Research on World Agricultural Economy
https://journals.nasspublishing.com/index.php/rwae

RESEARCH ARTICLE

China—Eastern Europe Agricultural Trade: (Dis)Advantages and Policy Responses

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Abstract: Assessment of the competitive advantages of goods and countries is one of the cornerstones of contemporary macroeconomics. In agriculture, this assessment is complicated by various factors, such as natural conditions, technological capabilities of agricultural production, and food security concerns. This study aimed to address the specific advantages of different countries by using a five-stage algorithm to calculate the Revealed Comparative Advantage (RCA), Relative Trade Advantage (RTA), Lafay (LI), and Domestic Resource Cost Advantage (DRC) indices for eight Eastern European countries and their trade with China in 37 categories of food and agricultural products. These products were grouped into four categories based on their revealed advantages. Competitive advantages of Eastern European countries were found in sectors that require technology and capital, such as crops, cereal products, edible goods, and animal feed. The study contributed to linking trade and competitive advantages with production capabilities of individual countries. It suggested promoting externally oriented advantages for competitive products and redirecting the supply of marginally competitive and non-competitive goods to domestic markets.

Keywords: Agricultural trade; Comparative advantage; Competitive advantage; Trade advantage; Food security

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Received: 26 April 2024; **Received in revised form:** 18 May 2024; **Accepted:** 29 May 2024; **Published:** 21 June 2024

Citation: Erokhin, V., Ivolga, A., Lazareva, N., et al., 2024. China—Eastern Europe Agricultural Trade: (Dis)Advantages and Policy Responses. *Research on World Agricultural Economy*. 5(2): 82–101. DOI: https://doi.org/10.36956/rwae.v5i2.1091

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1. Introduction

Ensuring a stable supply of agricultural products is an essential part of a country's comprehensive food security. The more deeply a country is integrated into the global food production and supply chain, the more crucial the comprehensiveness and stability of the food supply become for ensuring the adequate availability and accessibility of food on the domestic market [1,2]. China is one of the largest consumers of a variety of food and agricultural products in the world, ranging from basic staples like oilseeds and cereals to more specialized, high-quality foods [3,4]. Although China has managed to achieve self-sufficiency in basic food products, the country still relies on imports to varying degrees for certain agricultural commodities [2,5]. Diversification of supply chains is essential for ensuring both the physical availability and economic accessibility of food for all people (considering the FAO's approach to food security, which defines it as the conditions under which all individuals at all times have physical, social, and economic access to adequate, safe, and nutritious food [6]). The commitment to the development of economic, trade and logistics ties between countries is one of the top priorities for China's development. Although promoting agricultural trade is not explicitly mentioned among the development goals, it is clearly of fundamental importance to China [7]. Thus, China's National Strategy for Food Security 2019 states the country's commitment to promoting agricultural trade in every possible way, actively participating in global food security efforts, and establishing healthy and sustainable food value chains around the world [8]. The most recent Food Security Law (to take effect on June 1, 2024) makes provisions concerning establishing reserves of staples, including using trade, amid still a tight balance of supply and demand in the domestic food market [9].

China is working to establish resilient supply chains with other countries. In recent years, China has imported a large amount of food from the world's biggest suppliers, such as the United States and Latin America [2,10]. The share of European countries in China's agricultural turnover is significant, with Western European countries providing the majority of this trade. The role of Eastern European (EE) countries in the Chinese food market is relatively small. In 2021, China-EE trade in food exceeded $6.5 billion, an almost tenfold increase from 2010 (Figure 1). In 2022, trade turnover (exports plus imports) dropped to $4.2 billion, primarily due to a dramatic decline in imports from Ukraine. Overall, China's trade with EE countries has been significantly lower than the trade between China and the EU ($29.5 billion) or the US ($42.2 billion) [11].

