European Research Studies Journal
Volume XXVII, Issue 4, 2024

pp. 362-382

Intra-Industry Trade in Agri-Food Products: The Case of Poland and Ukraine

Submitted 11/09/24, 1st revision 21/09/24, 2nd revision 16/10/24, accepted 30/10/24

Łukasz Ambroziak[1]

Abstract:

Purpose: *The aim of the article is to compare the changes in the intensity of intra-industry trade (IIT) in agri-food trade of Poland and Ukraine, as well as changes in the structure of this trade from 2003 to 2023. Poland's membership in the European Union resulted in a dynamic increase in agri-food trade. This increase was accompanied by a growing significance of intra-industry trade, defined as the simultaneous export and import of products from the same industry. One of the factors supporting the increase in the intensity of intra-industry trade between the two countries is their participation in the process of economic integration. Since 2014, also Ukraine has been integrating with the European Single Market.*
Design/Methodology/Approach: *The intensity of IIT was measured using a simple Grubel-Lloyd index, and the division of trade into horizontal and vertical product differentiation was based on the unit value ratio in exports and imports.*
Findings: *The study found that during Poland's membership in the EU, the importance of intra-industry trade in agri-food products significantly increased, mainly due to the intensification of IIT in trade with EU countries. In contrast, intra-industry trade in Ukraine's agri-food sector had little significance. Despite Ukraine's ongoing integration with the European Single Market, IIT indicators in trade with EU countries remained very low. This was due to the underdeveloped food industry, whose products, as differentiated products, are mainly subject to intra-industry trade. Trade in basic agricultural products typically has an inter-industry character.*
Practical implications: *Increasing the intensity of intra-industry trade in agri-food products in Ukraine would allow both producers and consumers to benefit more from trade than in case of inter-industry specialization.*
Originality/Value: *The study allowed for a comparison of the intensity of intra-industry trade in agri-food products of Poland and Ukraine, thus filling a research gap in this area.*

Keywords: *Intra-industry trade, differentiated products, Poland, Ukraine*.

JEL classification: *F14, F15.*

Paper Type: *Research article.*

[1]*Assoc. Prof., Department of Agribusiness and Bioeconomy, Institute of Agricultural and Food Economics National Research Institute, Poland,*
e-mail: lukasz.ambroziak@ierigz.waw.pl;

1. Introduction

After Poland's accession to the European Union in 2004, Polish foreign trade in agri-food products grew dynamically. This significant increase was primarily due to the intensification of intra-EU trade (Ambroziak and Szczepaniak, 2016). Membership in the EU provided a new, powerful stimulus for the trade of agri-food products. The removal of all restrictions on mutual food trade, both with old and new member states, allowed food products to be freely exported to other member states' markets (Szczepaniak and Juchniewicz, 2024).

However, in order to introduce these products into the single market, it was necessary to comply with EU sanitary, phytosanitary, veterinary standards, as well as regulations regarding animal welfare and environmental protection. This required member states to take necessary actions towards full harmonization of legislation and the establishment of an effective control system.

The growth of agri-food trade was accompanied by the increasing significance of intra-industry trade (Grubel and Lloyd, 1975), defined as the simultaneous export and import of products from the same industry (Szczepaniak, 2013; Ambroziak and Szczepaniak, 2012; Ambroziak, 2014). According to theory, one of the factors supporting the increase in intra-industry trade intensity between two countries is their participation in the process of economic integration (Balassa, 1967; 1975; Falvey, 1981; Verdoorn, 1960).

This is also confirmed by research results (Kawecka-Wyrzykowska *et al.*, 2017; Ambroziak, 2012). Intra-industry trade increases the benefits of trade compared to trade based on inter-industry specialization, benefiting both producers and consumers. Static and dynamic economies of scale contribute to reducing production costs, and the increase in product variety expands existing markets (Czarny, 2002). At the same time, expanding the range of available products increases consumer choice and helps meet their diverse needs (Ambroziak, 2013).

Poland’s intra-industry trade in agri-food products has been the subject of multiple studies. Ambroziak and Szczepaniak (2012) and Szczepaniak (2013) examined Poland’s intra-industry trade in agri-food products with the world and specific country groups.

The research of Ambroziak (2014) and Kraciuk (2023) focused on Poland’s intra-industry trade in agri-food products with EU countries. Poland was also included in other studies on intra-industry trade in the Visegrád Group countries (Jambor, 2013; 2014; 2015; Kowalska *et al.*, 2021), EU member states (Bojnec and Ferto, 2016), and new EU member states (Kawecka-Wyrzykowska *et al.*, 2017).

Most studies considered the division of intra-industry trade into vertical and horizontal trade. Pawlak (2019) and Pawlak and Poczta (2019) studied the intensity

and structure of intra-industry trade between the EU countries, including Poland, and the United States. These studies indicated that Poland's EU membership contributed to an increase in the intensity of Poland's intra-industry trade in agri-food products and the evolution of the structure of this trade. The significance of low-quality vertical intra-industry trade decreased, while the importance of high-quality vertical and horizontal intra-industry trade increased.

Ukraine's integration with the European Single Market has been ongoing since April 2014, when provisions on market access liberalization from the Deep and Comprehensive Free Trade Agreement (DCFTA) between the EU and Ukraine began to apply. The DCFTA came into force on January 1, 2016. Since then, the agreement's provisions on tariff liberalization have also applied to Ukraine's imports from the EU.

Additionally, as of June 2022, autonomous trade measures were introduced for imports from Ukraine into the EU (Regulation…, 2022), effectively granting duty-free access for almost all Ukrainian goods to the EU market. Exceptions include poultry, eggs, sugar, oats, corn, groats, and honey.

From June 2024, tariffs may be imposed on imports of these products from Ukraine to the EU if the import value exceeds the average import levels recorded in the second half of 2021 and in 2022 and 2023 (Regulation…, 2024). Thus, the level of trade liberalization between the EU and Ukraine in the agri-food sector is very high, even higher than Poland's liberalization level with the European Communities before May 2004.

The aim of the article is to compare the changes in the intensity of intra-industry trade in agri-food products of Poland and Ukraine and the changes in the structure of this trade from 2003 to 2023. The novelty of the research stems from several issues. First, the author is aware of only one study that analyzed Ukraine's intra-industry trade in agri-food products (Luka and Levkovych, 2004), covering the years 1996-2002.

Luka and Levkovych (2004) used unadjusted Grubel-Lloyd indices, calculated at the HS six-digit level and then aggregated. Second, there is no study covering Poland's intra-industry trade in agri-food products for the entire period of Poland's membership in the EU. The study by Kraciuk (2023) covers the year 2022.

Pawlak (2019) and Pawlak and Poczta (2019) analyzed the years 2007-2018, but their study focused on Poland's intra-industry trade with the United States. Ambroziak's (2014) research ends in 2013. Third, using the same methodology will allow for a comparison of the intensity levels and structure of intra-industry trade in agri-food products of Poland and Ukraine and will highlight the similarities and differences between these two countries in this regard. Agri-food products here refer to products belonging to sections 01-24 of the HS classification.

