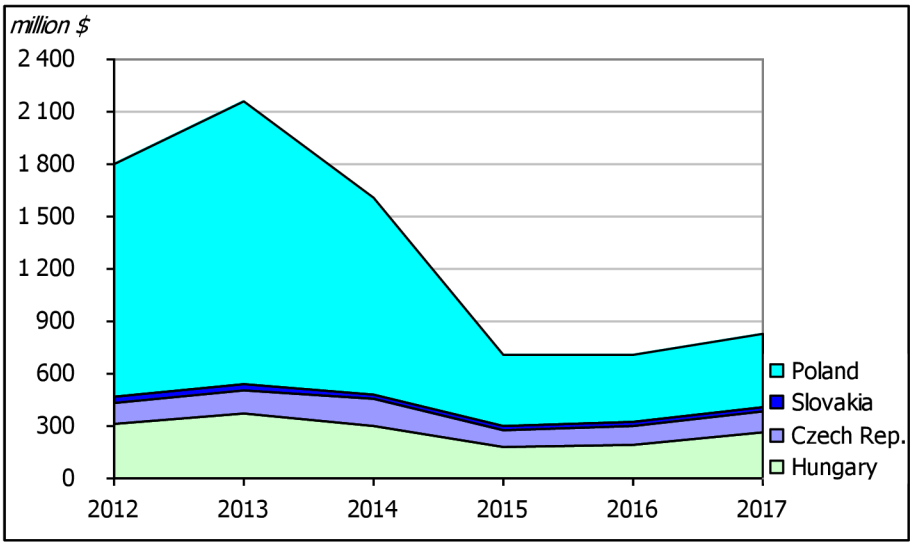
In each of the V4 countries are the following indicators. Thus, in the Czech Republic and Slovakia, APF trade in the Russian Federation in 2017 amounted to 3.7% and 0.9% of the total foreign trade with Russia, although before the introduction of Russian sanctions in the pre-crisis 2013, its share was 2.5% and 1%, respectively. APF trade is more important for Hungary and Poland, where in the general results of trade on the Russian market its share from 2013 to 2017: for Hungary, it grew from 12.3% to 12.6%; for Poland, it decreased from 19.5% to 8.7%. As follows from Table 1, in 2012–2017, the share of each country of V4 in APF deliveries to the Russian market changed as follows: for the Czech Republic - increased from 6.9% to 15.1%, for Slovakia - slightly increased from 2% to 2.2%; for Hungary, it increased significantly from 17.1% to 31.6%; for Poland, it decreased from 74% to 51.1%.

Fig. 1 Russian import from V4-countries



Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2019

Fig. 2 Russian APF (HS 01-24) import from V4



Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2019

APF trade in V4 countries, as follows from Table 1, in the considered period of 2012-2017 as a whole decreased by more than half (by 54% or 974 million dollars). The most significant reduction in the trade volume has been recorded since 2014. At this time, Russia imposed reciprocal trade restrictions on APF trade for EU countries (List of Russian counter sanctions, 2014), which led to an unprecedented reduction in the volume of supplies of V4 countries to the Russian Federation as a whole (Fig. 1), including APF supplies (Fig. 2).

Russian sanctions on deliveries to the Russian Federation had a different impact on each of the V4 countries, but everywhere in each of the countries they caused a drop in the supply of goods to the Russian market. Thus, the greatest total losses due to the sanctions were recorded in Poland. Here, from 2012 to 2017, the supply of Polish products to the Russian market as a whole declined by 34% or 2.6 billion dollars. The second place in the list of total losses was occupied by the Czech Republic with a reduction in deliveries to the Russian Federation from 2012 to 2017 by 36% or 1.9 billion dollars. In Slovakia and Hungary, total shipments to the Russian market also decreased by 46% and 32%, or by 1.7 and 1 billion dollars respectively.

As for the loss of APF supplies (Table 1), Poland was also the leader here (a decrease of 68% or 912 million dollars), while Poland's share in the APF supplies for the whole V4 significantly decreased from 74% to 51.1%. Hungary and Slovakia managed to stop the fall and get closer to the level of 2014. In Hungary, the APF supplies (Table 1) decreased by 15% or $ 46 million, and in Slovakia - by 47% or $ 17 million. At the same time, as noted above, the share of these two countries in the APF supplies structure increased all over: in Hungary - from 17.1% to 31.6%, in Slovakia - from 2% to 2.2%. We note that of the V4 countries, only the Czech Republic was able to stop the decline and in 2017 to exceed the level of APF supplies 2012 by 1 million dollars (an increase of 0.8%).

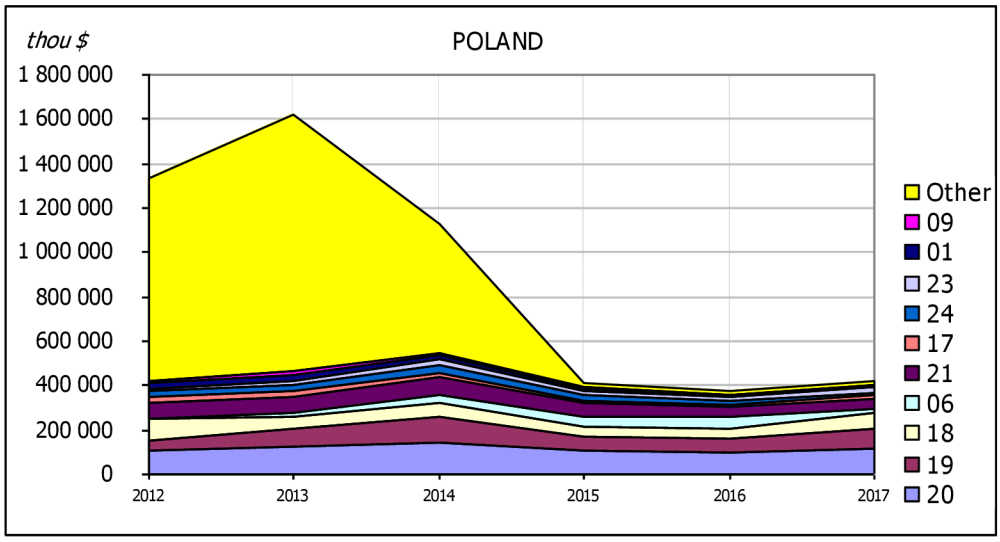
2.2 Analysis of the reduction in APF supply of V4-countries to the Russian market in 2014-2017 taking into account the sanctions restrictions on product groups

As is known the counter sanctions of Russia in the form of a list of prohibited goods (List of Russian counter sanctions, 2014) were introduced in August 2014 and included a ban on the

supply of products from EU countries and some other countries for most product subgroups (four positions of HS code) from product groups 02 (meat and offal), 03 (fish and shellfish), 04 (dairy products, birds' eggs), 07 (vegetables and roots), 08 (fruits and nuts), 16 (sausages and similar prepared foods), 19 (cheeses and cottage cheese with vegetable fats), 21 (finished products with milk and vegetable fats). In October 2017, this list was expanded at the expense of commodity group 01 (live animals) with a ban on the import of live pigs, except the purebreds. In addition, at the end of 2018, the sanctions of the Russian Federation were extended until the end of 2019.

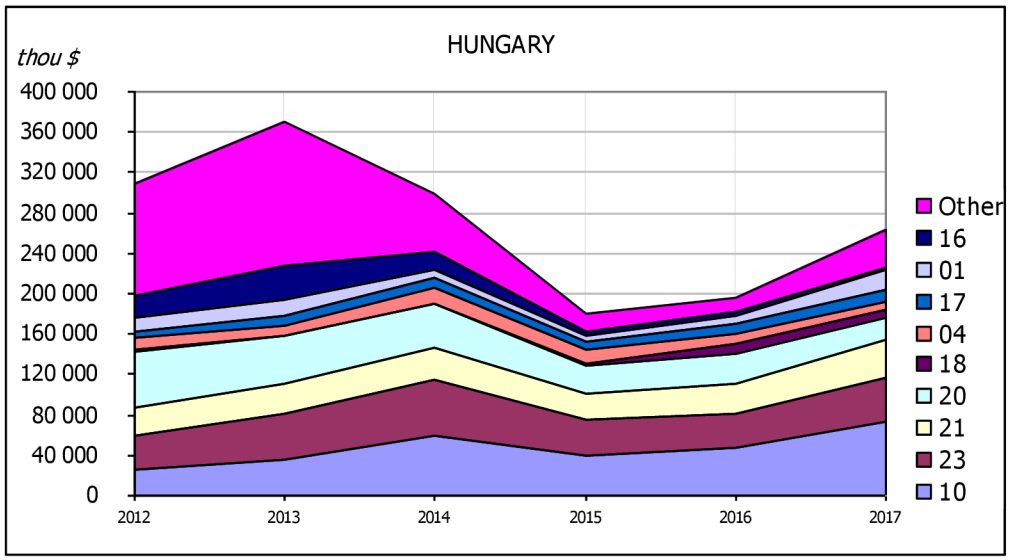
Consider how the imposed sanctions of the Russian Federation reflected on the dynamics of the value of APF supplies volumes of V4 countries by product groups 01-24 in 2014-2017. We presented these indicators graphically by V4 countries in figures 3-6.

Fig. 3 Russian APF (HS 01-24) import from V4-countries: Poland



Source: Federal Customs Service of Russia (2019)

Fig. 4 Russian APF (HS 01-24) import from V4-countries: Hungary

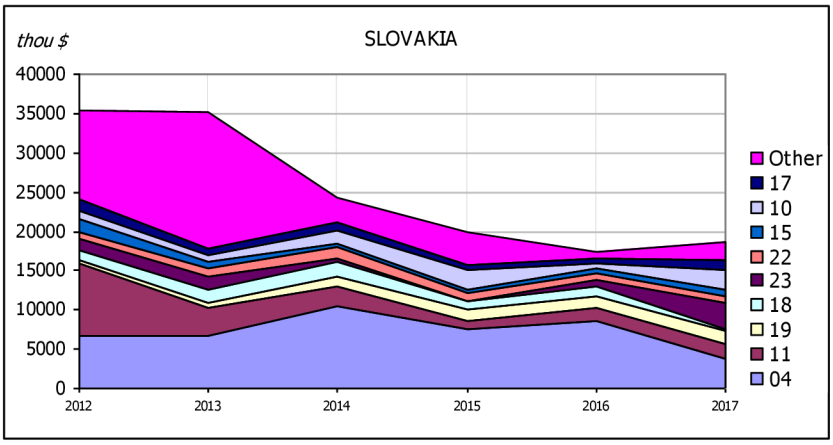


Source: Federal Customs Service of Russia (2019)

As Figure 3 shows for Poland the greatest reduction in the APF supplies falls to Other goods, which included commodity groups 04 (dairy products, birds' eggs), 07-08 (fresh fruits and vegetables) in 2012-2014. In the past three years (2015-2017), these goods have not been supplied due to the sanctions of the Russian Federation, and import from Poland have stabilized at an average level of $ 400 million. For Hungary, the largest cuts in APF supplies after the imposition of sanctions were given by Other products (Fig. 4) due to the cessation of supplies of meat and offal (from group 02). In the last three years, there has been an increase in the supply of goods from group 10 (cereals, seeds), as well as goods not included in the sanction list from groups 02 (meat and offal). We also note a noticeable increase in the supply of goods from group 01 (live animals), according to which an import ban was imposed on live pigs (subgroup 0103) in October 2017, which could affect future supply trends.