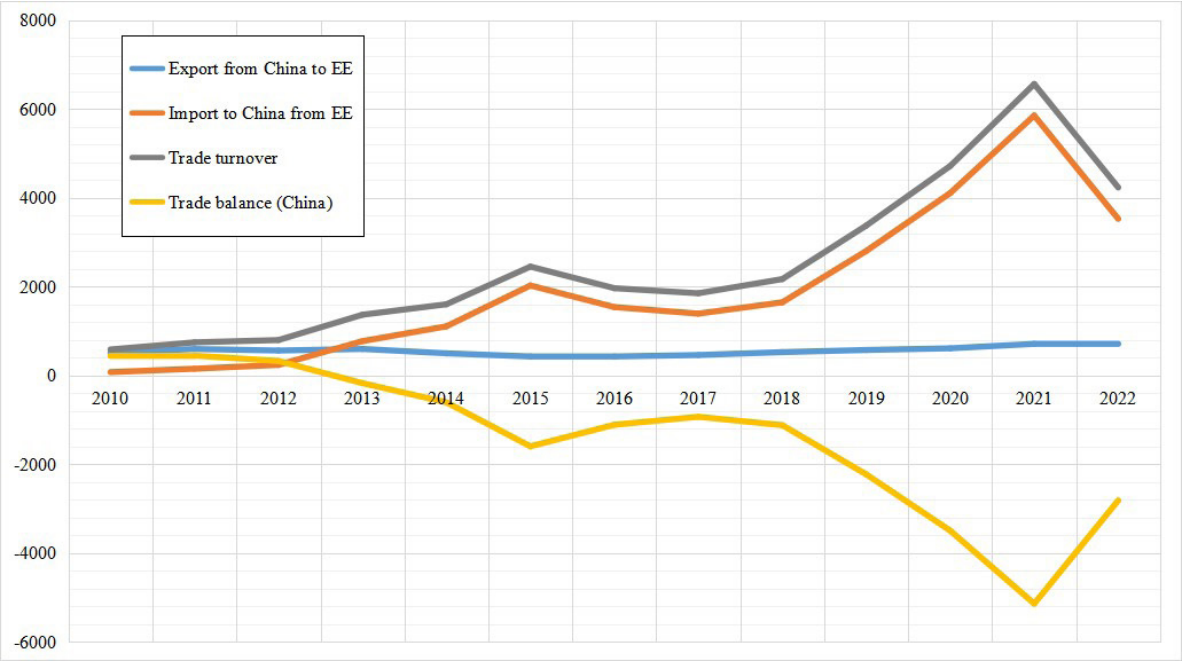


Figure 1. China-EE agricultural trade in 2010-2022, $ million.

Source: Authors' development based on UNCTAD [11].

China's largest trading partner in Eastern Europe is Ukraine, accounting for 72.2% of its total agricultural trade with the region in 2022 and 84.1% of China's imports from Eastern Europe. Maize is the main import item, accounting for 45% of China's agricultural imports from Ukraine and 35.8% of its trade turnover with the region. Ukraine also supplies barley and animal feed to China. Poland is China's second largest trading partner, accounting for 10.5% of its total trade turnover, 35.3% of its exports, and 4.6% of its imports. China imports milk and dairy products from Poland, while it exports fresh, chilled and frozen fish.

The recent increase in China-EE agricultural trade (2018-present) can be attributed to several factors. One of these factors is the promotion of international trade initiatives and routes [7], which have led to an increase in demand for European products in the Chinese market. This demand is supported by the growing living standards in major Chinese cities [12,13]. Additionally, there is a need to diversify suppliers due to trade tensions with the United States. Despite the growth in trade turnover in recent years, the topic of food trade between China and Eastern European countries remains under-researched in modern literature, both in China and Europe. While some studies address China's trade with Eastern Europe, they do not specifically focus on the role of agricultural trade in this relationship [7,14,15]. Those few studies that focus on the agricultural dimension of China-EU trade either provide a too generalized picture, blurring country-specific details [10,16], or focus on individual countries (primarily Ukraine) [17], failing to adequately reflect the overall regional specifics of agricultural trade. Similarly, the literature lacks analysis of the divergent implications of the comparative and competitive advantages of individual EU countries in food trade with China, while the agenda related to advantages is limited to the use of the gravity model [18] or indexes of revealed comparative advantage, trade complementarity, and trade intensity [19]. Some studies consider revealed comparative advantage to be a sufficient indicator of competitiveness in foreign trade [20], thus belittling the relevance of trade, competitive, and production advantages [21,22].

The existence of research gaps in the field of assessing the comparative and competitive advantages of countries in agricultural trade indicates that a comprehensive approach to identifying advantages should be based on combining various metrics of trade, competition, and production. Therefore, this study aims to fill some of the gaps in the China-EE literature on competitive advantages in food trade by developing an approach to sequentially revealing four types of advantages (comparative, trade, competitive, production) in the food trade of EE countries with China, and elaborating targeted policy measures to promote these advantages depending on the level of competitiveness of specific categories of agricultural products.

2. Background

2.1 Comparative Vs. Competitive Advantages in Agricultural Trade

The analysis of foreign trade portfolios to identify comparative advantages commonly involves calculating the Revealed Comparative Advantage (RCA) index, developed by Bela Balassa [23] in the 1960s. The commonly accepted merit of the method is that the RCA index significantly reflects how intensely a country exports a product compared to the global average [24–27]. The concept of comparative advantage reflects a country's ability to produce a product that is not only more productive, but also more differentiated than other countries [28,29]. However, in agriculture, there are some limitations to using RCA to investigate trade drivers.

There is a lot of evidence that the principle of comparative advantage works as long as the government does not interfere in the market except for providing basic rules and regulations [30–32]. When the government interferes in the market, the explanatory and predictive power of comparative advantages as a theory of trade decreases. Mariotti [33] compliments protectionism as long as it helps protect, not distort, free trade in the long term. The modern theory of comparative advantages emphasizes the variability and instability of comparative advantages and their dependence on changes in production factors or the economic environment [20]. The state shapes the market by adjusting comparative advantages to increase the competitiveness of domestic actors [34,35]. However, in agriculture, the level of state protection has been higher than in other sectors [36–38]. This gap emphasizes the importance of distinguishing between the concepts of comparative advantage and competitiveness when analyzing agricultural trade patterns.