Due to limitations in the availability of comparable trade data, the study covers the years 2003-2023.

The structure of the article is as follows. The first section presents selected theoretical aspects related to intra-industry trade and the research methodology. Then, the research results are discussed, characterizing the intensity of intra-industry trade of agri-food products of Poland and Ukraine. This includes IIT indicators in geographic and product terms. The following section describes the structure of intra-industry trade. The article concludes with final remarks.

2. Literature Review

The phenomenon of intra-industry trade (IIT) was first observed in the 1960s in trade between the member states of the European Economic Community (EEC). The first scholars to examine the topic of simultaneous exports and imports within the same industry were Verdoorn (1960), Balassa (1966), and Grubel (1967). A key moment in the evolution of the theory of intra-industry trade was the publication by Grubel and Lloyd in 1975.

According to them, the fundamental difference between classical trade theory and the theory of intra-industry trade lies in the latter's focus on products that are close substitutes in terms of consumption, production, or both. Grubel and Lloyd (1975) were the first to highlight increasing returns to scale in production and distribution under conditions of imperfect competition as a cause for the development of intra-industry trade.

The presence of increasing returns to scale allows firms to reduce unit costs as production increases. This may lead to the oligopolization of the economy, where one company specializes in certain types of goods while foregoing others, despite consumer demand for various types of products.

Grubel and Lloyd (1975) also introduced the first classification of intra-industry trade flows based on the types of products involved. They distinguished between trade in differentiated products and homogeneous products. Intra-industry trade mainly involves differentiated products, including:

1) products similar in terms of production processes but different from a consumption perspective (e.g., tar and gasoline);
2) products similar in terms of consumption purpose but different in production techniques (e.g., wooden and metal furniture);
3) products similar both in production techniques and consumption purposes (e.g., Volkswagen and Renault cars). The share of homogeneous products in intra-industry trade is small and includes re-exporting, border trade (bulk goods), cyclical trade, and trade in strategic goods.

The publication by Grubel and Lloyd (1975) sparked considerable interest in intra-industry trade. The existence of this type of trade contradicted classical trade theory, which associates trade between two countries with differences in their factor endowments. The nature of this phenomenon was first explained by Krugman (1979; 1980), Lancaster (1980), and Helpman (1981), who associated intra-industry trade with monopolistic competition and product differentiation.

The complex nature of intra-industry trade has so far made it difficult to create a single model that explains all flows of this type of exchange. This creates challenges in identifying factors influencing the intensity of intra-industry trade. Individual models explain only certain trade flows. Generally, the theoretical literature explaining the existence of IIT can be divided into two groups, vertical intra-industry trade (VIIT) and horizontal intra-industry trade (HIIT).

Finger (1975), Lipsey (1976), Falvey (1981), Falvey and Kierzkowski (1987), Shaked and Sutton (1984), and Flam and Helpman (1987) introduced the model of vertically differentiated products in intra-industry trade. According to them, intra-industry trade in goods of different quality can be explained by traditional comparative advantage theories, that is, by differences in factor endowments between two countries.

Additionally, some VIIT models take into account the phenomenon of production fragmentation. In this approach, intra-industry trade includes simultaneous exports (imports) of parts and accessories, finished goods, or a combination of finished goods and parts and accessories. Significant contributions to the theory in this area were made by Jones and Kierzkowski (1990), Arndt and Kierzkowski (2001), and Cheng and Kierzkowski (2001).

In contrast to VIIT, horizontal intra-industry trade (HIIT) cannot be explained by traditional theories of comparative advantage. The HIIT model is typically analyzed under conditions of monopolistic competition. The theory explains that horizontal intra-industry trade involves the exchange of goods of similar quality but differentiated in other attributes that may be important to consumers (e.g., country of origin, color, taste, packaging type, etc.).

Two theoretical approaches to these issues can be distinguished: the ideal product model (Lancaster, 1980; Helpman, 1981) and the love for variety model (Krugman, 1979, 1980; Dixit and Norman, 1980). The concept of ideal product assumes that different consumers have different preferences for alternative varieties of a given commodity and each consumer prefers one variety to all others.

If all goods from a group are accessible and at the same unit price, the consumer will seek to purchase the one favourite variety which is the closest to the ‘ideal product’. In other words, consumers want to buy the good which has the most ‘ideal’ characteristics to them. In turn, the concept of love of variety consists in the idea that

consumers want to buy many varieties of products and gain welfare from the amount of variety.

From the perspective of the conducted analysis, the distinction between horizontal and vertical intra-industry trade is crucial. Greenway, Hine, and Milner (1994) used the ratio of unit export prices to unit import prices as the criterion for this division. This choice was justified by the fact that differences in prices (unit value) reflect differences in quality.

Products with similar unit values should be treated as similar products. Assuming perfect information, a variant of a product sold at a higher price must be of higher quality than one sold at a lower price (Greenway, Hine, and Milner, 1994). Stiglitz (1987), however, argues that even under conditions of imperfect information, a product's price reflects its quality. Fontagné and Freudenberg (1997) also refer to unit value as a measure of quality. An alternative method for dividing intra-industry trade into horizontal and vertical was presented by Azhar and Elliott (2006).

The absence of a single model that explains the existence of all intra-industry trade (IIT) flows makes the range of factors influencing IIT intensity quite extensive. One of the factors contributing to the development of IIT is the process of economic integration between two trading countries, often measured by the average level of tariffs. Intra-industry trade typically involves differentiated products.

The demand for these products is more price-elastic than for those traded according to inter-industry specialization (Balassa, 1967; Falvey, 1981; Bergstrand, 1990). Differentiated products, therefore, have many substitutes (Falvey, 1981). Thus, within IIT, it is easier to replace a more expensive (due to customs duties or other barriers) imported product with a less costly domestic variant than in the case of inter-industry trade.

Moreover, IIT goods are produced in industries that benefit from increasing economies of scale (the larger the market, the lower the unit cost of production), which encourages price reductions and market expansion following the removal of trade barriers. Instead of producing every product, companies from individual countries can specialize in producing a smaller range of goods and exchange them, allowing consumers access to a wide variety of products.

In this way, a country can benefit from economies of scale while consuming a range of differentiated products. Consequently, a lower level of customs barriers, leading to reduced prices for domestically produced goods, will promote market expansion and increase the potential for IIT development (Lancaster, 1980; Krugman, 1979).