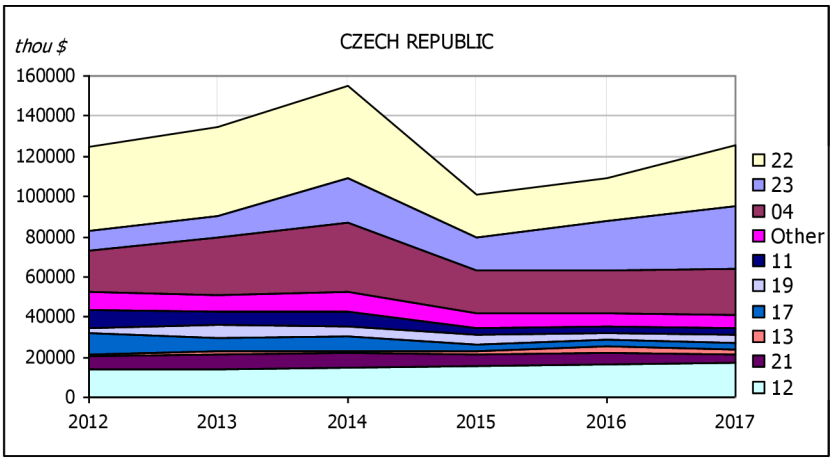
For Slovakia (Fig. 5) the Other products group was also a source of supply cuts and included sanctions groups 21 (finished products with milk and vegetable fats) and 16 (sausages and similar prepared foods). For the Czech Republic (Fig. 6), as follows from Figure 6, a noticeable reduction can be noted only in the unauthorized group 22 (alcoholic and non-alcoholic beverages), as well as in the sanction group 02 (meat and offal) with the supply of goods not included in the sanction list.

Fig. 5 Russian APF (HS 01-24) import from V4-countries: Slovakia



Source: Federal Customs Service of Russia (2019)

Fig. 6 Russian APF (HS 01-24) import from V4-countries: Czech Republic



Source: Federal Customs Service of Russia (2019)

Table 2 shows the distribution of supply reductions by APF product groups in each country of V4, while for convenience, sanctions groups are marked with a yellow fill.

Tab. 2 Changes in the volume of APF supplies of V4 countries by HS 01-24 product groups

CZECH REP.		SLOVAKIA		HUNGARY		POLAND	
HS	*2017-2012 thou $*	*HS*	*2017-2012 thou $*	*HS*	*2017-2012 thou $*	*HS*	*2017-2012 thou $*
01-24	1 010	*01-24*	-16 834	*01-24*	-46 034	*01-24*	-911 690
Reduction		Reduction		Reduction		Reduction	
22	-10 743	*11*	-7 197	*02*	-48 996	*07*	-234 032
17	-6 790	*16*	-6 021	*20*	-34 267	*04*	-113 654
11	-5 484	*04*	-2 884	*16*	-18 881	*02*	-99 586
21	-2 320	*01*	-2 814	*08*	-11 494	*03*	-99 586
01	-1 730	*18*	-1 026	*19*	-7 431	*18*	-30 042
08	-728	*15*	-705	*22*	-5 558	*21*	-24 183
16	-353	*17*	-365	*04*	-4 841	*01*	-18 582
20	-263	*21*	-174	*07*	-4 116	*16*	-11 583
07	-177	*20*	-76	*09*	-530	*17*	-10 712
18	-116	Growth		*15*	-299	*24*	-9 856
24	-35	*23*	1 648	*06*	-189	*09*	-6 829
Growth		*10*	1 511	*11*	-104	*22*	-1 460
23	21 307	*19*	1 127	Growth		*11*	-1 308
12	3 364	*22*	89	*10*	47 116	*15*	-1 217
19	1 882			*23*	21 307	*13*	-264
04	1 869			*23*	10 813	*05*	-91
13	717			*21*	9 122	Growth	
15	307			*18*	8 346	*19*	49 126
10	164			*17*	6 655	*06*	12 768
06	54			*01*	4 430	*23*	11 439
02	50			*12*	3 222	*20*	7 888
09	35			*24*	966	*12*	1 383
05	0					*10*	510
						14	62

Note: yellow highlighted product groups from the List of Russian counter sanctions, 2014.

Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2019.

First, we consider the distribution of supply reductions by product groups HS 01-24 for V4 countries (Table 2). As follows from Table 2, of course, Russian sanctions affected all V4 countries, and the volume of APF trade in 2012–2017 declined in many product groups.

Thus, in the Czech Republic, of the total amount of the reduction in APF deliveries of 28.7 million dollars in the sanctioning groups (21, 01, 08, 16, 07) the reduction amounted to 5.3 million dollars. On the other hand, in the total volume of growth in deliveries by 29.7 million dollars deliveries of sanction groups increased by 3.7 million dollars. As a result, by 2017 compared to 2012, the Czech Republic was the only V4 country able to increase by $ 1 million the volume of APF supplies to the Russian market, including through the expansion of supplies within the framework of sanctions groups by subgroups of goods that were not included in the sanctions list. Here we also mention Slovakia and Hungary, which, within the framework of sanctions groups 19, 21, 01, increased the supply of goods that were not banned.

Several different situation can be noted for Poland, where the trade reduction took place practically on all sanctions groups of the list (List of Russian counter sanctions, 2014), and growth of deliveries of not forbidden goods within sanctions groups it is not noted in general. As a result, Poland still suffers significant losses, and the volume of APF supplies to the Russian market practically does not grow.

Thus, we can conclude that Russian sanctions to one degree or another caused a reduction in APF supplies to the Russian market of all V4-countries. But some countries were forced to completely stop the supply of sanctions products (Poland), others (the Czech Republic, Slovakia and Hungary), stopping the supply of sanction goods, reoriented to the supply of other products not included in the sanction list, as well as increase the supply of goods from unsanctioned groups.

Let us consider the post-sanctional status, features and prospects of APF trade on the Russian market for the Czech Republic, taking into account the results of statistics for 2015-2017.

2.3 Deliveries of Czech APF to the Russian market: post-sanctional continuation

As can be seen in Figures 3-6, after the introduction of sanctions, the trade volumes of the V4 countries, although they have significantly decreased, but in 2015-2017 for each country stabilized at their new level. Let's consider and analyze these new realities of trade in the Russian APF market using the example of the Czech Republic, which is the only non-CIS country after the introduction of Russian sanctions in 2014 against the EU by 2018 was able to halt the decline in APF trade and exceed 2015 trade volumes. The analysis will be carried out on the basis of specific goods, the receipt of which is recorded by statistics in the customs base (FCS, 2019). For the analysis, we will use index aggregation methods within the relevant groups of goods (Yurik S., 2018; Pushkin N., 2018).

The value of APF of commodity groups 01-24 in 2015 and 2017 amounted to 100.5 and 125.5 million dollars respectively and within three years it grew by 25% or 25 million dollars. For the calculation of foreign trade indices (FTI), taking into account the requirements of the FTI calculation methodology, we generated a list of the main Czech imported goods from 32 main products, which we divided into a group of 11 products with the greatest value weight and the remaining 21 products. The first group of 11 heavyweight goods had a share in the total volume of Czech imports in 2015 and 2017, respectively, 85% and 92%. Its commodity composition is presented in Table 3 along with the calculated indices, including for the selected groups of goodsThe calculations were carried out using the algorithms discussed in detail in our publication (Yurik S., 2018; Pushkin N., 2018).

As follows from Table 3, a group of 11 main goods ensured an increase in Czech APF import in 2015-2017 in the amount of 29.8 million dollars or 35%. At the same time, the remaining goods reduced the volume of deliveries by $ 3.7 million or by 31%. As a result, the total supply of 32 main goods increased by $ 26.1 million or by 26.8%. Here the leaders were the following subgroups: 2309 (animal feed) with an increase in supplies of $ 14.1 million; supplies of 22 alcoholic and other beverages in the total amount of 10.8 million dollars - this is a subgroup of 2203 (beer) and 2208 (spirits and liqueurs); subgroup 0407 (birds' eggs) with an increase in supplies of 1.8 million dollars. The latter subgroup has good growth rates and is not yet included in the Russian sanction list (List of Russian counter sanctions, 2014), which includes quite a few subgroups of dairy products from commodity group 04.