In determining both comparative and competitive advantages, comparison is the key element. Competitive advantage refers to the ability of an economic actor to withstand competition, or in other words, to succeed in comparison with other market players. Comparative advantage, on the other hand, is the result of specialization based on differences in factors of production

and their relative efficiency, but in the absence of international exchange. The inclusion of the exchange condition into the model transforms the stationary nature of comparative advantages into the dynamic nature of competitive advantages. The more volatile markets are, the further competitive advantages can deviate from comparative advantages [39]. Government regulations aim to reduce this gap, and as a result, a country's competitiveness in the world market becomes a product of adjusting its comparative advantage [40,41]. Thus, comparative advantages form the basis for competitive advantages and competitiveness. However, the basis is not yet a competitive advantage, it has yet to be developed. Therefore, it is possible for comparative advantages not to lead to competitive ones.

Among the shortcomings of the RCA index is the usability of the index to identify stationary comparative advantages, but not competitive ones [42]. Another demerit of the method is that it reveals no determinants of competitive advantages, such as support measures, innovations, or efficiency gains [43]. According to Szczepaniak [44], Erdem [45], and Urba et al. [46], one of the ways to eliminate the limitations of the RCA method is the calculation of the Relative Trade Advantage (RTA) index. The approach to evaluating the competitive advantages of traded goods based on comparing their relative shares in the foreign trade turnover of a country was proposed by Thomas Vollrath [47]. The main benefit of using this approach compared to RCA is that it takes into account not only data on exports of goods, but also their imports. This allows for a more comprehensive assessment of trade advantages. According to Vollrath [48], using both export and import data makes it possible to embody both the relative demand and relative supply dimensions of comparative advantages and therefore remain consistent with the real world phenomenon of two-way trade. Based on the values of exports and imports of a particular country, the index shows how competitive the country is in the global market for a certain product. In the analysis of competitive advantages in agricultural trade in Eastern European countries, the RTA index was used by Simo et al. [49], Szczepaniak [44], and Hristov et al. [50], among others. Erokhin et al. [21] evaluated China's trade advantages in foreign trade in food and agricultural products by comparing the values of RCA and RTA indexes. However, as evidenced by Danna-Buitrago and Stellian [51], the RTA method is not free from drawbacks, particularly, numeric exception of division by zero, when a country does not export or import certain products, or trade values are negligible. Such a limitation can significantly affect the results of the analysis of trade advantages for smaller countries, such as those in Eastern Europe that are included in this study. These countries may have a much narrower range of traded agricultural products compared to larger economies. As a result, RTA index for such a smaller trade territory could be left undefined, and a measure of competitive advantage could not be identified adequately.

2.2 Checking Comparative and Competitive Advantages Against Specialization

Along with the parameters of competitiveness, the involvement of the state in the regulation of agriculture distorts the parameters of specialization as an integral element of the international division of labor [28,39,52]. Few farmers act as independent decision makers when it comes to going global or investing in new technologies to increase their competitiveness in foreign markets. Instead, the advantages-focused policies carried out by the government, through protectionism or liberalization, primarily send signals to large corporations. These policies create advantages in the form of increased production volumes or maintained price levels, but they do not offer farmers additional incentives to reduce costs or introduce new technologies to expand their export opportunities. Thus, the processes of creative destruction are less likely to occur in agriculture, compared to the manufacturing sector. In the latter, pursuing firm-level strategies is crucial for a company's international competitiveness.

Specialization can be measured by comparing data on different goods produced within a country, rather than comparing data on countries trading in a particular product [53]. The RCA and RTA indices are structural indices, and therefore the influence of cyclical factors must be eliminated to improve the accuracy of assessments [54–56]. While RCA and RTA compare different countries' indicators for a specific product, using the Lafay Index (LI) allows one to compare data on various goods one country produces or exports. The index measures the comparative advantage of country *i* by comparing a normalized indicator of a country's net exports with the total trade balance. The normalized indicator is weighted by the share of each good in the foreign trade turnover, which helps to determine how each good contributes to the country's trade balance [39]. The advantage of employing the LI index is that it only uses national trade data. This is especially useful when conducting retrospective studies on individual countries whose share in global trade is small (like those EE countries included in the study).

The complementarity of the RCA, RCA, and LI indices makes it possible to use them in assessing comparative and competitive advantages in global markets. Although there have been few studies that have tested the three-index approach in relation to agriculture, such as Maitah et al. [57], Benesova et al. [58], and Erokhin et al. [21,22], the results have been promising. However, the method clearly needs to be refined to address the limitations imposed by the specific nature of agriculture as an economic activity. The classical interpretation of comparative advantage assumes that the intended outcome of identifying stronger and weaker advantages is the redistribution of resources to favor the production of goods with clearly expressed advantages [59]. While labor and capital can flow between industries, the exchange of factors of production in agriculture is not as straightforward. Not only are natural factors a barrier, but the low mobility of rural workers, the seasonality of agricultural production, and the level of infrastructure in rural areas also play a role. If lower-competitive industrial goods can be replaced with more competitive alternatives, then the decision not to produce lower-competitive crops could threaten the country's food security.