3. Methodology

The intensity of intra-industry trade was measured by a simple Grubel-Lloyd index,

computed on the basis of bilateral trade flows at 4-digit HS (*Harmonised System*) code level. One of the reasons for selecting this index was the fact that it was the most frequently used measure in such analyses. In addition, the application of bilateral (rather than multilateral) trade eliminates the phenomenon of the so-called geographical bias in the measurement of intra-industry trade. Then the GL indices were aggregated using two variables, i.e.: trading partner *k'* and industry *i*, in accordance with the following formula:

$$GL_t^k = 1 - \frac{\sum_{k'=1}^{K'} \sum_{i=1}^{N} \left| X_{i,t}^{kk'} - M_{i,t}^{kk'} \right|}{\sum_{k'=1}^{K'} \sum_{i=1}^{N} \left(X_{i,t}^{kk'} + M_{i,t}^{kk'} \right)} \quad (1)$$

where:

GL_t^k– the GL index between country *k* and its trading partner *k'* in year t;
$X_{i,t}^{kk'}$– exports from country *k* to country *k'* of product group *i* (here: 4-digit HS code level) in year t;
$M_{i,t}^{kk'}$– imports of country *k* from country *k'* of product group *i* (here: 4-digit HS code level) in year t;
N – denotes the number of product groups in the agri-food products in trade between countries k and k',
K' – the total number of trading partners of country *k*.

The *GL* index takes on values from the interval <0;1>. The higher it is the greater the share of intra-industry trade between two countries.

The division into intra-industry trade in horizontally differentiated products (offering diverse products of the same quality) and intra-industry trade in vertically differentiated products (offering the same products or very close substitutes of different quality) was made in accordance with the concept developed by Greenaway, Hine and Milner (1994), subsequently modified by Fontagné and Freudenberg (1997).

Intra-industry trade was divided into horizontal and vertical IIT on the basis of the so-called unit values of specific products. It is based on the assumption that differences in the price (the so-called unit value) reflect differences in quality.
Horizontal intra-industry trade (HIIT) is considered to be IIT satisfying the following criteria:

$$\frac{1}{1+\alpha} \leq \frac{UV_i^x}{UV_i^m} \leq 1 + \alpha \quad (2)$$

whereas vertical intra-industry trade (VIIT) is IIT where the following conditions are met:

$\frac{UV_i^x}{UV_i^m} < \frac{1}{1+\alpha}$ (VIIT low quality) (3)

or $\frac{UV_i^x}{UV_i^m} > 1 + \alpha$ (VIIT high quality) (4)

where:

UV_i^x – the unit value of exports of product group *i*,
UV_i^m – the unit value of imports of product group *i*,
α – the deviation of relative unit values in exports ($\frac{UV_i^x}{UV_i^m}$) It is assumed that α = 0.15.

4. Research Results and Discussion

4.1 General Tendencies in IIT

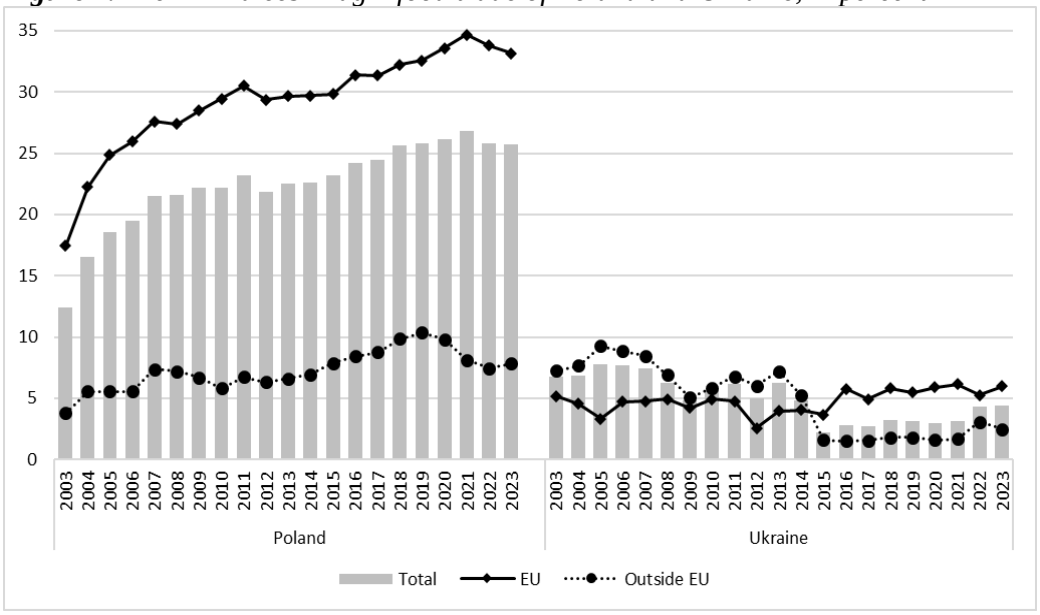
Between 2003 and 2023, the intra-industry trade index for agri-food products in Poland more than doubled, increasing from 12.4% to 25.7%. This means that in 2023, over a quarter of Poland's agri-food trade was intra-industry nature. The significance of intra-industry trade grew particularly rapidly in the early years of Poland's membership in the EU. From 2003 to 2007, the IIT index rose by 9.1 percentage points, from 12.4% to 21.5%.

These changes were mainly a result of Poland's accession to the EU and the increase in intra-industry trade intensity with EU countries. During this period, the IIT index for trade with these countries increased from 17.4% to 27.6%. Following Poland's accession, there was a complete liberalization of trade in agri-food products with EU countries.

The trade of these products was already largely liberalized during the pre-accession period, mainly due to agricultural agreements made in 2000 and 2002 (Niemczyk and Władyniak, 2004). However, until May 1, 2004, tariff quotas and customs barriers still restricted the export of certain goods (e.g., poultry), along with various administrative requirements and border controls.

The necessity to meet formal requirements, such as obtaining licenses, paying guarantees, and acquiring preferential status, often discouraged exporters and importers from utilizing customs preferences in trade (Kaliszuk et al., 2005). Among the other new member states, selective and limited liberalization applied to goods from CEFTA countries, namely the Czech Republic, Slovakia, Hungary, and Slovenia. Lithuania and Latvia also benefited from preferences in importing agri-food products into Poland. Estonia, Cyprus, and Malta were essentially not covered by liberalization in agri-food trade (Kaliszuk, 2009).

Figure 1. *The IIT indices in agri-food trade of Poland and Ukraine, in percent*



Note: *EU without UK during the whole period 2003-2023.*
Source: *Author's calculations based on WITS-Comtrade.*

According to theory, the participation of two countries in the process of economic integration promotes an increase in the intensity of intra-industry trade (Balassa, 1967; 1975; Falvey, 1981; Verdoorn, 1960). Differentiated products have more substitutes than homogeneous products. They are also typically produced in industries characterized by increasing returns to scale.

This means that the larger the market, the lower the unit production cost (Falvey, 1981). Therefore, the expansion of the market and, as a result, the increase in the potential for intra-industry trade will be favored by tariff liberalization and the removal of non-tariff barriers, which occurred with Poland's accession to the EU.

From 2007 to 2011, the IIT index grew more slowly, and in 2012, it experienced a decline. Between 2012 and 2021, the intensity of IIT in agri-food trade increased again, with the IIT index rising by 5 percentage points during this period. In 2021, which marked a record in terms of IIT intensity, as much as 26.8% of Poland's agri-food trade was classified as intra-industry trade.