Tab. 3 Russian APF import from the Czech Republic: set of main goods with the largest share of value

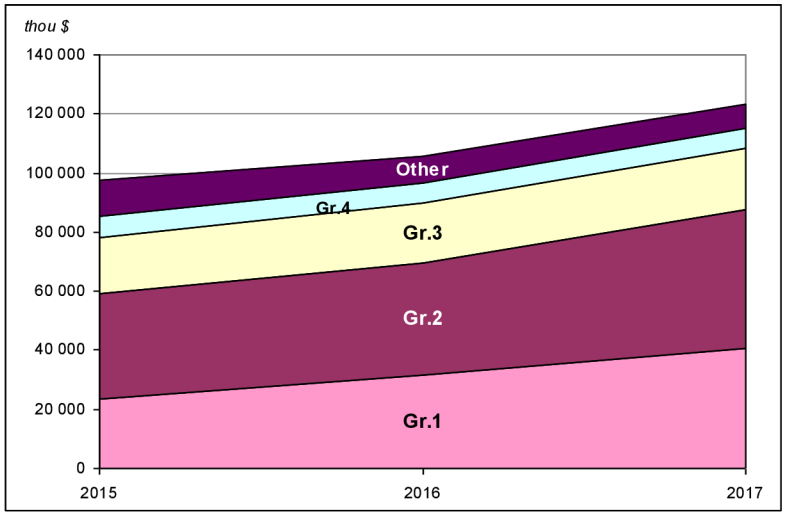
№	HS		2015		2017		2017-2015, thou $	Indices 2017/2015		
			Value, thou $	Share	Value, thou $	Share		price	volume	value
	01-24	Agricultural products and foodstuffs	100 532	100%	125 500	100%	24 968			1,248
	32 main goods		97 339	96,8%	123 429	98,4%	26 091	1,053	1,204	1,268
	- 11 main goods with the largest share of value		85 438	85,0%	115 233	91,8%	29795	1,064	1,267	1,349
1	2309	Animal feed	17 056	17,0%	31 160	24,8%	14105	1,179	1,550	1,827
2	2203	Beer	14 570	14,5%	23 814	19,0%	9244	0,933	1,751	1,634
3	0407	Birds'eggs	21 308	21,2%	23 127	18,4%	1819	0,812	1,337	1,085
4	1207	Other oil seeds and oleaginous fruits	11 618	11,6%	11 646	9,3%	27	1,009	0,993	1,002
5	2208	Spirits, liqueurs and other spirituous, beverages	3 596	3,6%	5 181	4,1%	1585	1,110	1,298	1,441
6	1210	Hop cones	2 778	2,8%	4 503	3,6%	1725	1,222	1,326	1,621
7	2106	Reparations not elsewhere specified or included	3723	3,7%	4100	3,3%	378	2,084	0,529	1,101
8	1704	Sugar confectionery (including white chocolate)	3 684	3,7%	3 568	2,8%	-116	1,093	0,886	0,968
9	1107	Malt; whether or not roasted	3 525	3,5%	3 265	2,6%	-260	0,926	1,001	0,926
10	1905	Pastry, cakes, biscuits and other bakers'wares	2 016	2,0%	2 720	2,2%	704	1,644	0,821	1,349
11	1302	Vegetable saps and extracts	1 564	1,6%	2 149	1,7%	585	1,582	0,869	1,374
	- other *21 main goods*		11901	11,8%	8197	6,5%	-3705	1,064	0,647	0,689

Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2019

We noticed that 11 heavyweight goods have different index characteristics, according to which additional groups can be formed: 1st group of goods-leaders, whose value supplies grow simultaneously with the rise in prices and quantity of goods (all indices are greater than one); 2nd group, where the value of the supply of goods is growing, but prices are falling (the average price index is less than one, the other indices are more than one); 3rd group, value deliveries of goods grow along with price increases with a decrease in volumes of supplies (quantity index is less than one, other indexes are more than one); 4th group with a final fall in value volumes (the value index is less than one, and so one of the remaining indices is also less than one).

It should be noted that the first three groups of products with a growing value provide 86% of the value of supplies with its growth compared to 2015 by $ 30.2 million. The structure of Czech APF import to Russia by selected groups is presented in Figure 7 and Table 4.

Fig. 7 Groups of Czech APF imported to Russia



Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2019

Tab. 4 Russian APF import from the Czech Republic: set of main goods with rising and decreasing of value

HS		2015		2017		2017-2015, thou $	Indices 2017/2015		
		Value, thou $	Share	Value, thou $	Share		price	volume	value
01-24	Agricultural products and foodstuffs	100 532	100%	125 500	100%	24 968			1,248
	32 main goods	97 339	96,8%	123 429	98,4%	26 091	1,053	1,204	1,268
	- 11 main goods *with the largest share of value*	85 438	85,0%	115 233	91,8%	29 795	1,064	1,267	1,349
	- GROUP 1 *(increase in price, quantity, value)*	23 430	23,3%	40 844	32,5%	17 414	1,173	1,486	1,743
2309	Animal feed	17 056	17,0%	31 160	24,8%	14105	1,179	1,550	1,827
2208	Spirits, liqueurs and other spirituous, beverages	3 596	3,6%	5 181	4,1%	1585	1,110	1,298	1,441
1210	Hop cones	2 778	2,8%	4 503	3,6%	1725	1,222	1,326	1,621
	- GROUP 2 *(increase in value, decrease in price)*	35 878	35,7%	46 941	37,4%	11 064	0,861	1,519	1,308
2203	Beer	14 570	14,5%	23 814	19,0%	9244	0,933	1,751	1,634
0407	Birds'eggs	21 308	21,2%	23 127	18,4%	1819	0,812	1,337	1,085
	- GROUP 3 *(increase in value, decrease in quantity)*	18 921	18,8%	20 615	16,4%	1 694	1,336	0,816	1,090
1207	Other oil seeds and oleaginous fruits	11 618	11,6%	11 646	9,3%	27	1,009	0,993	1,002
2106	Reparations not elsewhere specified or included	3723	3,7%	4100	3,3%	378	2,084	0,529	1,101
1905	Pastry, cakes, biscuits and other bakers'wares	2 016	2,0%	2 720	2,2%	704	1,644	0,821	1,349
1302	Vegetable saps and extracts	1 564	1,6%	2 149	1,7%	585	1,582	0,869	1,374
	- GROUP 4 *(decrease in value)*	7 209	7,2%	6 833	5,4%	-377	1,011	0,937	0,948
1704	Sugar confectionery (including white chocolate)	3 684	3,7%	3 568	2,8%	-116	1,093	0,886	0,968
1107	Malt; whether or not roasted	3 525	3,5%	3 265	2,6%	-260	0,926	1,001	0,926
	- 21 other main goods *(decrease in value)*	11 901	11,8%	8 197	6,5%	-3 705	1,064	0,647	0,689

Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2019

As shown in Table 4, by weight in the value of supplies is leading the second group of goods (beer and birds' eggs), with the most significant share (37.4%) in the total volume of APF supplies in 2017. In this group the increase in the value by 30.8% or $ 11.1 million is due to the growth in volumes with a decrease in average prices. Thus, the natural supply of beer increased by 75.1% while prices decreased by 6.7%, while the value increased by 63.4% or $ 9.2 million. Natural supply of eggs increased by 33.7%, the average price decreased by 18.8%, as a result, the value increased by 8.5% or $ 1.8 million.

Tab. 5-6 Data on price and market share of Russian import from non-CIS countries in 2017

	L	$/L	Share
2203 Beer made from malt			
non-CIS	153 835 151	1,09	100%
DE	62 968 072	1,03	41%
CZ	27 037 780	0,88	18%
BE	14 941 712	1,39	10%
LT	8 048 022	0,69	5%
GB	7 456 429	1,36	5%
IE	6 748 694	1,97	4%
MX	6 653 370	1,13	4%
CN	3 880 122	1,02	3%
KR	2 807 170	0,76	2%
FI	1 920 810	1,23	1%
NL	1 810 921	1,65	1%
PL	1 719 673	0,66	1%
JP	1 528 475	1,07	1%
US	1 513 274	1,42	1%
FR	1 461 029	0,84	1%
Other	3 339 598	1,33	2%

	t	thous, $	$/kg	Share
0407 Birds' eggs				
non-CIS	33787	178561,3	5,28	100%
NL	12444	49055,9	3,94	37%
CZ	6728	23127,1	3,44	20%
DE	6175	33516,4	5,43	18%
FR	2205	26828,3	12,17	7%
PT	1349	6390,4	4,74	4%
ES	1284	6329,8	4,93	4%
SK	1034	3840,1	3,71	3%
CA	885	12593,9	14,23	3%
HU	783	7921,6	10,12	2%
BE	247	1060,8	4,29	1%
SE	240	1117,1	4,65	1%
GB	123	5097,7	41,44	0%
IT	107	737,6	6,89	0%
DK	91	444,9	4,89	0%
PL	61	226,8	3,72	0%
IE	19	88	4,63	0%
BR	12	185,1	15,43	0%

Source: own calculations on the basis of data of the Federal Customs Service of Russia, 2019

In general, the second group of products demonstrates a good example of adaptation to market conditions, when the supply of eggs (subgroup 0407) in the sanctions group of goods 04 began to expand at affordable prices, which led to an increase in the presence of these goods on the Russian APF market. Data on price conditions and market share of natural supply of beer and eggs we present in Tables 5–6.

Thus, compared to other V4 countries, in 2017 the average price of Czech eggs deliveries was 3.44 dollars / kg lower than in other V4 countries (in Hungary, Poland and Slovakia, the price of eggs was respectively 10.12; 3.72; 3.71 dollars / kg). At the same time, in natural supplies, the share of the Czech Republic among non-CIS countries on the Russian egg import market is significantly higher than other V4 countries - 19.9% versus 2.3%, 0.2%, 3.1%, respectively, of Hungary, Poland and Slovakia. In this case, the Czech Republic occupies the second position in the Russian market of imported eggs, behind the Netherlands (37% of the market with a price of $ 3.94 / kg) and ahead of Germany (18% of the market with a price of $ 5.43 / kg). Thus, the competitive position of the Czech Republic on the Russian market for imports of eggs from non-CIS countries is the highest among the V4 countries, which determined the final result. Prospects for further growth in the supply of Czech eggs are quite optimistic and the price allows winning a large market share.

As for subgroup 2203 (beer), its position in the Russian market can be called stable, since among non-CIS countries in 2017 Czech beer occupied 18% of the market, and this is the second place after Germany (41%) with a noticeable margin from third place Belgium (10% of the market of non-CIS countries). The average beer price per liter for Germany, the Czech Republic and Belgium was 1.03; 0.88 and 1.39 dollars / l. According to our estimates, the demand for original Czech beer in the Russian market will continue with a tendency of growth in both the number of deliveries and prices, since the closest competitors from non-CIS countries have a noticeable gap in prices from the Czech Republic. In addition, it is possible to recommend the expansion of the supply of premium Czech beer. Judging by the prices for German and Belgian beer, the Russian market is ready to pay more for high-quality original beer brewed and bottled in the Czech Republic.