Considering the limitations inherent in the agriculture of both individual methods of assessing advantages and their combinations, it is advisable to test the identified competitive advantages in trade against advantages in the production of relevant categories of agricultural products. According to Yercan and Isikli [60] and Hoang et al. [61], one of the promising approaches to matching competitive and cost advantages is the Domestic Resource Cost Advantage (DRC) index. The idea is to match input costs (domestic and foreign ones) with the price of output in agriculture. It has its origins in studies that first attempted to measure real opportunity costs through total domestic resources in the early 1970s [62,63]. In recent decades, Masters and Winter-Nelson [64], Yercan and Isikli [60], and Hoang et al. [61] have demonstrated the applicability of the DRC index to checking competitive advantages of countries in foreign agricultural trade in terms of their cost advantages in the domestic agricultural production. Therefore, the extension of the three-index model for assessing competitive advantages by adding the fourth criterion allows for matching comparative, trade, competitive, and cost advantages that a particular country enjoys in the production and trade of certain categories of food and agricultural products.

3. Materials and Methods

Since there are no established territorial boundaries for the region of Eastern Europe, academic literature uses different sets of countries depending on various geographical, natural, political, economic, and social factors. Most studies refer to the following eight countries as part of the EE region: Bulgaria, the Czech Republic, Hungary, Moldova, Poland, Romania, Slovakia, and Ukraine. The study algorithm consists of five sequential stages, during which the advantages of EE countries in production and trade for 37 different categories of goods are calculated. Matches between these advantages are identified and product categories are ranked according to their level of competitiveness (Figure 2).

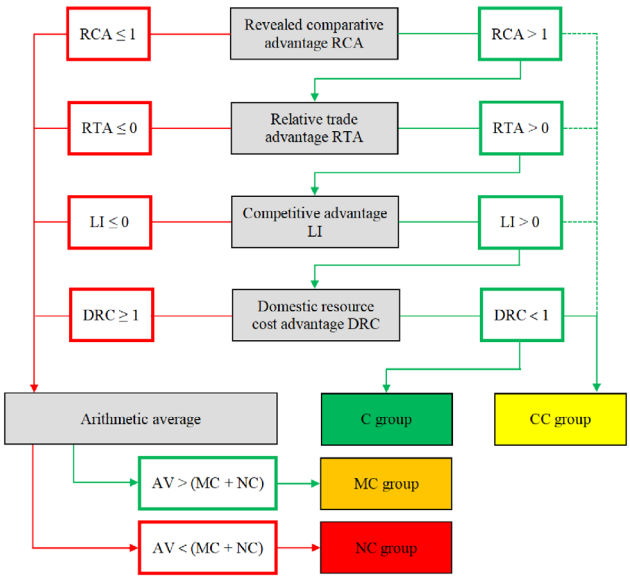


Figure 2. Study algorithm.

Source: Authors' development.

At stage 1, the RCA index is calculated, which is a standard approach to assessing comparative advantages of countries and sectors, including agriculture [65–68]. Country *i* obtains a strong comparative advantage in trade in product *j* if $RCA_{ij}>1$. Otherwise, there is a weak comparative advantage (Table 1). RCA does not allow one to attribute the advantage to specific factors [55], as well it fails to differentiate between natural and acquired advantages [69]. Therefore, the authors compare RCA values with trade advantages (stage 2), competitive advantages (stage 3), and cost advantages (stage 4). At Stage 2, RCA and RTA sets of advantages are compared and matches between the two are identified. Then, at stage 3, following Maitah et al. [57] and Alessandrini

et al. [70], the authors eliminate the possible influence of cyclic factors on the resulting advantage array by calculating the Lafay index of competitive advantage. At stage 4, as previously tested by Masters and Winter-Nelson [64], Gorton et al. [71], and Yercan and Isikli [60], the authors match the RCA-RTA-LI array with the cost advantages of EE countries for selected categories of food and agricultural products.

Table 1. Parameters of advantages used in the study.

Parameter	Index	Formula	Value	
			Strong advantage	Weak advantage
Revealed comparative advantage	RCA_{ij}	$RCA_{ij} = \frac{\frac{X_{ij}}{X_{it}}}{\frac{X_{nj}}{X_{nt}}} = \frac{\frac{X_{ij}}{X_{nj}}}{\frac{X_{it}}{X_{nt}}}$	$RCA_{ij} > 1$	$RCA_{ij} \leq 1$
Relative trade advantage	RTA_{ij}	$RTA_{ij} = \frac{\frac{X_{ij}}{X_{it}}}{\frac{X_{nj}}{X_{nt}}} - \frac{\frac{M_{ij}}{M_{it}}}{\frac{M_{nj}}{M_{nt}}}$	$RTA_{ij} > 0$	$RTA_{ij} \leq 0$
Competitive advantage	LI_{ij}	$LI_{ij} = \frac{1000}{Y_i} \times 2\frac{X_{ij} \times M_i - X_i \times M_{ij}}{X_i + M_i}$	$LI_{ij} > 0$	$LI_{ij} \leq 0$
Domestic resource cost advantage	DRC_{ij}	$DRC_{ij} = \frac{C_{ij}^d}{P_{ij} - C_{ij}^f}$	$DRC_{ij} < 1$	$DRC_{ij} \geq 1$

Note: X = export; M = import; i = country; j = product (domestic market); t = product (international market); n = group of countries; C^d = domestic input costs; C^f = foreign input costs; P = price of a unit of the output (undistorted border price measured in foreign exchange).
Source: UNCTAD [11].