However, between 2022 and 2023, there was again a slight decrease in the IIT index, dropping to 25.7%. Changes in the IIT indices for Poland's agri-food trade primarily depended on the developments in the IIT intensity for trade with EU countries. These indices were several percentage points higher than in trade with the world. In 2023, about one-third of Poland's agri-food trade with EU countries was characterized as intra-industry trade.

However, a study by Kraciuk (2023) indicated that in 2022, as much as 78% of Poland's total agri-food trade and 79% of its agri-food trade with EU countries were classified as intra-industry trade. Such significant discrepancies arise from the calculation method adopted by Kraciuk.

The IIT indices were not calculated bilaterally and then aggregated, but were derived from aggregate data such as total agri-food exports and imports with EU countries. Additionally, the calculations were based on data at the SITC section level, or even aggregates that summed sections 0 (food and live animals), 1 (beverages and tobacco), and 4 (oils and fats).

In the examined period, trade in agri-food products of Ukraine showed different trends. The highest IIT indices for these products were recorded between 2003 and 2007, reaching nearly 8%. From 2008 to 2014, the IIT indices were lower, oscillating around 5-6%. Until 2014, the intensity of IIT in trade with non-EU countries was greater than in trade with EU countries.

A significant drop in the intra-industry trade intensity for agri-food products in Ukraine occurred in 2015, when only 2.2% of Ukraine's agri-food trade was characterized as intra-industry trade. This decline resulted from a reduction in IIT intensity in trade with non-EU countries. Despite the observed increase in the IIT index since 2016, it remains at a very low level. In 2023, only 4.4% of Ukraine's agri-food trade was classified as intra-industry trade.

The process of Ukraine's integration with the European single market, observed since 2014, has not resulted in a noticeable increase in the significance of intra-industry trade in agri-food products with EU countries. From 2014 to 2023, the IIT index increased from 4.1% to just 6%.

The low intensity of IIT primarily resulted from Ukraine's specialization in the export of basic agricultural products, such as grains (wheat, corn), oilseeds (soybeans, sunflowers), oils (soybean oil, sunflower oil), and by-products from oil extraction (including cake and meal) (Szajner, Szczepaniak, Łopaciuk, 2024).

This specialization is inter-industry in nature and has clearly deepened in the second half of the first decade of the 21st century, particularly in trade with non-EU countries. Between 2004 and 2009, the share of grains, oilseeds, oils, and cakes in Ukraine's exports increased from 50% to 71%. In the second decade of the 21st century, Ukraine's specialization in the export of basic agricultural products continued to deepen.

From 2021 to 2023, grains, oilseeds, oils, and cakes accounted for about 85% of Ukraine's agri-food exports. Thus, the limited impact of Ukraine's integration with the European single market on intra-industry trade is a result of its poorly developed food industry (Hamulczuk *et al.*, 2023; Cherevko, 2024).

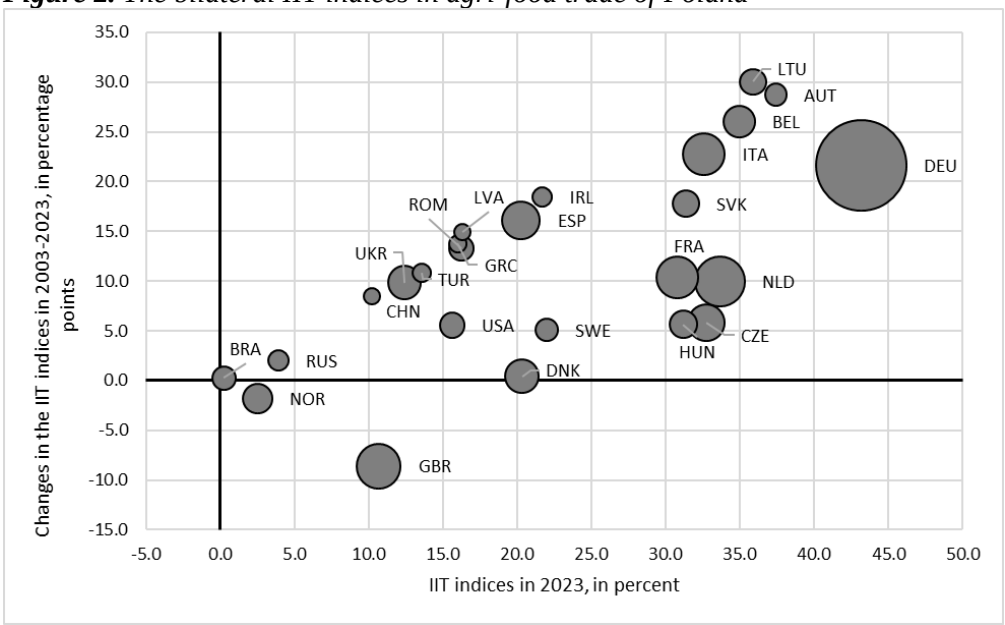
According to theory, intra-industry trade mainly involves differentiated products, which are produced in the food industry. Furthermore, the IIT of agri-food trade with EU countries had a limited impact on the overall value of the IIT indices in Ukraine's agri-food trade because, until 2021, the EU's share in Ukraine's agri-food exports did not exceed 30%. The EU only became a significant recipient of Ukrainian goods in 2022-2023, during which over 55% of Ukraine's agri-food exports were directed to the EU market.

4.2 Bilateral IIT Indices

In 2003, Poland recorded the highest IIT indices with the Czech Republic and Hungary, at 27% and 26% respectively. The significant intensity of IIT could be attributed to the similarity in consumer demand between these countries. According to Linder's theory (1961), the more equal the per capita incomes of two trading nations, the more similar their demand structures, leading to more comparable consumer preferences.

Countries with similar buyer demand structures will produce similar groups of commodities for both domestic and foreign markets. High IIT intensity in agri-food products also characterized trade between Poland and the Netherlands (24%), Germany (22%), France and Denmark (20%), and the UK (19%).

Figure 2. *The bilateral IIT indices in agri-food trade of Poland*



Note: *The size of the bubble is proportional to the share of a given country in trade turnover in 2023.*
Source: *Author's calculations based on WITS-Comtrade.*

From 2003 to 2023, the intensity of IIT in Poland's agri-food trade with nearly all major trading partners increased, with the exceptions being the UK and Norway. The most significant gains in IIT were seen in trade with Lithuania (an increase of 30 percentage points), Austria (29 pp.), Belgium (26 pp.), Italy (23 pp.), Germany (22 pp.), as well as Slovakia, Spain, Ireland, Greece, France, and the Netherlands (several-point increases).

The rise in IIT intensity in trade with EU-15 countries was a result of decreasing differences in per capita income between Poland and these nations. Krugman (1980) and Lancaster (1980) argue that per capita income levels approximate consumer willingness to purchase horizontally differentiated products. Helpman and Krugman (1985) assert that higher per capita income correlates with a higher capital-to-labor ratio in the domestic factor endowment, enhancing the ability to produce differentiated goods and thus increasing the potential for intra-industry trade growth.