The 1st group combined three main products with indices greater than one. Although the share of this group (32.5%) in APF import in 2017 is less than the second group, the first group is in first place in terms of the increase in supply: its deliveries increased by 74.3% or $ 17.4 million. The leader of the first group is the subgroup 2309 (animal feed), the volume of supplies of which increased in value by 83% or 14.1 million dollars, including volumes and average prices increased by 55% and 18% respectively. This most dynamic product subgroup has good growth prospects in the Russian market, where the demand for this product is high, especially in the area of first-class modern pet food, whose production in Russia is underdeveloped or absent. Further, supplies of subgroup 2208 (spirits and liqueurs) are growing steadily, with a forecast of positive growth in value due to the consistently high demand for Czech alcohol in the Russian Federation. The next subgroup of 1210 (hop cones) has good growth prospects: the value of supply increased by 62% or 1.7 million dollars. with an increase in prices and volumes, respectively, by 22% and 33%. In the Russian import market in 2017 hops from the Czech Republic ranks second after Germany (the market share of volumes is 11% and 73%, respectively), but the price of Czech hops is higher than Germany's - $ 12.3 / ton against $ 10.4 / ton. It is clear that product quality can be different, but the issue of price as a factor in expanding the presence of Czech hop suppliers in the Russian market must be under control.

The 3rd group, consisting of four products, ensured a 9% increase in value or $ 1.7 million, with a decrease in the supply of products by 18.4% and a rise in prices by 33.6%. Here the greatest increase in value by 35% or by 0.7 million dollars was provided by the subgroup 1905 (pastry, cakes, biscuits, other bakers' wares), the prices of whose products increased 1.6 times with a decrease in supply volumes by 17.9%. Supplies of subgroup 1302 (vegetable saps and

extracts) increased by $ 0.6 million or 37.4% due to a 1.6-fold increase in prices, while supply volumes decreased by 13.1%. Subgroup 2106 (food preparations not elsewhere specified or included) was able to increase the cost of supply by 10.1% or by $ 0.4 million, with prices rising 2.1 times and reducing natural supply by almost half (48%). Subgroup 1207 (other oil seeds and oleaginous fruits) demonstrates stability: the cost increased by 0.2%, the price by 0.9%, the amount decreased by 0.7%. For the time being it is difficult to predict the future behavior of the 3rd group in view of a rather wide range of supplies within the group's goods. But one thing is for sure - this is a group of growth in supply, although more modest than in previous groups.

The 4th group combines 2 products (of the remaining 11 main ones), the value of deliveries of which in 2015-2017 decreased by 5.2% or 0.4 million dollars due to a decrease in natural supply by 6.3% and a rise in prices by 1.1%. These are the general indices of group 4, although, as follows from Table 4, the reasons for the decrease in the value of the goods are different. Thus, in terms of deliveries of subgroup 1704 (sugar confectionery), the value reduction occurred against the backdrop of rising prices (by 9.3%), while the volume of natural supplies decreased by 11.4%. At the same time, in the other product group 1107 (malt), on the contrary, the value of supply decreased by 7.4% or by 0.26 million dollars due to a decrease in prices by 7.4% with an almost unchanged volume of natural supplies. Note that the price of Czech malt in the Russian market is lower than the average for non-CIS countries ($ 0.51 / kg versus the average $ 0.52 / kg). At the same time, Czech malt occupies 10% of the non-CIS supply market, second place after Germany (20.5% at a price of $ 0.65 / kg). With proper product quality, it can be assumed that the price of Czech malt may well grow along with the cost of supply.

In general, it can be noted that Czech products of the 4th group and others (outside the four selected groups) do not have a sufficient level of competitiveness and so far do not have a noticeable impact on the overall results of APF trade on the Russian market. Here, the center of trade interests is undoubtedly concentrated in the first three groups of Czech goods (Table 4), which have significant volumes of trade and have promising growth characteristics for expanding their presence in the Russian market.

CONCLUSION

1. Traditionally the analysis of the country's exports is based on national statistics. However the analysis of the same stream on the basis of the host country’s mirror statistics in the form of its imports is no less important. In general mirror statistics is closer to the real conditions of the sales market, as it captures the receipt of goods for sale in the domestic market of the importing country. This allows using the tools of foreign trade indices quantifying the competitive positions of foreign goods and their dynamics in the market of the host country, taking into account prices and volumes of supplies, which are carefully fixed by the customs service for calculating budget payments.

2. According to the Federal Customs Service of the Russian Federation APF imports from V4 countries to Russia in 2012-2017 as a whole declined by more than half (by 54% or $ 974 million). The most significant decline in imports has been recorded since 2014. At this time Russia imposed reciprocal trade restrictions on APF trade for the EU and some other countries.

Russian sanctions had a different impact on each of the V4 countries, but in each of the countries they caused a drop in APF supply volumes to the Russian market. Here Poland was the leader (a decrease by 68% or $ 912 million). Hungary and Slovakia managed to stop the fall and get closer to the level of 2014. In Hungary APF deliveries decreased by 15% or $ 46 million, and in Slovakia - by 47% or $ 17 million. We note that of the V4 countries, only the

Czech Republic was able to stop the decline and in 2017 to exceed the level of APF supplies 2012 by 1 million dollars (an increase of 0.8%).

Analysis at the level of HS product groups showed that some countries (Czech Republic, Slovakia and Hungary), to stop supplying subgroups sanctions goods, shifted to the supply of other products not included in the sanctions list. Others (Poland) have completely stopped the supply of sanctions goods to the Russian market. However, as is known from press reports, Polish exports of apples and other vegetables and fruits are carried out to Russia through Belarus, where there are no sanctions bans on imported products and there is no customs border with Russia. In general the particularities of trade in each V4 country after the introduction of sanctions, of course, should be studied separately.

3. A detailed analysis of post-sanction trade (2015-2017) using FTI was carried out using the example of the Czech Republic. For FTI calculations, a list of the main 32 goods of Czech imports to the Russian Federation (share in the total volume of 98-99%) with data on cost and quantity was compiled. The analysis showed that the group of the main 11 products (92% of deliveries) provided an increase in deliveries by 35% or $ 30 million, and the remaining 21 goods reduced deliveries by 31% or 4 million dollars. Further, according to index characteristics, of the 11 main products, three groups of products were identified with an increase in supply (86% of supply) and one group with a reduction in supply (5%).

4. The largest weight in 2017 (37.4%) had the second group, which included subgroups 2203 (beer) and 0407 (eggs). These products successfully adapted in the post-sanction period, slightly lowering the price of the products, which made it possible to expand the volume natural supplies and obtain an increase in value. In the Russian market, these products occupy a significant market share among non-CIS countries and have prices lower than those of the main competitors from non-CIS countries. It is obvious that reducing the average price for the supply of these goods is impractical, and the average price for them should rise while maintaining product quality. In particular it is recommended to expand the supply of premium beer, which will bring the average price of Czech beer (0.88 dollars / l) closer to the average price of the closest competitors of Germany and Belgium (1.03 and 1.39 dollars/l).

The first group of growth (33% share) with price and volume indices greater than one included the leading product - subgroup 2309 (animal feed). Volumes of supply here increased in value by 83% or 14.1 million dollars, including volumes and average prices increased by 55% and 18% respectively. This most dynamic product subgroup has good growth prospects in the Russian market, where the demand for this product is high, especially in the area of first-class modern pet food, whose production in Russia is underdeveloped or absent. The growth prospects for the rest of the goods of this subgroup were positively assessed - 2208 (spirits and liqueurs) and 1210 (hop cones).

The third group with an increase in value and price and a decrease in volumes of natural supplies, included goods of subgroup with a small proportion and increase in sales, which was associated with a decrease in price and expansion in natural supplies. It is difficult to predict the behavior of goods of the third group in view of the rich assortment of its products. Here the value increase is possible due to lower prices or access to new products.

5. In conclusion noted the center of trade interests is undoubtedly concentrated in the first three groups of Czech goods, which have significant volumes of trade and have promising growth characteristics for expanding their presence in the Russian market. Czech products of the 4th group and others (outside the four selected groups) do not have a sufficient level of competitiveness and so far do not have a noticeable impact on the overall results of APF trade on the Russian market.

In further studies, we propose to continue the analysis of post-sanctioned trade of other V4 countries in the Russian APF market.

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THE POSSIBILITY OF USING MIRROR STATISTICS IN THE ANALYSIS OF CZECH EXPORTS OF AGRICULTURAL PRODUCTS AND FOODSTUFFS TO THE RUSSIAN MARKET

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Annotation: The Russian market is the largest market for sales of goods from all EU countries. Therefore, a practical analysis of the state, conditions of sales and prices of goods exported to the Russian market is demanded and relevant for each country trading with Russia. Traditionally export analysis is based on national statistics of the exporting country. However, the analysis of the same stream on the basis of the host country's mirror statistics in the form of its imports is no less important. Theoretically in mirror statistics export of goods of one country to another should be equal to the import of goods of the last country from the first and vice versa. In practice, however, the mentioned trade volumes usually differ. The asymmetry of the data is due to the difference in prices of the recorded flows, where customs statistics register the export of goods at FOB prices, and imports at CIF prices. In addition, the asymmetry of the mirror data can also be associated with various errors in determining the value, masking shadow operations and capital flight. The article presents the results of the study of the asymmetry of mirror statistics of the Czech Republic and Russia in the agricultural products and foodstuffs (APF) trade and analyzes the export of Czech APF to the Russian market using mirror statistics of Russian imports from the Czech Republic. The results of a comparative analysis of mirror data by APF product groups and then main products from these groups are discussed. Also, using the example of supplies of Czech beer, the problem asymmetry of statistics on natural supplies is considered and approaches to its possible solution are formulated.

Key words: Agriculture in International Trade, Export and import of goods, Mirror international statistics

JEL Classification: F14, Q17

1. Introduction

The Russian market is the largest market for sales of goods from all European countries, including for V4 countries. Therefore, a practical analysis of the state, conditions of sales and prices of goods exported to the Russian market is demanded and relevant for each country trading with Russia. Traditionally the analysis of a country's exports is based on national statistics. However the analysis of the same stream on the basis of the host country's mirror statistics in the form of its imports is no less important. In general mirror statistics is closer to the real conditions of the sales market, as it captures the receipt of goods for sale in the domestic market of the importing country. This allows quantifying the competitive positions of foreign goods and their dynamics in the market of the host country, taking into

account prices and volumes of supplies, which are carefully fixed by the customs service for calculating budget payments.

This publication examines the results of study of mirror statistics asymmetry for export of Czech goods to the Russian Federation (data of the Czech export statistics) and Russian mirror statistics of import in 2015-2017 to assess possibilities to apply the Russian customs import statistics for the analysis of deliveries of Czech APF goods to the Russian market.