Based on the comparison of all four advantages and the sequential exclusion of products with weakest advantages from the analysis, the study arrives at categorizing SITC positions on the degree of their complex competitiveness at stage 5. If all four strong advantages coincide, the product is considered competitive (C group). CC group includes products for which cost advantage matched with at least one of RCA, RTA, or LI advantages. SITC positions with weak cost advantage are categorized as either marginally competitive (MC group) or non-competitive (NC group). If arithmetical average figures of RCA, RTA, and LI are all below RCA_{MC+NC}, RTA_{MC+NC}, and LI_{MC+NC}, respectively, the product is categorized as being non-competitive. If at least one of the arithmetical average figures is above RCA_{MC+NC}, RTA_{MC+NC} , or LI_{MC+NC}, such a product is categorized as being marginally competitive.

Agricultural trade data is organized using the UNCTAD Standard International Trade Classification (SITC) [11]. The "All food items" (SITC 0 + 1 + 22 + 4) category is used to create generalized datasets for the 2000-2022 period for the EE-China and the EE-world agricultural trade. This category includes 37 types of major food and agricultural products (Table A1, Appendix A). The data for calculating the RCA, RTA, and LI indices from 2000 to 2022 was taken from the UNCTAD database [11], specifically the section "Merchandise: Intra-trade and Extra-trade of Country Groups by Product, Annual". The DRC index was calculated based on a combination of the UNCTAD data and that of national statistics services of the nine countries in the study. Particularly, parameter C was calculated by comparing national-level data on the output for individual SITC categories with international data on total agricultural production costs for each relevant country (UNCTAD database section "Gross Domestic Product: GDP by Type of Expenditure, Agriculture)". Parameter P was calculated based on the data from UNCTAD's section "Commodity Prices, 1995–2023, Monthly". The annual price was used as the average of the monthly quotations for the narrower 2000–2022 period for each SITC commodity exported by economies in the study. To mitigate the impact of measuring costs and prices based on current prices on the results, the authors used constant prices (2015), as reported by UNCTAD.

4. Results

At stage 1 of the study, the authors identified comparative advantages across 37 SITC positions and eight EE countries. Based on average RCA values for the period 2000–2022, the study found that EE countries have notable advantages in trade with China in the

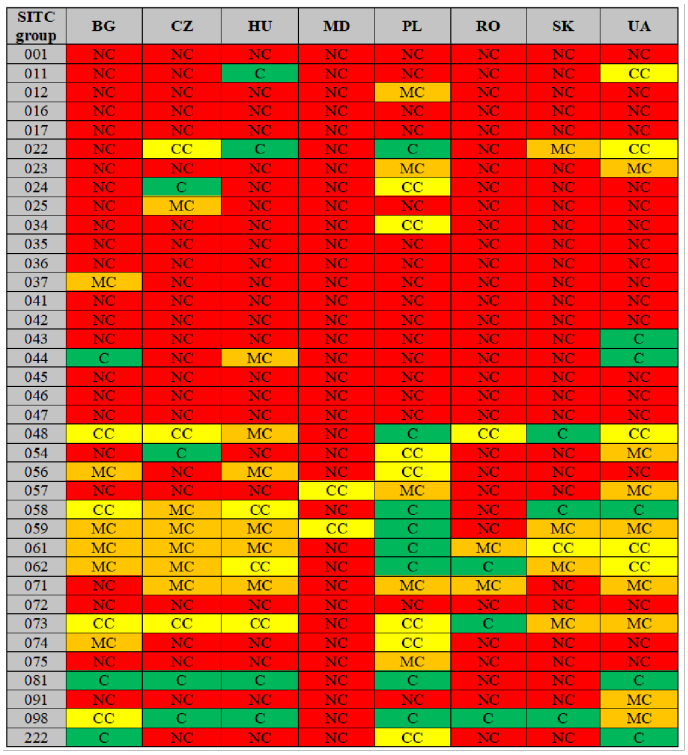
crop sector. The highest RCA values were detected for maize (Ukraine, Bulgaria), oilseeds (Ukraine, Bulgaria), barley (Ukraine), and wheat (Slovakia) (Table A2, Appendix A). In horticulture, countries such as the Czech Republic, Moldova, Poland, Slovakia, and Ukraine demonstrated distinct advantages in exporting vegetables and fruits. In the food processing sector, countries like Romania, Poland, Hungary, Slovakia, and the Czech Republic specialize in producing edible products and preparations, while Ukraine and Bulgaria have an advantage in margarine production, the Czech Republic and Romania—in cheese, and Ukraine, Poland, Hungary, and Bulgaria - in feeding stuff for animals. Finally, in animal husbandry, EE countries do not have as many comparative advantages as in crop production. Hungary and Romania have a competitive advantage in exporting beef, while Moldova, Slovakia, and the Czech Republic specialize in other types of meat and edible offal. Hungary, Poland, and Ukraine are also major exporters of milk and dairy products.