There was a notable increase of nearly ten percentage points in the significance of IIT in Polish-Ukrainian agri-food trade. This growth may be attributed to the implementation of the EU-Ukraine free trade agreement, which liberalized mutual trade in agri-food products. The decline in IIT intensity in trade with the UK resulted from its exit from the European Single Market in 2021. Even in 2020, 23% of Poland's agricultural trade with the UK was intra-industry, but this share dropped to 13% in 2021.

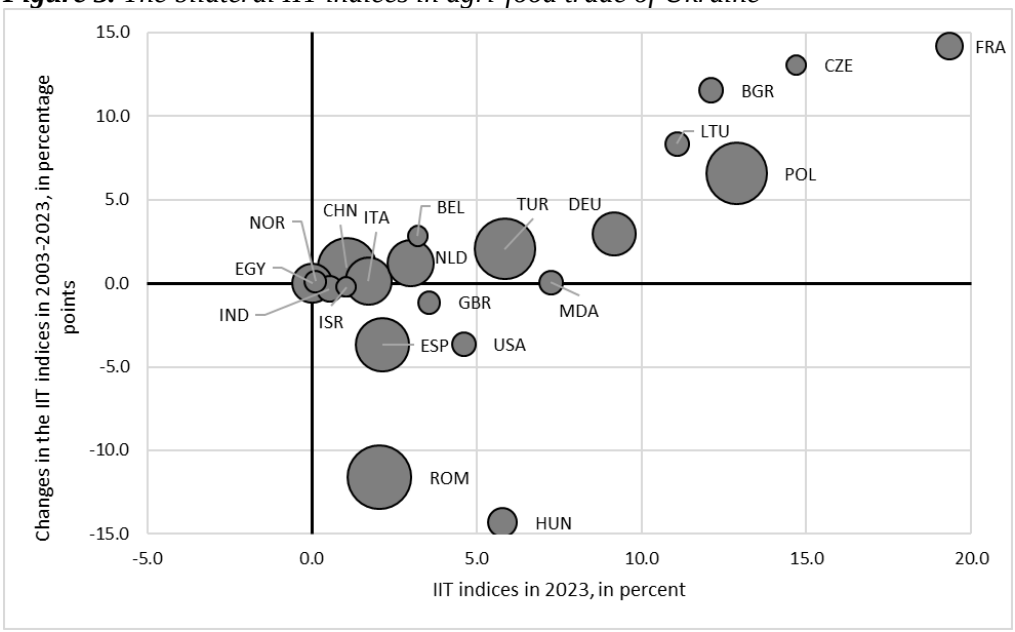
As a result of these changes, in 2023, as much as 43% of Polish-German agri-food trade was classified as intra-industry. High IIT rates were also recorded in agricultural trade between Poland and Austria (37%), Lithuania (36%), Belgium (35%), the Netherlands (34%), the Czech Republic and Italy (33%), as well as Hungary, Slovakia, and France (31%).

Throughout the analyzed period, intra-industry trade was marginal in Poland's agri-food trade with Norway, Brazil, and Russia. The IIT indices obtained are therefore lower than the bilateral indices calculated by Kraciuk (2023), who used aggregated data based on SITC sections for his calculations.

In 2003, Ukraine had the highest IIT rates in agri-food trade with Hungary and Romania, with intra-industry trade comprising 20% and 14% of agricultural trade with these countries, respectively. IIT indices between 5-8% were noted in Ukraine's agri-food trade with the USA, Moldova, Poland, Germany, Spain, and France.

From 2003 to 2023, the intensity of intra-industry trade with most of these countries decreased, but it notably increased in trade with France, Poland, and Germany. In 2023, over 19% of Ukraine's agri-food trade with France, 13% with Poland, and 9% with Germany was intra-industry nature.

Figure 3. *The bilateral IIT indices in agri-food trade of Ukraine*



Note: *The size of the bubble is proportional to the share of a given country in trade turnover in 2023.*
Source: *Author's calculations based on WITS-Comtrade.*

During the studied period, intra-industry trade gained significance in Ukraine's agri-food trade with several EU member states, including the Czech Republic (IIT index of 14.7% in 2023), Bulgaria (12.1%), and Lithuania (11.1%). A study by Luka and Levkovych (2004) indicated that in 2002, less than 3% of Ukraine's agricultural trade was intra-industry.

The highest indices were observed in trade with the Commonwealth of Independent States (7%) and the Baltic States (2%). In trade with Central and Eastern European countries, as well as EU-15 countries, IIT indices were below 2%. Luka and Levkovych (2004) point out that high IIT intensity is a result of specific characteristics of the trading countries involved, such as: close geographical proximity, similar level of per capita income, similar level of development, similar consumer tastes, language, culture, institutional, political and transport links.

4.3 IIT by Commodity

The analysis of IIT intensity for agri-food products at the four-digit HS (Harmonized System) classification level revealed that intra-industry trade were predominant in Poland's trade of several processed product groups. In 2023, these included animal feed (HS 2309) at 71%, chocolate products (HS 1806) at 58%, sugar confectionery (HS 1704) at 57%, and other food preparations, including dietary supplements and protein substances (HS 2106) at 54%. High IIT indices were also recorded in the

trade of cheeses and curds (HS 0406) at 48%, food preparations made from flour, groats, meal, starch, or malt extracts (HS 1901) at 45%, other processed tobacco (HS 2303) at 42%, and pastry and bakery products (HS 1905) at 41%. These products were generally close substitutes, primarily due to their utility value. Consumers' purchasing decisions were influenced by individual, specific attributes such as origin, taste, shape, or packaging.

Intra-industry trade also occurred within less processed agricultural products, though on a notably smaller scale. For example, 16% of pork trade was intra-industry in 2023. Similarly, around 16% of fish fillet trade and 9% of fresh or chilled beef trade were intra-industry.

Occasionally, agricultural raw materials were involved in intra-industry trade, particularly regarding re-exported products (e.g., importing coffee beans and exporting roasted coffee) or cyclical trade (importing grains before harvest and exporting after harvest, or complementary imports of vegetables and fruits during winter).

In Ukraine, intra-industry trade on a larger scale was limited to certain processed products. In 2023, the product groups with the highest IIT intensity included pastry and bakery products (HS 1905, IIT index of 46%), sugar confectionery (HS 1704, 36%), waters and non-alcoholic beverages (HS 2202, 29%), vodka and other spirits (HS 2208, 23%), chocolate products (HS 1806, 18%), and fruit and vegetable juices (HS 2009, 18%).

In the trade of grains, oilseeds, oils, or cakes, IIT indices were close to zero. Intra-industry trade had a few percent significance in the trade of low-processed products, such as poultry and animal feed. Similar conclusions regarding the period from 1996 to 2002 were reached by Luka and Levkovych (2004).

The highest IIT indices at that time were noted in the trade of cereal products, flour and groats, beverages, fish, and seafood, as well as processed meat and fish. Inter-industry specialization was dominant in product groups such as grains, fats and oils, meat, and fruits and nuts. The use of a different calculation method by Luka and Levkovych (2004) than in the current study precludes a comparison of the obtained IIT indices.