2. Materials and Methods

As is known, international trade between two countries is simultaneously monitored by the customs services of these countries. The result is a two-sided display of trade data, which is commonly referred to as mirror statistics. Theoretically in mirror statistics export of goods of one country to the other one should be equal to the import of goods of the latter country from the former one, whereas import of the former country from the latter one should be equal to export of the latter country to the former one. In practice, however, the mentioned trade volumes usually differ.

Price factor. First of all, this is due to the difference in prices of the recorded flows. As is known, according to customs statistics methodology (World Bank, 2018), the value of exporting goods of a country A to the market of a country B is represented by statistics of a country A in FOB prices, while imports of goods from a country A to a country B are represented by statistics of a country B at CIF prices, which additionally include the costs of insurance and transportation of goods. According to the IMF, the world average CIF/FOB value is 1.06 (Bogdanova, 2010). Currently, the Central Bank of Russia at the mirror comparing statistics for non-CIS countries applies coefficient 1.0588 (BOP, 2018). In addition to the difference in prices of trade flows, the asymmetry of the mirror data can also be associated with various errors in determining the customs value of goods, masking shadow operations and capital flight. In general, as experts note (MONSTAT, 2015) the reasons for the data asymmetry (discrepancies in the mirror statistics) can be various and should be considered separately in each case using available statistical data from trading countries.

Flow registration accuracy. Regarding the accuracy of registration of exports and imports, the UN statistics experts point out that for a given country, imports are usually recorded with more accuracy than exports because imports generally revenues while exports don't (World Bank, 2018). The general view of experts on the accuracy of data collected by customs offices is that import data are more reliable than export data because customs services are more serious about recording imported goods for purposes of tariff revenue collection, taxes, and other regulatory controls (Hamanaka, 2011).

The conclusion about a smaller asymmetry of import flows of mirror statistics was practically confirmed when comparing Czech export statistics on APF and mirror statistics on the import of Czech goods to Belarus (Yurik, 2017). Indeed, the mirror data of Czech imports from Belarus and Belarusian exports to the Czech Republic had rather large differences, while data on the opposite flow to Belarus, by contrast, differed slightly.

This publication will present the results of the study of the asymmetry of the mirror flows of Czech exports to Russia and Russian imports from the Czech Republic by groups of APF goods (HS 01-24). In addition, a mirror comparison of statistics for the main Czech APF exports to Russia will be carried out and possible causes of problematic data asymmetry are estimated

using the example of beer supplies. As we know, similar studies for APF products in the Czech Republic's trade with Russia have not been conducted before.

Below we present the results of a comparison of Czech export statistics in the Russian Federation and Russian import statistics to assess the possibility of its practical use in analyzing the competitive positions of Czech goods in the Russian market. The focus of our research will be on the APF product group (HS 01-24), for which the causes of data asymmetry will be considered. The initial data of comparative studies is statistics from the UN COMTRADE database (UN COMTRADE, 2019), which is formed on the basis of customs statistics of foreign trade of Russia and the Czech Republic. The main goods of Czech imports to Russia are presented by the Federal Customs Service of the Russian Federation from its database. We note that the data of the national statistical services and the UN COMTRADE are homogeneous, since the UN COMTRADE combines the national foreign trade statistics of the countries of the world without changing them. Differences in the data are possible in view of the delay in technical adjustments, so all other things being equal, preference should usually be given to national statistics as more relevant, including the latest data refinements.

3. Results and Discussion

3.1. Total cost estimate of the asymmetry of mirror statistics of the Czech Republic and Russia for APF

Mirror comparison of the data of export and import of Czech goods to the Russian APF market showed the following (Table 1). Comparison of the general results shows that from 2015 to 2017 the cost estimate of Czech exports to Russia (prices FOB - Czech statistics) was higher than the estimate of imports to Russia from the Czech Republic (prices CIF - Federal Customs Service of the Russian Federation) by an average of 12% with a minus sign (Czech goods were exported to Russia less than Russian import statistics show). This unnatural data asymmetry requires additional analysis and indicates problems with errors in reporting and / or determining the customs value of goods that may mask shadow operations and capital flight. Such discrepancies should be studied by statisticians and customs officers in each particular case.

Table 1. Mirror comparison of APF trade data

	CIF: Russian import from the Czech Republic			FOB: Czech export to Russia			(CIF - FOB) / FOB		
HS	2015	2016	2017	2015	2016	2017	2015	2016	2017
	$			$			%		
Total	2,679,134,129	2,766,511,012	3,216,554,357	3,199,489,631	3,074,515,354	3,539,595,373	-16%	-10%	-9%
01-24	100,482,076	109,183,144	125,876,176	95,555,906	104,739,446	115,664,815	5%	4%	9%

Source: Own calculations on the basis of data UN COMTRADE, 2019

In contrast to the overall results, a mirror comparison of APF trade data (Table 1) shows a generally normal situation with an average valuation excess of CIF prices over FOB by an average of 6%, which is comparable to the ratio of 1.0588 of the Central Bank of Russia for calculating the balance of payments (BOP, 2018).

Thus, it can be concluded that, in general, the use of import statistics of the UN COMTRADE/the Federal Customs Service of the Russian Federation for the analysis of mirror data on the Czech APF trade in the Russian market is possible in view of the acceptable data difference methodology.

3.2. Main APF goods and mirror statistics asymmetry

To study the commodity composition of Czech APF exports to the Russian market, we used the results of the previous study (Yurik and Pushkin, 2018), where a list of 32 main Czech APF products with a depth of sampling of 98.4% was selected, while 11 main products accounted for over 90% of the trade volume. As noted in the indicated study, the center of trade interests is undoubtedly concentrated in the first three groups of Czech goods, which have significant volumes of trade and have promising growth characteristics for expanding their presence in the Russian market. At the same time, the first three products formed more than 60% of the value of APF goods and had excellent growth characteristics, when, at the same time as the cost of supply, their quantity and price increase (Yurik, Pushkin and Yurik, 2019). As for the asymmetry of statistical data on products from the top three (Table 2), the following results are recorded here.

Table 2. Mirror data comparison for the APF top three

		CIF/FOB			Share		
		2015	*2016*	*2017*	*2015*	*2016*	*2017*
	TOTAL	0.84	0.90	0.91			
01-24		1.05	1.04	1.09	100%	100%	100%
	11 Main goods	1.08	1.07	1.10	85%	88%	92%
	- Top 3				53%	57%	62%
2309	Animal feed	0.90	0.94	0.98	17%	23%	25%
2203	Beer	1.10	1.06	1.17	14%	15%	19%
0407	Birds' eggs	1.04	1.06	1.01	21%	20%	18%

Source: Own calculations on the basis of data of UN COMTRADE, 2019

Thus, in group 2309 (Animal feed), the value of the coefficient CIF/FOB is less than one, i.e. the value of Czech goods exported to Russia (Czech statistics) was greater than that which the Customs fixed when crossing the Russian border. By 2017 this asymmetry has steadily decreased and, in general, it can be attributed to transport losses. Additional information about the situation can be obtained only by customs directly from manufacturers. For the rest of the top three products, the average values of deviations in the value of goods in CIF prices from FOB for groups 2203 (Beer) and 0407 (Birds' eggs) remained on average within acceptable values, i.e. the cost of goods in CIF prices was higher for transportation costs and insurance within the average norms (perhaps, for beer in 2017, it is slightly more than acceptable).

Thus, a mirror comparison of data on the value of trade flows of 11 main goods and three top-leaders at the level of statistics did not reveal any noticeable problems and confirmed the possibility of using mirror statistics of Russian imports from the Czech Republic when analyzing Czech APF exports to the Russian market.

3.3. Additional possibilities of mirror statistics in analysis of APF products (on the example of beer)

As we know, statistics records not only the customs value of goods for a particular product, but also their quantity. The standard unit of measurement of physical volumes of goods at customs is kilograms. At the same time, for the convenience of calculating customs payments for certain goods, physical volumes are also recorded in additional units of measurement (liters, units, etc.). Thus, the statistics allows carrying out a mirror comparison of data not only by value, but

also by the number of traded goods. These quantitative data can be found in the additional tables of the statistical database of the Federal Customs Service of the Russian Federation.

Russian market of natural imports supplies of beer. The data on price conditions and market share of natural supply of beer and eggs are presented in Table 3.

Table 3. Data on price and market share of Russian import from non-CIS countries in 2017

	L	thous, $	$/L	Share
2203 Beer made from malt				
non-CIS	153835151	167630	1.09	100%
DE	62968072	64551	1.03	41%
CZ	27037780	23814	0.88	18%
BE	14941712	20763	1.39	10%
LT	8048022	5513	0.69	5%
GB	7456429	10128	1.36	5%
IE	6748694	13311	1.97	4%
MX	6653370	7541	1.13	4%
CN	3880122	3952	1.02	3%
KR	2807170	2124	0.76	2%
FI	1920810	2357	1.23	1%
NL	1810921	2986	1.65	1%
PL	1719673	1132	0.66	1%
JP	1528475	1636	1.07	1%
US	1513274	2154	1.42	1%
FR	1461029	1232	0.84	1%
Other	3339598	4436	1.33	2%

Source: Own calculations on the basis of data of the Federal Customs Service of Russia, 2019.

As follows from Table 3, the position of Czech beer in the Russian market can be called stable, since among non-CIS countries in 2017 Czech beer occupied 18% of the market, and this is the second place after Germany (41%) with a noticeable margin from third place Belgium (10% of the market of non-CIS countries). The average beer price per liter for Germany, the Czech Republic and Belgium was 1.03; 0.88 and 1.39 dollars/l.

According to our estimates, the demand for original Czech beer in the Russian market will continue with a tendency of growth in both the number of deliveries and prices, since the closest competitors from non-CIS countries have a noticeable gap in prices from the Czech Republic. In addition, it is possible to recommend the expansion of the supply of premium Czech beer. Judging by the prices for German and Belgian beer, the Russian market is ready to pay more for high-quality original beer brewed and bottled in the Czech Republic.

Problem data asymmetry. We will consider the possibility of detecting the problematic asymmetry of statistical data on the example of Czech beer.