Comparative and trade advantages match largely in the crop sector (maize and oilseeds in Ukraine and Bulgaria and barley in Ukraine) (Table A3, Appendix A). There are matches detected for vegetables and roots (Czech Republic, Poland), fruits (Moldova, Poland, Slovakia, Ukraine), edible products and preparations (Slovakia, Czech Republic, Hungary, Poland, Romania), and feeding stuff for animals (Ukraine, Poland, Hungary, Bulgaria, Czech Republic). In the animal sector, RCA and RTA values confirm the advantages of Hungary in trading in meat of bovine animals, Poland, Hungary, and Ukraine in milk and dairy products, and Czech Republic in cheese. In many cases, EE countries trade in those products for which relative trade advantages are not backed up by comparative advantages (meat and edible meat offal in Czech Republic, Moldova, and Romania, eggs in Bulgaria, Romania, and Slovakia, fish in Poland and Moldova, wheat in Romania, etc.).

Mismatches between different types of advantages confirm the applicability of consequential elimination of product categories with no advantages from the analysis. At stage 3, the study demonstrates that EE countries enjoy competitive advantages in technology-intensive and capital-intensive sectors of agricultural production, rather than in labour-intensive ones. The three indexes match for crops (maize and oilseeds in Ukraine and Bulgaria and barley in Ukraine), cereal preparations (Poland, Slovakia, Bulgaria), edible products and preparations (Romania, Slovakia, Poland, Hungary, Czech Republic), feeding stuff for animals (Ukraine, Hungary, Bulgaria, Poland, Czech Republic), meat of bovine animals (Hungary), and milk and dairy products (Poland, Ukraine, Hungary, Czech Republic) (Table A4, Appendix A).

In the labor-intensive horticultural sector, competitive advantages are not that distinct. Thus, Poland, Slovakia, and Ukraine posses competitive advantages in trade in fruits and fruit preparations (SITC 058), while the vegetable sector (SITC 054) is competitive in Czech Republic only (Figure 3). The revealed pattern of advantages in technology-intensive and capital-intensive sectors is further confirmed at stage 4 by comparing trade-related advantages with cost advantages (Table A5, Appendix A). The allocation of SITC categories based on the degree of competitiveness at stage 5 shows that the competitive advantages of EE countries (C products in Table 3) are concentrated in (1) crop production (maize (SITC 044) and oilseeds (SITC 222) in Bulgaria and Ukraine and barley (SITC 043) in Ukraine); (2) food processing (edible products (SITC 098) in Czech Republic, Hungary, Poland, Romania, and Slovakia, sugar (SITCs 061 and 062) in Poland and Romania, fruit preparations and juices (SITC 058) in Poland, Slovakia, and Ukraine, and cereal preparations (SITC 048) in Poland and Slovakia); (3) animal husbandry (bovine meat (SITC 011) in Hungary and milk and dairy products (SITC 022) in Hungary and Poland). There is potential for the development of certain sectors in certain countries, such as the conditionally competitive (CC products) dairy sector in the Czech Republic and Ukraine, fish sector in Poland, horticulture in Poland, Moldova, Bulgaria, and Hungary, and food processing in Ukraine, Bulgaria, Czech Republic, Hungary, and Slovakia.

The competitiveness matrix in Figure 3 indicates that EE countries have the potential to develop food production and supply chains in cooperation with China across various sectors and product categories. China's top import SITC categories are oilseeds and oleaginous fruits (approximately 20% of China's total agricultural imports), fish, feeding stuff for animals, meat, edible products and preparations, and fruits and nuts. According to Huang et al. [72], Zhang [73], and Erokhin et al. [2], China will not achieve self-sufficiency in oilseeds, vegetable oils, and fats in the near future. Mukhopadhyay et al. [74] even predict that China's self-sufficiency in oilseeds will continue to decline until 2040, while the demand for maize, including for non-food use, is growing due to the rapid growth of animal husbandry in China [1]. As EE countries' advantages concentrated visually in diverse SITC 058-071 (Figure 3), with a few additions like 048, 081, 098, and 222, the matching of China's demand with revealed advantages determines promising areas for the development of mutual trade (Table 2).