4.4 Structural Pattern of the IIT

During Poland’s membership in the EU, the dynamic increase in the intensity of intra-industry trade in agri-food products was not accompanied by any significant changes in the structure of this type of trade. There were no clear trends in the evolution of the structure and it was often unstable.

After accession, intra-industry trade in agri-food products of Poland was dominated

by trade in vertically differentiated products. This means that one variant of a given good exhibits greater intensity of a certain characteristic compared to another or possesses additional properties. Vertical varieties are associated with the supply side of the market (Finger, 1975).

Improving product quality requires additional investments, which leads to an increase in the unit price of that product. Unlike horizontal product differentiation, in a vertically differentiated model, consumers have identical tastes (Falvey and Kierzkowski, 1987). Given that price increases with quality, and every consumer desires the highest attainable quality product, the choice of a specific product variant depends on consumer income.

This choice does not stem from a preference for diversity but from differences in income levels. Consequently, differences in unit prices between exports and imports were significant enough to indicate disparities in the quality of traded products (Falvey, 1981; Flam and Helpman, 1987).

The majority of vertical IIT involved agri-food products of relatively higher quality, meaning that Poland exported products of relatively better quality and imported products of relatively lower quality. The share of high-quality vertical IIT fluctuated between 40-50% of total IIT, while low-quality vertical IIT oscillated around 30-40%.

The remaining portion of intra-industry trade consisted of horizontally differentiated products (approximately 20-25% of total IIT in agri-food products). Horizontal product differentiation occurs when individual variants of products have the same quality but differ in other characteristics, such as taste, color, country of origin, or packaging. Examples include bottled beer versus canned beer or Georgian wine versus French wine.

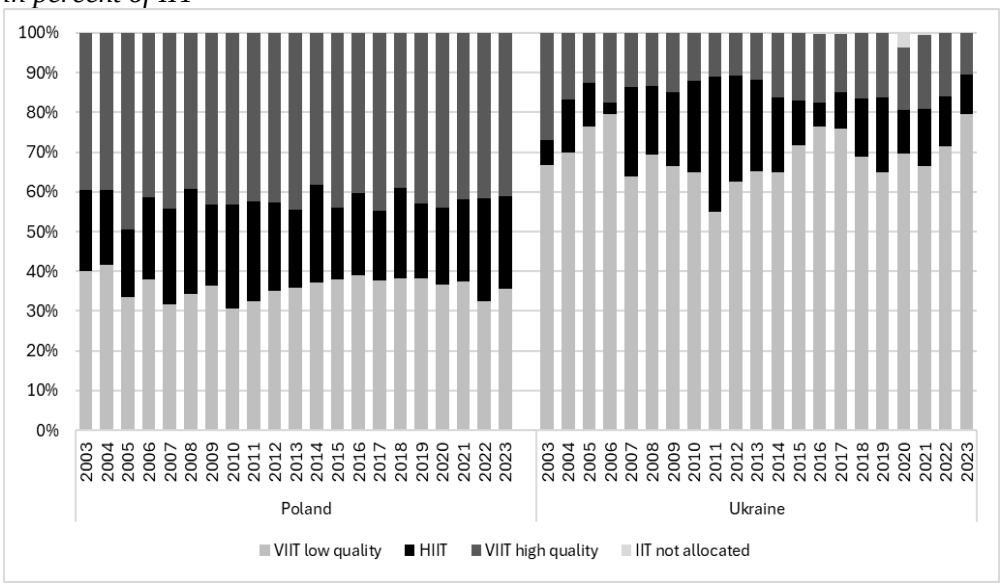
Intra-industry trade involving horizontally differentiated products is primarily analyzed under conditions of monopolistic competition (Krugman, 1979; Lancaster, 1980). Increasing economies of scale in production and consumers' preference for diversity encourage producers in an open economy to increase production and specialize in a single variant of a product. Through intra-industry trade, these product variants become available to consumers at a lower price.

Evaluating the structural composition of Ukraine's intra-industry trade in agri-food products and changes in this structure is challenging due to the relatively minor significance of this trade. During the analyzed period, vertical intra-industry trade of low quality predominated, accounting for approximately 55-80%.

This indicated that Ukraine exported products of relatively low quality while importing products of relatively high quality. This type of exchange is characteristic of a country with a low level of economic development and a relatively

underdeveloped food industry, which undoubtedly applies to Ukraine (Bułkowska and Bazhenova, 2023). The remaining portion of intra-industry trade consisted of horizontally differentiated products (where their share exceeded 20% of total IIT from 2007 to 2013) and high-quality vertically differentiated products.

Figure 4. *The structural pattern of the IIT in agri-food trade of Poland and Ukraine, in percent of IIT*



Source: *Author's calculations based on WITS-Comtrade.*

5. Conclusions, Proposals, Recommendations

From the comparison of intra-industry trade intensity in agri-food products of Poland and Ukraine, several conclusions can be drawn. Firstly, during Poland's membership in the EU, the significance of intra-industry trade in agri-food products with EU countries noticeably increased.

The IIT index rose from 17.4% in 2003 to 33.2% in 2023. Given the dominant role of the EU in trade, these results translated into overall agri-food trade, with one-quarter being intra-industry in nature by 2023. Poland's membership in the EU contributed to this increase in IIT.

Secondly, Ukraine's integration process into the European single market, observed since 2014, has not resulted in a significant increase in the importance of intra-industry trade in agri-food products with EU countries. From 2014 to 2023, the IIT index increased from 4.1% to just 6%.

The low intensity of IIT was primarily due to Ukraine's specialization in exporting basic agricultural products, such as grains (wheat, corn), oilseeds (soybeans,

sunflowers), oils (soybean, sunflower oil), and by-products from oil extraction (including meal and cake). It was only from 2022 that the EU gained significant importance as a recipient of Ukrainian goods.

Thirdly, the growth of intra-industry trade intensity in agri-food products in Ukraine is contingent upon the development of the food industry. Intra-industry trade primarily involves differentiated products, which are produced in food processing plants. As long as Ukraine does not develop a robust food industry, the benefits for producers and consumers arising from intra-industry exchange will remain limited.

Fourthly, the high level of development of the Polish food industry is evidenced by the relatively significant share of high-quality vertical intra-industry trade in the IIT structure. This indicates that Poland exports variants of goods that are of better quality than those it imports.

The level of development of the food industry is also reflected in the relatively significant role of intra-industry trade in horizontally differentiated products, meaning products of similar quality but differing in other consumer-relevant characteristics, such as origin, color, or packaging.

A limitation of this study is the ability to compare the obtained IIT indices with those from other authors, which is due to the different methods of calculating IIT indices. The choice of method essentially boils down to selecting the appropriate classification of trade data and the level of detail of that data.

It is also important to consider whether the IIT indices were calculated bilaterally or not. Typically, IIT indices are calculated based on a three-digit level of aggregation in the SITC classification or a four-digit level in the HS classification. A higher level of data aggregation can yield inflated results.