As known, the Czech Republic is proud of its national drink and Czech beer is world famous. In addition, since January 2008 "Czech beer" is a protected designation of the European Union (PGI – Protected geographical indication). This sign is regarded as intellectual property and is protected by EU legislation in order to preserve the good name and quality of beer produced in the Czech Republic. In addition, the entry of the designation "Czech beer" in the EU registry provides an opportunity to protect the traditions of Czech brewing and production technology, as well as to prevent the emergence of fakes that breweries can give out for Czech beer and thereby abuse its unique qualities. According to the EU protected designation, “Czech beer cannot be considered a product made in the Czech Republic in an unconventional way or produced in the traditional way, but abroad” (Fontanka, 2008).

In further analysis, we will focus not on the value volumes of beer, but on its quantity. When comparing mirror flows, the norm is considered to be almost complete coincidence of the physical volumes of the flows. Otherwise, an additional analysis of the causes of data asymmetry is required.

Comparison of Czech exports to the Russian Federation and Russian imports from the Czech Republic on beer in quantitative terms gave the following results.

Table 4. Mirror comparison of Czech beer data (in liters)

	2015	*2017*
Russian import from the Czech Republic	15,644,571	27,061,624
Czech export to Russia	15,226,590	24,216,116
Import / Export	103%	112%
Import - Export	417,981	2,845,508

Source: Own calculations on the basis of data UN COMTRADE, 2019

As follows from Table 4, the import of Czech beer to Russia from the Czech Republic in liters was higher than the Czech export of these volumes to the Russian market: in 2015 and 2017 by 3% and 12% respectively. This unnatural asymmetry of the data indicates that, along with the original Czech beer from the Czech Republic, supposedly “Czech beer“ from other countries also enters the Russian market, while the amount of this beer is growing from year to year. As a result, in 2017, according to mirror statistics, every tenth bottle of Czech beer was delivered to the Russian market from outside the Czech Republic.

Moreover, as calculations show, in 2017 the price of a liter of original Czech export beer was $ 0.82. Beer, which passed customs under the guise of Czech, had a price of 1.22 dollars per liter, which is almost 1.5 times higher than the original Czech export beer.

The study of the reasons for the indicated asymmetry of mirror statistics by value volumes, of course, requires a separate analysis and answers to many questions for customs services and statistics. For example, why do more Czech beer enter the Russian market than are exported from the Czech Republic? Is it re-export (then the export of Czech beer is underestimated by Czech statistics) or system errors in the declaration for the purpose of exporting dubious products? How is the designation "Czech beer" protected by the EU controlled when exporting across the EU border to Russia?

These issues of data asymmetry should be in the focus of attention of the customs authorities of the two countries, in particular, to prevent the unfair use of the EU-protected name “Czech beer” and the possible spread of fakes. We plan to continue this line of research and send inquiries to the customs of the EU and Russia.

In conclusion, we can only note that our recommendations regarding the growing demand for original Czech beer in Russia, for which the consumer is willing to pay a higher price, are confirmed to an excellent degree. Indeed, the Russian consumer is already paying a high price for the dubious "Czech beer", whose supply is growing.

4. Conclusion

1. The Russian market is the largest market for sales of goods from all European countries, including for the Czech Republic. Therefore, a practical analysis of the state, conditions of sales and prices of goods exported to the Russian market is demanded and relevant. Traditionally

the analysis of a country's exports is based on national statistics. However the analysis of the same stream on the basis of the host country's mirror statistics in the form of its imports is no less important. In general mirror statistics is closer to the real conditions of the sales market, as it captures the receipt of goods for sale in the domestic market of the importing country.

2. Theoretically in mirror statistics export of goods of one country to the other one should be equal to the import of goods of the latter country from the former one and vice versa. In practice, however, the mentioned trade volumes usually differ. The asymmetry of the data is due to the difference in prices of the recorded flows. As is known, according to customs statistics methodology, the value of exporting goods of a country A is represented in FOB prices, while imports of goods at CIF prices, which additionally include the costs of insurance and transportation of goods. According to various estimates, the ratio of the value of CIF/FOB is from 4 to 10 percent. In addition, the asymmetry of the mirror data can also be associated with various errors in determining the value, masking shadow operations and capital flight.

3. Currently the general view of expert statisticians on the accuracy of data collected by customs offices is that import data are more reliable than export data because customs services are more serious about recording imported goods for purposes of tariff revenue collection, taxes, and other regulatory controls. This conclusion was confirmed by us on the example of the import of Czech APF goods to the Russian market. Here, a mirror comparison of APF trade data showed a generally normal situation with an average valuation excess of CIF prices over FOB by an average of 6%, which is comparable to the ratio of 1.0588 of the Central Bank of Russia for calculating the balance of payments for non-CIS countries. In addition, this conclusion was also confirmed at the level of comparison of data on trade of goods leading (animal feed; beer; eggs of birds), which accounted more than 60% of the value of supplies.

4. In conclusion, the study was conducted mirror comparison of data on the natural supply of Czech beer to the Russian market. The liter was chosen as the unit of measure for quantity, since customs duty and excise are levied by Russian customs per liter of beer. As a result, a problematic data asymmetry was revealed, which shows that beer exports from the Czech Republic were lower than those recorded by Russian customs as imports from the Czech Republic. This "Czech" beer occupies one tenth of the Russian market of original Czech beer. In this case, a mirror comparison of data on the trade in beer made it possible to identify problems in the export of Czech beer. These problems of non-coincidence of natural supplies of the same product need to be dealt with both by the Czech side (in order to protect the national producers of original Czech beer from its imitations) and by the Russian side (including to protect Russian consumers of beer from possible deception and fakes). In addition, in this case, in our opinion, an additional analysis of the situation with the use of the EU-protected Czech beer designation is also required.

In addition, in our opinion, questions of the use of intellectual property rights for the EU-protected PGI mark for Czech beer for export to Russia require analysis.

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Mirror Comparison of Czech Export and Russian Import Statistics: Tips for Business and Trade Policy

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Abstract: Traditionally, a country's export analysis is based on national statistics. However, analysis of the same flow based on mirror statistics of the import of the host country is no less interesting. Theoretically in mirror statistics export of goods from the origin country to a destination one should be equal to the import to destination country from the origin one. In practice the mentioned trade volumes differ due to the difference in prices and errors in determining customs value. The article proves the acceptability of using mirror statistics and presents an analysis of Czech agricultural products and foodstuffs (APF) exports to Russia based on statistics of Russian imports at the level of main goods, including beer - the leader in trade. Comparison of mirror data in liters for beer showed that Czech statistics underestimated beer exports to Russia by at least 2 million liters due to neglect of re-export. Recommendations are formulated to expand the trade of Czech APF in the Russia.

Keywords: agriculture in international trade; export and import of agricultural products and foodstuffs; mirror international statistics; protected geographical indication – PGI Czech beer

JEL Classification codes: F14, Q17, O34

INTRODUCTION

The Russian market is the largest market for sales of goods for all European countries. Therefore, a practical analysis of the state, conditions of sales and prices of goods exported to the Russian market is demanded and relevant for each country trading with Russia.

As is known, international trade between two countries is simultaneously monitored by the customs services of these countries. The result is a two-sided display of trade data, which is commonly referred to as mirror statistics. Traditionally, the analysis of a country's exports is based on national statistics. However, the analysis of the same stream on the basis of the host country's mirror statistics in the form of its imports is of undoubted practical interest.

In general mirror statistics is closer to the real conditions of the sales market, as it captures the receipt of goods for sale in the domestic market of the importing country. This allows quantifying the competitive positions of foreign goods and their dynamics in the market of the host country, taking into account prices and volumes of supplies.

Theoretically, in mirror statistics export of goods of one country to the other one should be equal to the import of goods of the latter country from the former one, whereas import of the

former country from the latter one should be equal to export of the latter country to the former one. In practice, however, the mentioned trade volumes usually differ. Such a difference in data of mirror statistics is usually called asymmetry.

What is considered normal asymmetry of mirror flows? First of all, the asymmetry of the data is associated with the difference in the prices of the recorded flows. As is known, according to customs statistics methodology (IEMD, 2018; IMTS, 2010), the value of exporting goods of country A to the market of country B is represented by statistics of a country A in FOB prices, while imports of goods from country A to country B are represented by statistics of country B at CIF prices, which additionally include the costs of insurance and transportation of goods. According to the IMF, the world average CIF/FOB value is 1.06 (DOTS, 2018, p. xii; Bogdanova & Chuplanov, 2010, p. 47), although the earlier studies used a coefficient of 1.10 (EIFRF, 2003; DOTS, 2018). Currently, the Central Bank of Russia applies coefficient 1.0588 at the mirror comparing statistics for non-CIS countries (BOPR-C, 2018, p. 1).

We also note that the permissible differences in the estimates depend on the specifics of the goods and are determined by the amount of expenses not only for transportation and insurance, but also during transportation losses, as well as calendar differences in sending and receiving goods. In general, the allowable discrepancy in estimates is usually taken equal to 6–10%, and in the future we will focus on this interval of values.

What is registered more precisely - export or import? To this question, the UN statistic experts answer that for a given country, imports are usually recorded with more accuracy than exports because imports are the main revenue base of the state budget, but exports are not (IEMD, 2018). The general view of experts on the accuracy of data collected by customs offices is that import data are more reliable than export data because customs services are more serious about recording imported goods for purposes of budget revenue from collection of customs duties, taxes (VAT, excises, etc.) and other regulatory control measures (Hamanaka, 2011, p.1; EIFRF, 2003).

The conclusion about a smaller asymmetry of import flows of mirror statistics was practically confirmed when comparing Czech export statistics on APF and mirror statistics on the import of Czech goods to Belarus (Yurik, 2017). Indeed, the mirror data of Czech imports from Belarus and Belarusian exports to the Czech Republic had rather large differences, while data on the opposite flow to Belarus, by contrast, differed within the limits of methodologically permissible norms.

1 LITERATURE REVIEW

Studies on the problems of mirror statistics are few in number, which is explained by the problems of the formation of the initial data and the difficulties in the subsequent interpretation of the results of mirror comparison of information. The main volume of publications is focused on the topic of increasing the reliability of statistics. Macroeconomic comparisons of data of the total value of trade results with the recording of the largest deviations, including between countries, prevail here (see, for example, publications of the Central Bank of Russia (BOPR-CMD, 2019; Javorsek, 2016; Valiev, 2016; SFTG, 2008; etc.)). In addition, we also note publications in which a wide mirror comparison of the value results of trade at the level of countries – trade partners of the country is carried out, including mirror comparison by product groups and rarely by selected goods (CCSKR, 2014; Troshina & Kislitsyna, 2008; EIFRF, 2007). Separately, we indicate publications related to the subject of the shadow economy, in which mirror statistics are compared at the level of specific goods to assess the volume of shadow operations (Belov & Soboleva, 2018; Soboleva, 2017, etc.).