SITC group	BG	CZ	HU	MD	PL	RO	SK	UA
001	NC	NC	NC	NC	NC	NC	NC	NC
011	NC	NC	C	NC	NC	NC	NC	CC
012	NC	NC	NC	NC	MC	NC	NC	NC
016	NC	NC	NC	NC	NC	NC	NC	NC
017	NC	NC	NC	NC	NC	NC	NC	NC
022	NC	CC	C	NC	C	NC	MC	CC
023	NC	NC	NC	NC	MC	NC	NC	MC
024	NC	C	NC	NC	CC	NC	NC	NC
025	NC	MC	NC	NC	NC	NC	NC	NC
034	NC	NC	NC	NC	CC	NC	NC	NC
035	NC	NC	NC	NC	NC	NC	NC	NC
036	NC	NC	NC	NC	NC	NC	NC	NC
037	MC	NC	NC	NC	NC	NC	NC	NC
041	NC	NC	NC	NC	NC	NC	NC	NC
042	NC	NC	NC	NC	NC	NC	NC	NC
043	NC	NC	NC	NC	NC	NC	NC	C
044	C	NC	MC	NC	NC	NC	NC	C
045	NC	NC	NC	NC	NC	NC	NC	NC
046	NC	NC	NC	NC	NC	NC	NC	NC
047	NC	NC	NC	NC	NC	NC	NC	NC
048	CC	CC	MC	NC	C	CC	C	CC
054	NC	C	NC	NC	CC	NC	NC	MC
056	MC	NC	MC	NC	CC	NC	NC	NC
057	NC	NC	NC	CC	MC	NC	NC	MC
058	CC	MC	CC	NC	C	NC	C	C
059	MC	MC	MC	CC	C	NC	MC	MC
061	MC	MC	MC	NC	C	MC	CC	CC
062	MC	MC	CC	NC	C	C	MC	CC
071	NC	MC	MC	NC	MC	MC	NC	MC
072	NC	NC	NC	NC	NC	NC	NC	NC
073	CC	CC	CC	NC	CC	C	MC	MC
074	MC	NC	NC	NC	CC	NC	NC	NC
075	NC	NC	NC	NC	MC	NC	NC	NC
081	C	C	C	NC	C	NC	NC	C
091	NC	NC	NC	NC	NC	NC	NC	MC
098	CC	C	C	NC	C	C	C	MC
222	C	NC	NC	NC	CC	NC	NC	C

Figure 3. Allocation of SITC categories to competitiveness groups per country

Note: green = competitive (C); yellow = conditionally competitive (CC); orange = marginally competitive (MC); red = non-competitive (NC).

Source: Authors' development.

Table 2. China's top import products and competitive advantages of EE countries.

SITC group*	Share in imports**, percentage	Imports/GDP ratio***, percentage	Competitive advantages per countries
222	20.776	76.183	BG, PL, UA
034	6.450	12.574	PL
081	6.086	20.419	BG, CZ, HU, PL, UA
012	4.807	16.055	PL
057	4.488	10.038	MD, PL, UA
098	3.425	13.800	BG, CZ, HU, PL, RO, SK, UA
022	2.571	82.982	CZ, HU, PL, SK, UA
054	2.172	9.336	CZ, PL, UA
061	1.683	69.027	BG, CZ, HU, PL, RO, SK, UA
011	0.981	22.170	HU, UA
048	0.522	7.005	BG, CZ, HU, PL, RO, SK, UA
058	0.414	14.864	BG, CZ, HU, PL, SK, UA
091	0.414	17.449	UA
073	0.347	38.114	BG, CZ, HU, PL, RO, SK, UA
056	0.291	7.385	BG, HU, PL
059	0.244	18.793	BG, CZ, HU, MD, PL, SK, UA
024	0.221	44.170	CZ, PL
023	0.217	37.372	PL, UA
062	0.188	21.006	BG, CZ, HU, PL, RO, SK, UA
074	0.083	2.378	BG, PL

Note: * In descending order depending on the share of China's imports; ** share of a product *i* in total agricultural imports of China, average in 2000–2022; *** ratio of import volume of a product *i* to gross domestic output of a product *i*, average in 2000–2022.

Source: Authors' development.

The most obvious way for EE region to exploit the existing competitive advantages in agriculture is to promote exports of oilseeds and oleaginous fruits to China from Ukraine, Bulgaria (C group) and Poland (CC group). Another SITC category, for which demand matches advantages is feeding staff for animals from Bulgaria, Czech Republic, Hungary, and Poland (including the related supplies of maize and barley for non-food uses from Ukraine and Bulgaria). Fruits and nuts can also be promising for export from Moldova, Poland, and Ukraine, but for this category, advantages of EE countries are either conditional or marginal. Moreover, China's self-sufficiency in fruits and fruit preparations has been improving since mid-2000s. The demand for value-added food products from abroad has been rising in China in recent years as a result of an ongoing shift of food consumption patterns toward higher-quality, healthier, and higher-status imported foods [3]. In this market niche, EE countries enjoy distinct competitive advantages in supplying edible products and preparations such as cheese, butter, and sugar to China. Also, there are demand-advantages matches for milk and dairy products (competitive sectors in Hungary and Poland and conditionally competitive ones in Czech Republic and Ukraine).