There is no doubt that further research is needed on intra-industry trade in agri-food products of Poland and Ukraine. In particular, it would be important to compare the intensity of intra-industry trade in agri-food products across other EU countries. An assessment of how the structural composition of intra-industry trade differs across various product groups would also be significant.

This would help identify which product groups have relatively higher export prices than import prices, indicating competition in foreign markets based on product quality.

Another important research direction would be to identify the factors driving intra-industry trade growth and determine the direction and scale of their impact on intra-industry trade in agri-food products in EU countries, including Poland. There exists a research gap in this area in the literature.

References:

Ambroziak, Ł. 2012. FDI and Intra-Industry Trade: Theory and Empirical Evidence From the Visegrad Countries. International Journal of Economics and Business Research, 4(1/2), 180-198. https://doi.org/10.1504/IJEBR.2012.044252.

Ambroziak, Ł. 2013. Wpływ bezpośrednich inwestycji zagranicznych na handel wewnątrzgałęziowy państw Grupy Wyszehradzkiej. Warszawa: IBRKK.

Ambroziak, Ł. 2014. Intra-Industry Trade in Agri-Food Products of Poland With the European Union. In: I. Szczepaniak (Ed.), Assessment of the competitiveness of Polish food producers in the European Union (pp. 70-85). Multi-Annual Programme 2011-2014, 126.1. Warsaw: IAFE-NRI.

Ambroziak, Ł., Szczepaniak, I. 2012. Ocena wskaźnikowa konkurencyjności handlu produktami rolno-spożywczymi. In: I. Szczepaniak (Ed.), Monitoring i ocena konkurencyjności polskich producentów żywności (2). Program Wieloletni 2011-2014, 40. Warszawa: IERiGŻ-PIB. Multiannual Programme 2011-2014, 40. Warszawa: IAFE-NRI.

Ambroziak, Ł., Szczepaniak, I. 2016. Handel zagraniczny produktami rolno-spożywczymi Unii Europejskiej. Studia BAS, 4(48), 193-223. https://orka.sejm.gov.pl/WydBAS.nsf/0/12603DC559AB589CC125809E003F5382/$file/Strony%20odStudia_BAS_48-8.pdf.

Arndt, S., Kierzkowski, H. 2001. Fragmentation. New Production Patterns in the World Economy. Oxford University Press.

Azhar, A.K.M., Elliott, R.J.R. 2006. On the Measurement of Product Quality in Intra-Industry Trade. Review of World Economics, 142(3), 476-495. https://doi.org/10.1007/s10290-006-0077-5.

Balassa, B.B. 1966. Tariff Reductions and Trade in Manufactures Among Industrial Countries. American Economic Review, 56(3), 466-473.

Balassa, B. 1967. Trade Liberalisation Among Industrialized Countries: Objectives and Alternatives. New York: McGraw-Hill.

Balassa, B. 1975. Trade Creation and Diversion in the European Common Market. In: B. Balassa (Ed.), European Economic Integration. Amsterdam: North-Holland.

Bergstrand, J.H. 1990. The Heckscher-Ohlin-Samuelson Model, the Linder Hypothesis and the Determinants of Bilateral Intra-industry Trade. The Economic Journal, 100(403), 1216-1229. https://doi.org/10.2307/2233969.

Bojnec, S., Ferto, I. 2016. Patterns and Drivers of the Agri-Food Intra-Industry Trade of European Union Countries. International Food and Agribusiness Management Review, International Food and Agribusiness Management Association, 19(2), 53-74. https://ageconsearch.umn.edu/record/234956/?v=pdf. Czy https://www.researchgate.net/publication/301754271_Patterns_and_Drivers_of_the_Agri-Food_Intra-Industry_Trade_of_European_Union_Countries.

Bułkowska, M., Bazhenova, H. 2023. Direct and Indirect Consequences of the War in Ukraine for Polish Trade in Agri-Food Products. Zagadnienia Ekonomiki Rolnej/Problems of Agricultural Economics, 376(3), 66-90. https://doi.org/10.30858/zer/170892.

Cheng, L., Kierzkowski, H. (eds). 2001. Globalization of Trade and Production in South-East Asia. New York: Kluwer Academic Press.

Cherevko, H. 2024. Challenges For the Agriculture of Ukraine During the War and Directions of Its Development. Annals of the Polish Association of Agricultural and

Agribusiness Economists (Annals PAAAE), XXVI(1), 43-55. https://doi.org/10.5604/01.3001.0054.2828.

Czarny, E. 2002. Teoria i praktyka handlu wewnątrzgałęziowego. Monografie i Opracowania No. 496. Warsaw: Warsaw School of Economics.

Dixit, A.K., Norman, V.D. 1980. Theory of International Trade. Cambridge, Mass., Cambridge University Press.

Falvey, R.E. 1981. Commercial Policy, and Intra-industry Trade. Journal of International Economics, 11(4), 495-511. https://doi.org/10.1016/0022-1996(81)90031-3.

Falvey, R.E., Kierzkowski, H. 1987. Product Quality, Intra-industry Trade and Imperfect Competition. In: H. Kierzkowski (Ed.), Protection and Competition in International Trade (pp. 143-161). Oxford and New York: Basil Blackwell.

Finger, J.M. 1975. Trade Overlap and Intra-Industry Trade. Economic Inquiry, 13(4), 581-589. https://doi.org/10.1111/j.1465-7295.1975.tb00272.x.

Flam, H., Helpman, E. 1987. Vertical Product Differentiation and North-South Trade. American Economic Review, 77(5), 810-822.

Fontagné, L., Freudenberg, M. 1997. Intra-Industry Trade: Methodological Issues Reconsidered. CEPII Document de Travail, No. 1997-01, Paris. https://www.cepii.fr/PDF_PUB/wp/1997/wp1997-01.pdf.

Greenaway, D., Hine, R.C., Milner, C. 1994. Country-Specific Factors and Pattern of Horizontal and Vertical Intra-Industry Trade in the UK. Weltwirtschaftliches Archiv, 130(1), 77-100. https://doi.org/10.1007/BF02706010.

Grubel, H.G. 1967. Intra-Industry Specialization and the Pattern of Trade. Canadian Journal of Economics and Political Science, 33, August.

Grubel, H.G., Lloyd, P.J. 1975. Intra-Industry Trade: the Theory and Measurement of Intra-Industry Trade in Differentiated Products. London: Macmillan.

Hamulczuk, M., Cherevyk, D., Makarchuk, O., Kuts, T., Voliak, L. 2023**.** Integration of Ukrainian Grain Markets with Foreign Markets During Russia's Invasion of Ukraine. Zagadnienia Ekonomiki Rolnej/Problems of Agricultural Economics, 377(4), 1-25. https://doi.org/10.30858/zer/177396.

Helpman, E. 1981. International Trade in the Presence of Product Differentiation, Economies of Scale and Monopolistic Competition: A Chamberlin-Hecksher-Ohlin Approach. Journal of International Economics, 11(3), 305-340. https://doi.org/10.1016/0022-1996(81)90001-5.