From our point of view, the common drawback of mirror statistics research is the wide focus of research, when asymmetry studies are conducted on the almost complete composition of product groups with a comparison of values of trade, which, due to large amounts of information, makes it difficult to interpret the results, leaving comments at the level of fixing the fact of asymmetry and determining its size. In addition, data on natural supplies of goods and prices in these publications remain practically unused with the exception of single publications with an estimate of the volume of shadow trade of a particular product (see, for example, (Belov & Soboleva, 2018; Soboleva, 2017), volumes of shadow trade of Russian crab with Japan are estimated where based on mirror natural supplies).

This publication, based on data from mirror statistics of Russian imports, examines the export of Czech APF products to the Russian market. To solve this problem, the publication analyzes the acceptability of using mirror statistics for APF products from the point of view of existing methodological standards for the interval 2015-2018. The comparison of the value data of mirror statistics is at the level of all APF product groups (HS 01-24), according to the list of main products and the top three products - beer, bird eggs and animal feed. Then, the asymmetry of natural supplies is examined for the leading goods, and possible trade problems and ways to solve them are commented.

2 METHODOLOGY

The research within the designated topic included the following steps.

The APF group (HS 01-24) was at the center of the study. In order to assess the practical use of mirror statistics in analyzing of the competitive positions of Czech APF goods in the Russian market, we compared the statistics of Czech exports to the Russian Federation and statistics of Russian imports from the Czech Republic. Next, a list of imports of Czech APF goods to Russia was compiled on the basis of the Federal customs service of the Russian Federation database (FCSR, 2019), and the asymmetry of mirror statistics on the value of goods within a group of 12 basic goods with a trade volume of more than 90% was investigated. In conclusion, we compared the asymmetry of mirror statistics of natural supplies for the three leading products of Czech APF imports to Russia (more than 60% of trade) and commented on possible causes of deviations, including recommendations on the use of the intellectual property factor. The calculation interval for all indicators is 2015-2018.

The study used two databases at the same time - UN COMTRADE (general asymmetry) and FCSR (main goods). Note that the data from the two indicated databases are identical and possible minor deviations of a temporary nature are associated with technical adjustments at the level of national statistical services, which are not always promptly reflected in the UN COMTRADE database.

3 RESULTS AND DISCUSSION

3.1 Total estimate of the asymmetry of mirror statistics of the Czech Republic and Russia for APF

Mirror comparison of the data of export and import of Czech goods to the Russian market showed the following (Tab. 1). A comparison of the overall results shows that the total Czech exports to Russia (FOB prices - Czech statistics) were higher than the volumes of Russian imports from the Czech Republic (CIF prices - FCSR) by an average of 11% from 2015 to 2018.

This unnatural asymmetry of data indicates problems with errors in reporting and / or determining the customs value of goods, that may mask shadow operations, minimize taxes and capital flight, which requires additional analysis by both statisticians and customs officers when critical volumes are reached. We will narrow the focus of research and consider the supply of APF to the Russian market.

Tab. 1 Mirror comparison of APF trade data

HS	CIF: Russian import from the Czech Republic			FOB: Czech export to Russia			CIF/ FOB		
	2015	2017	2018	2015	2017	2018	2015	2017	2018
	$			$					
Total	2,679,134,129	3,216,554,357	3,775,323,696	3,199,489,631	3,539,595,373	4,116,618,162	84%	91%	92%
01-24	100,323,730	125,876,176	156,775,528	95,555,906	115,660,558	143,593,202	105%	109%	109%

Source: own calculations on the basis of data of UN COMTRADE (2019)

In contrast to the overall results, a mirror comparison of APF trade data (Tab. 1) shows a generally normal situation with an average valuation excess of CIF prices over FOB by 6-7%, which is comparable to the ratio of 1.0588 of the Central Bank of Russia for calculating the balance of payments (BOPR-C, 2018).

Thus, it can be concluded that, in general, the use of import statistics of the UN COMTRADE / the Federal Customs Service of the Russian Federation for the analysis of mirror data on the Czech APF trade in the Russian market is possible in view of methodologically permissible differences in data.

3.2 Main APF goods and mirror statistics asymmetry

Tab. 2 Russian APF import from the CR: set of main goods with the largest share of value

HS		Unit	2015			2018			2018-2015, thou $	2018/2015, %
			quantity	Value, thou $	Share	quantity	Value, thou $	Share		
01-24	Agricultural products and foodstuffs			100,532	100.0%		157,069	100.0%	56,537	156.2%
29 main goods				96,794	96.3%		154,930	98.6%	58,136	160.1%
- 12 main goods with the largest share of value				85,760	85.3%		147,868	94.1%	62,108	172.4%
2203	Beer made from malt	l	15,437,391	14,570	14.5%	39,750,351	36,629	23.3%	22,059	251.4%
2309	Preparations of a kind used in animal feeding	t	10,701	17,056	17.0%	19,853	34,769	22.1%	17,714	203.9%
0407	Birds' eggs	t	5,032	21,308	21.2%	6,386	26,204	16.7%	4,896	123.0%
1207	Oil seeds and oleaginous fruits	t	6,160	11,618	11.6%	5,673	18,193	11.6%	6,574	156.6%
2208	Spirits, liqueurs and other spirituous beverages	l	325,546	3,596	3.6%	470,140	5,708	3.6%	2,112	158.7%
1905	Bread, pastry, cakes, biscuits	t	670	2,016	2.0%	1,454	5,330	3.4%	3,313	264.3%
2106	Food preparations	t	630	3,723	3.7%	601	5,088	3.2%	1,365	136.7%
1704	Sugar confectionery not containing cocoa	t	1,500	3,684	3.7%	1,245	3,847	2.4%	163	104.4%
1210	Hop cones	t	276	2,778	2.8%	280	3,832	2.4%	1,054	137.9%
1302	Vegetable saps and extracts	t	160	1,564	1.6%	247	3,689	2.3%	2,125	235.9%
1107	Malt	t	6,375	3,525	3.5%	5,498	2,925	1.9%	-600	83.0%
2202	Waters mineral and aerated waters	l	469,206	323	0.3%	2,040,205	1,656	1.1%	1,333	512.9%
- Other (17 goods)				11,034	11.0%		7,062	4.5%	-3,972	64.0%

Source: own calculations based on the data of the FCSR (2019) using the algorithm (Pushkin & Yurik, 2018)

In order to study the product structure of Czech APF exports to the Russian market, we have compiled a list of Czech APF goods imported into Russia on the basis of data from FCS of Russia. In total, the list included 29 products with a sampling depth of 98.6% (2018). Table 2

shows the main 12 APF products (with the highest share of value) with a sampling depth of 94.1%.

As follows from Tab. 2, the center of trade interests of Czech APF exports to Russia is undoubtedly concentrated in the group of main goods, where all 12 goods had significant trade volumes, and 11 goods (except 1107 - Malt) were able to expand their presence in 2015-2018 in the Russian market. At the same time, the first three products accounted for more than 60% of the value of APF goods and had excellent growth characteristics, which allowed increasing prices and enlarging trade volumes by $ 45 million in 2015-2018, thereby providing more than 75% of the increase in value for all APF products. As for the topic of our study directly - the asymmetry of mirror statistics, the following results were recorded on the values of goods from the first three (Tab. 3).

Tab. 3 Mirror data comparison for the APF top three

HS		CIF / FOB				Share			
		2015	*2016*	*2017*	*2018*	*2015*	*2016*	*2017*	*2018*
01-24	APF	1,05	1,04	1,09	1,05	100%	100%	100%	100%
	12 Main goods	1,08	1,07	1,10	1,11	85%	89%	92%	94%
	- Top 3	1,00	1,01	1,04	1,04	53%	57%	62%	62%
2203	Beer	1,10	1,06	1,17	1,13	14%	15%	19%	23%
2309	Animal feed	0,90	0,94	0,98	0,97	17%	23%	25%	22%
0407	Birds' eggs	1,04	1,06	1,01	1,02	21%	20%	18%	17%

Source: own calculations on the basis of data of UN COMTRADE (2019)

First of all, the CIF / FOB coefficient is less than one in group 2309 (Animal feed), i.e., the value of Czech goods exported to Russia (Czech statistics) was higher than that recorded by Russian customs at the border. This asymmetry has decreased by 2018. One of the reasons may be an underestimation of the customs value of goods to reduce tax and customs payments. Only customs inspection with the help of information from suppliers of these goods to the Russian market can clarify the situation.

For group 0407 (bird eggs), the average deviations in the value of goods in CIF prices from FOB remained on average within acceptable values, that is, the prices of goods in CIF prices were higher for transportation costs and insurance within average norms.

However, the deviation coefficient was slightly higher than the permissible values (1.17 and 1.13, respectively) for group 2203 (beer) in 2017-2018. Since beer is the leader in the list of basic goods, we tried to deal with the causes of asymmetry and continued the analysis.

3.3 Additional possibilities of mirror statistics in analysis of APF products (on the example of beer)

As we know, statistics records not only the customs value of goods for a particular product, but also their quantity. The standard unit of measurement of physical volumes of goods at customs is a kilogram. At the same time, physical volumes are also recorded in additional units of measurement (liters, units, etc.) for the convenience of calculating customs payments for certain goods. Thus, the statistics allows carrying out a mirror comparison of data not only by value, but also by the number of traded goods. These quantitative data can be found in the additional tables of the statistical database of the Federal Customs Service of the Russian Federation.

Russian market of natural imports supplies of beer. The data on price conditions and market share of natural supply of beer and eggs are presented in Tab. 4.

As follows from this table, the position of Czech beer in the Russian market can be called stable, since Czech beer occupied 14% of the market among non-CIS countries in 2018, and this is the second place after Germany (41%) with a small interval from the third place for Belgium (11% of the market of non-CIS countries). In 2018, the average beer price per liter for Germany, the Czech Republic and Belgium was 0.97; 0.92 and 1.30 dollars / l respectively (1,03; 0,88 and 1,39 dollars / l – in 2017). We note that in 2018 prices for German and Belgian beer decreased by 6 and 9 cents per liter, respectively, while the price for Czech beer increased by 5 cents.