Helmpan, E., Krugman, P. 1985, Market Structure and Foreign Trade. Increasing Returns, Imperfect Competition and the International Economy. Cambridge M.A., MIT Press.

Jámbor, A. 2013. Country-Specific Determinants of Horizontal and Vertical Intra-Industry Agri-Food Trade of the Visegrad Countries. FIW Working Paper, No. 104.

Jámbor, A. 2014. Country-Specific Determinants of Horizontal and Vertical Intra-industry Agri-food Trade: The Case of the EU New Member States. Journal of Agricultural Economics, 65(3), 663-682. https://doi.org/10.1111/1477-9552.12059.

Jámbor, A. 2015. Country- and Industry-Specific Determinants of Intra-Industry Trade in Agri-Food Products in the Visegrad Countries. Studies in Agricultural Economics, 117(2), 93-101. http://dx.doi.org/10.7896/j.1514.

Jones, R.W., Kierzkowski, H. 1990. The Role of Services in Production and International Trade: A Theoretical Framework. In: R.W. Jones, A. Krueger (Eds.), The Political Economy of International Trade. Essays in Honor of R.E. Baldwin. Oxford: Basil Blackwell.

Kaliszuk, E. et al. 2005. Analiza członkostwa dla wymiany handlowej. In: Polska w Unii Europejskiej, doświadczenia pierwszego roku członkostwa. Warszawa: Urząd Komitetu Integracji Europejskiej.

Kaliszuk, E. 2009. Konsekwencje systemowe akcesji Polski do Unii Europejskiej dla obrotów towarowych. In: E. Kaliszuk, K. Marczewski (Eds.), Wpływ członkostwa w Unii Europejskiej na stosunki gospodarcze Polski z zagranicą (pp. 11-62). Warszawa: Instytut Badań Rynku, Konsumpcji i Koniunktur.

Kawecka-Wyrzykowska, E., Ambroziak, Ł, Molendowski, E., Polan, W. 2017. Intra-Industry Trade of the New EU Member States. Theory and Empirical Evidence. Warsaw: Wydawnictwo Naukowe PWN.

Kowalska, A.S., Gurkowa, K., Olszańska, A., Soukal, I., Matejicek, M. 2021. Assessment of the Competitive Position of the V4 Group Countries in the Foreign Trade of Agri-food Industry Products. In: Maci, J. et al. (Eds.), Proceedings of the International Scientific Conference Hradec Economic Days 2021, 11(1), 449-470. University of Hradec Kralove. https://uni.uhk.cz/hed/site/assets/files/1077/proceedings_2021_1-1.pdf.

Kraciuk, J. 2023. Intra-Industry Trade in Agri-Food Products Between Poland and European Union Countries. Annals of the Polish Association of Agricultural and Agribusiness Economists (Annals PAAAE), XXV(4), 243-254. https://doi.org/10.5604/01.3001.0053.9669.

Krugman, P.R. 1979. Increasing Returns, Monopolistic Competition, and International Trade. Journal of International Economics, 9(4), 469-479. https://doi.org/10.1016/0022-1996(79)90017-5.

Krugman, P.R. 1980. Scale Economies, Product Differentiation, and the Pattern of Trade. American Economic Review, 70.

Lancaster, K. 1980. Intra-Industry Trade Under Perfect Monopolistic Competition. Journal of International Economics, 10(2), 151-175. https://doi.org/10.1016/0022-1996(80)90052-5.

Linder, S.B. 1961. An Essay on Trade and Transformation. Uppsala.

Lipsey, R. 1976. Review of Grubel and Lloyd (1975). Journal of International Economics, 6(3), 312-314.

Luka, O., Levkovych, I. 2004. Intra-Industry Trade in Agricultural and Food Products: The Case of Ukraine. IAMO Discussion Papers 14923, Institute of Agricultural Development in Transition Economies (IAMO). https://econpapers.repec.org/paper/agsiamodp/14923.htm.

Niemczyk, J., Władyniak, A. 2004. Analiza zmian w polskim handlu rolnym. In: Zmiany w handlu zagranicznym Polski w okresie realizacji stowarzyszenia (1992-2003). Warszawa: Instytut Koniunktur i Cen Handlu Zagranicznego.

Pawlak, K. 2019. Intensity and Structure of Intra-Industry Trade in Agri-Food Products Observed in Polish and EU Foreign Trade With the US. Annals of the Polish Association of Agricultural and Agribusiness Economists (Annals PAAAE), XXI(4), 374-382. https://doi.org/10.5604/01.3001.0013.5812.

Pawlak, K., Poczta, W. 2019. Handel wewnątrzgałęziowy w wymianie produktami rolno-spożywczymi UE z USA. Journal of Warsaw University of Life Sciences – SGGW. Problems of World Agriculture, 19(4), 93-102. https://doi.org/10.22630/PRS.2019.19.4.59.

Regulation (EU) 2022/870 of the European Parliament and of the Council of 30 May 2022 on temporary trade-liberalisation measures supplementing trade concessions applicable to Ukrainian products under the Association Agreement between the European

Union and the European Atomic Energy Community and their Member States, of the one part, and Ukraine, of the other part. Dz.Urz. L 152 z 3.6.2022.

Regulation (EU) 2024/1392 of the European Parliament and of the Council of 14 May 2024 on temporary trade-liberalisation measures supplementing trade concessions applicable to Ukrainian products under the Association Agreement between the European Union and the European Atomic Energy Community and their Member States, of the one part, and Ukraine, of the other part. Dz.Urz. z 29.05.2024.

Shaked, A., Sutton, J. 1984. Natural Oligopolies and International Trade. In: H. Kierzkowski (Ed.), Models of Trade in Differentiated Goods, Discussion Papers in International Economics. Geneva: Graduate Institute of International Studies.

Stiglitz, J.E. 1987. The Causes and Consequences of the Dependence of Quality on Price. The Journal of Economic Literature, 25(1), 1-48. https://www.jstor.org/stable/2726189.

Szajner, P., Szczepaniak, I., Łopaciuk, W. 2024. An Assessment of the Production Potential and Food Self-Sufficiency of Ukraine against the Background of the European Union and Poland. Sustainability, 16(17), 7735. https://doi.org/10.3390/su16177735.

Szczepaniak, I. 2013. Development of Intra-Industry Trade as a Measure of Competitiveness of the Polish Food Sector. Oeconomia Copernicana, 4(2), 147-164. https://journals.economic-research.pl/oc/article/view/444/409.

Szczepaniak, I., Juchniewicz, M. 2024. Konkurencyjność sektora żywnościowego Polski na rynkach zagranicznych w latach 2018–2022. Studia BAS, 1(77), 73-102. https://doi.org/10.31268/StudiaBAS.2024.05.

Verdoorn, P.J. 1960. The Intra-Bloc Trade of the Benelux. In: E.A.G. Robinson (Ed.), Economic Consequences of the Size of Nations. London: MacMillan.