Tab. 4 Data on price and market share of Russian import from non-CIS countries in 2018

	quantity, l	thou $	share	price, $/l
2203	Beer			
non-CIS	254,529,618	267,572.7	100.0%	1.05
Germany	112,264,727	108,639.3	40.6%	0.97
Czech Republic	39,750,351	36,629.1	13.7%	0.92
Belgium	23,505,992	30,479.1	11.4%	1.30
Ireland	10,195,063	20,894.1	7.8%	2.05
United Kingdom	10,804,606	15,202.0	5.7%	1.41
Lithuania	15,338,508	10,787.1	4.0%	0.70
Mexico	9,266,565	10,347.7	3.9%	1.12
China	5,233,986	5,226.1	2.0%	1.00
Korea, Repub.Of	6,874,054	4,771.7	1.8%	0.69
Netherlands	2,798,783	4,212.1	1.6%	1.50
Finland	2,903,956	3,791.8	1.4%	1.31
France	3,236,330	3,276.6	1.2%	1.01
Other	12,356,697	13,316.0	5.0%	1.08

Source: own calculations on the basis of data of the Federal Customs Service of Russia (2019)

According to our estimates, the demand for original Czech beer in the Russian market will continue with a tendency of growth in both the number of deliveries and prices, since the closest competitors from non-CIS countries still have a price gap from the Czech Republic. In addition, it is possible to recommend the expansion of the supply of premium Czech beer. Judging by the prices for German and Belgian beer, the Russian market is ready to pay more for high-quality original beer brewed and bottled in the Czech Republic.

Problem quantitative data asymmetry. We will consider the possibility of identifying problematic mirror asymmetries of natural supplies using Czech beer as an example.

As you know, the Czech Republic is proud of its national drink, and Czech beer is world famous. In addition, "Czech beer" has been a protected designation of the European Union (PGI - protected geographical indication) since January 2008. This mark is considered intellectual property and is protected by EU law in order to preserve the good name and quality of beer produced in the Czech Republic. In addition, the entry of the designation "Czech beer" in the EU registry provides an opportunity to protect the traditions of Czech brewing and production technology, as well as to prevent the emergence of fakes that breweries can give out for Czech beer and thereby abuse its unique qualities (LB-PGICB, 2019). According to the EU protected designation, "Czech beer cannot be considered a product made in the Czech Republic in an unconventional way or produced in the traditional way, but abroad" (Czech beer, 2008).

In further analysis, we will focus not on the volume of beer, but on its quantity. When comparing mirror flows, the norm is considered to be almost complete coincidence of the physical volumes of the flows. Otherwise, an additional analysis of the causes of data asymmetry is required.

A comparison of Czech beer exports to the Russian Federation and Russian imports from the Czech Republic in quantitative terms yielded the following results.

Tab. 5 Mirror comparison of Czech beer data (in liters)

	2015	*2017*	*2018*
Russian import from the Czech Republic	15,437,391	27,061,624	39,750,351
Czech export to Russia	15,226,590	24,216,116	37,434,856
Import / Export	101%	112%	106%
Import - Export	210,801	2,845,508	2,315,495

Source: own calculations on the basis of data of UN COMTRADE (2019)

As follows from Tab. 5, the import of Czech beer to Russia from the Czech Republic was higher than the Czech export of these volumes to the Russian market: by 1%, 12% and 6% in 2015, 2017 and 2018 respectively. This unnatural asymmetry of the data indicates that along with the original Czech beer from the Czech Republic, "Czech beer" was also imported to the Russian market from other countries, and the amount of this beer is growing from year to year. As a result, according to mirror statistics, 12 bottles of Czech beer out of 100 were delivered to the Russian market from outside the Czech Republic in 2017, 6 out of 100 - in 2018 (this year's statistics will be specified). According to the calculations, the price per liter of the original Czech export beer was $ 0.87 in 2018. Czech beer imported to Russia from outside the Czech Republic in 2018 had a price almost two times higher than that of the original Czech export beer (in 2017, the price was 1,5 times higher). In general, the volume of supplies of "Czech beer" not from the Czech Republic exceeded the mark of 2 million liters per year and fixed at this level over the past two years.

Deliveries of goods from one country to another through other countries, including for sale, are not prohibited and are called re-exports. In the final country, according to the methodology of customs statistics and the rule of the country of origin, these goods are attributed to imports of the first country (in our case, Russian customs refers the volumes of beer re-export to imports from the Czech Republic to the Russian Federation). We would not question the figures of Russian statistics on beer, since these figures are repeatedly checked by the customs and tax authorities of the Russian Federation in the process of calculating customs duties, excise tax and VAT.

Czech statistics do not see these volumes, therefore, the volume of Czech beer exports to Russia is underestimated by at least 2 million liters in the Czech statistics due to the neglect of re-exports. But are Czech beer producers aware of these volumes of non-Czech imports and do they control the activities of the re-export seller of their goods? For now, we will refrain from answering this question.

Re-export very often arises as a consequence of the implementation of a regional marketing strategy with a special reduction in prices to expand sales and consolidate the market (in our case, it is possible that this is one of the EU countries). A future re-exporter buys this product and exports it abroad (in our case, to Russia). At the same time, the manufacturer-supplier of goods at a special price may not even know about the existence of a re-exporter. He will report on the successful implementation of the strategy and expand sales in the regional market (EU country), and the re-exporter will also expand his business and be proud of his personal sales

success (in our case, in the Russian market). As a result, it is precisely on the Russian market that two sellers of the same product compete, while a re-exporter has more opportunities to lower prices on this market than the original manufacturer. It is practically impossible to counteract such unfair competition, since the re-exporter acquired the goods and supplied them for export legally.

There is only one exception and that is beer is marked with a trademark (for example, the PGI designation protected in the EU - it is legally equivalent to a trademark). In this case, in the absence of permission from the copyright holder, re-export turns into parallel imports, the counteractions of which are quite well known, including in judicial practice. In this case, the copyright holder can hold the seller liable for the sale of goods through the court without his consent, followed by a ban on sales and significant fines (Losev, 2019).

The marketing services of Czech beer producers in the Czech Republic should take these trade features into account when building plans for expanding regional sales with a special product price, when lower prices for beer without PGI markings can provoke the re-export of goods (including unfair competition on the foreign market of the same the same product), and for beer with PGI marking - the organization of unauthorized parallel import by copyright holders and the distribution of counterfeit (albeit original) products.

In addition, in this particular case, we would like to know how the EU customs controls the PGI designation "Czech beer" protected in the EU when exporting across the EU border, including to Russia. Here the question arises: is the PGI mark "Czech beer" included in the register of protected goods when imported into the Russian Federation? All these issues relate to the economy of intellectual property and the solutions of them require collaboration with professional specialists in order to turn the PGI decorative trademark "Czech beer" into an active factor in international competitive advantage with a significant increase in the revenue of producers and owners of the PGI trademark "Czech beer", that already have products of high world quality and should benefit from this. The state should not stand aside either. At the state level, it is necessary to carry out work to activate the intellectual property factor in the production and export of Czech beer, so that the Czech national world-class product can earn more revenue for both the state and the copyright holders of the PGI brand, through which the traditions and secrets of the unique Czech are protected and maintained brewing.

CONCLUSION

1. The Russian market is the largest market for sales of goods from all European countries, including for the Czech Republic. Therefore, a practical analysis of the state, conditions of sales and prices of goods exported to the Russian market is demanded and relevant. Traditionally the analysis of a country's exports is based on national statistics. However, the analysis of the same stream on the basis of the host country's mirror statistics in the form of its imports is no less important. In general mirror statistics is closer to the real conditions of the sales market, as it captures the arrival of goods for sale in the domestic market of the importing country.

2. Theoretically, export of goods of one country to the other one should be equal to the import of goods of the latter country from the former one and vice versa in mirror statistics. In practice, however, the mentioned trade volumes usually differ. The asymmetry of the data is due to the difference in prices of the recorded flows. As is known, according to customs statistics methodology, the value of exporting goods of country A is represented in FOB prices, while imports of goods at CIF prices, which additionally include the costs of insurance and transportation of goods. According to various estimates, the ratio of the value of CIF / FOB is from 4 to 10 percent. In addition, the asymmetry of the mirror data can also be associated with various errors in determining the customs value, masking shadow operations and capital flight.

3. Currently the general view of expert statisticians on the accuracy of data collected by customs offices is that import data are more reliable than export data because customs services are more serious about recording imported goods for purposes of tariff revenue collection, taxes, and other regulatory controls. This conclusion was confirmed by us on the example of the import of Czech APF goods to the Russian market. Here, a mirror comparison of APF trade data showed a generally normal situation with an average valuation excess of CIF prices over FOB by an average of 6%, which is comparable to the ratio of 1.0588 of the Central Bank of Russia for calculating the balance of payments for non-CIS countries. In addition, this conclusion was also confirmed at the level of comparison of data on trade of goods leading (animal feed; beer; eggs of birds), which accounted more than 60% of the value of supplies. However, certain questions arose regarding beer, since the asymmetry slightly exceeded the permissible norms (in 2017 by 17% instead of 5-10%)

4. A mirror comparison of data on the natural supply of Czech beer to the Russian market was conducted in conclusion of the study. The comparison of mirror data showed that beer exports from the Czech Republic were lower than imports from the Czech Republic registered by Russian customs. This "Czech" beer occupied 6-10% of the Russian market of imported Czech beer in 2017-2018. First of all, this difference in the mirror data allows us to state that the volume of Czech beer exports to Russia in the Czech statistics is underestimated by at least 2 million liters due to the neglect of re-export. In addition, the problematic asymmetry of the data indicates possible problems of re-export and parallel imports of Czech beer on the Russian market, depending on whether beer is labeled with the PGI designation protected in the EU or not.

With this in mind, in the absence of PGI marking, it is recommended that the marketing services of Czech beer producers take into account the possibility of unfair competition (based on the re-export of cheaper beer) when building strategies for expanding regional sales with a special price. In the presence of PGI marking, the possibility of legislative restriction and prohibition of beer supplies from the regional market abroad at a special price due to the lack of permission of the manufacturer and at the same time copyright holder of the PGI trademark is indicated.

In general, it was noted that at the state level, it is necessary to work on enhancing the intellectual property factor in the production and export of Czech beer, so that the Czech national world-class product could earn more revenue for both the state and the PGI mark copyright producers, through which they are legally protected and the traditions and secrets of unique Czech brewing are maintained.

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