5. Discussion

The processes of economic and social development in China in recent decades have significantly transformed the role of agriculture in the country's GDP and the specifics of agricultural development and rural areas [2]. The basis of Chinese agriculture is crop production, with corn, rice, and wheat being the dominant crops, accounting for more than 75% of total acreage. A strategic goal for the government is to increase total grain harvests to 650 million tons [8,9] to ensure stability in grain prices on the domestic market, although this goal cannot be achieved through domestic production alone [75]. In 2023, the government announced an increase in national grain production capacity by an additional 50 million tons, and the acreage was expanded by 30 million hectares. Plans are underway to develop capacities for storing and processing agricultural raw materials as well as logistics facilities. The missing volumes are to be imported. Particularly, China is highly dependent on the supply of soybeans and oilseeds (SITC 222, in which Bulgaria, Poland, and Ukraine possess a competitive advantage in trade with China), with the gross domestic harvest of soybeans barely exceeding 20 million tons and China's annual demand for this crop exceeding 120 million tons.

Economic growth has radically transformed food consumption patterns in the country. This has led to a significant shift in demand towards high-quality, healthy food with above-average nutritional value, especially in the largest cities [4,13]. The proportion of meat, dairy products and fish in people's diets is increasing due to a decrease in the consumption of starchy foods and fats [3,12]. Further growth in pork production is anticipated due to the commissioning of large-scale pig breeding complexes, including the world's largest pig farm in Hubei province, which has a capacity of up to one million heads. This is expected to increase production significantly. Additionally, increased feed production, thanks to the opening of several new feed mills, will also contribute to this growth. China is also opening its market to imported livestock products. The abolition of anti-pandemic measures and quarantine requirements has greatly simplified and reduced the cost of logistics.

Overall, since the early 2000s, China has emerged as one of the world's most promising markets for supplying a wide range of food and agricultural products [76]. The demand for high-quality imported meat, dairy products, and processed foods is becoming more elastic in price, which has an impact on the profitability of trade with China [77]. Against the background of the identified competitive advantages of EE countries in agricultural sectors, current trends in the Chinese market may have four types of implications for the development of China-EE agricultural trade.

First, the increase in demand for processed food products clearly benefits those EE countries that have a competitive advantage in the food processing industry (edible goods and preparations in the Czech Republic, Hungary, Poland, Romania, and Slovakia, as well as cereal preparations in Slovakia and Poland and sugar in Poland and Romania). Additionally, the meat and dairy sectors benefit from increased demand for milk and cream in Poland and Hungary, cheese and curd in the Czech Republic, and meat of bovine animals in Hungary.

Second, while consumer demand is refocusing on processed foods, the prospects for exports of staple grains such as wheat, maize, barley, and other cereals may deteriorate. However, despite the background of falling consumer demand, producer demand for agricultural raw materials used in animal husbandry is soaring. Therefore, there are reasons to expect long-term demand for maize, oilseeds and barley from countries like Ukraine, Bulgaria, and Poland. Additionally, Hungary could capitalize on its marginal competi-

tive advantage in maize trade with China.

Third, large-scale pork, poultry, and cattle breeding facilities that have been established in China in recent years are showing a strong demand not only for cereals but also for processed feed for animals, including both unmilled and milled grains. In this sector, five of the eight EE countries have distinct competitive advantages.

Fourth, the study identified demand-advantages matches in smaller market segments that had not been previously apparent for China-EE trade. These include supplies of preserved fruit, fruit preparations, and juices (from Poland, Slovakia, and Ukraine), confectionery products and preparations (from Poland and Romania), eggs (from the Czech Republic), and certain categories of fish (from Poland).

Due to the significant variation in the degrees of identified advantages across countries and categories of agricultural products, it is necessary to diversify approaches to the development and implementation of these advantages in order to achieve the most effective results. Based on the classification of SITC positions into four competitiveness groups, policy measures can also be categorized accordingly.

For the most competitive products (C group), measures to develop competitive advantages include the elimination of unnecessary administrative restrictions on food exports from Eastern Europe to China. The development of production, logistics, and supply infrastructure consolidates advantages by improving the access of agricultural producers to the Chinese market and thereby increasing the resilience of supply chains to external disturbances. Such infrastructural development is in line with China's vision of the need for integrated development of transcontinental economic and transport corridors to improve the country's food security [78]. As evidenced by Van der Putten et al. [14], Zhao [7], and Erokhin et al. [21], among others, the development of economic corridors not only improves logistics, but also attracts investments in competitive sectors integrated in value and supply chains within the corridor format.

Most of the SITC positions included in group CC have competitive advantages in domestic production rather than in foreign trade. Therefore, for such products, it is advisable to focus on creating demand in the Chinese market. Measures include marketing promotion and work on creating competitive advantages in market niches. According to Svanidze et al. [79] and Erokhin et al. [22], for conditionally competitive goods, advantages development measures should be complemented by support of producers and suppliers. Siggel [55] and Yercan and Isikli [60] advocate the provision of tax incentives and subsidised loans to farmers, while Zhou [3], Huang et al. [72], and Tian et al. [4] emphasise the need for state-driven technological advancements in agricultural production and supply.

Dealing with marginally competitive SITC positions is a two-way process. On the one hand, it is important to protect existing advantages by mitigating the damaging effects of foreign competition on local production. This can be done by promoting diversification of agricultural production and improving the economic parameters of domestic producers' competitiveness. On the other hand, protecting these advantages also means nurturing them through research and investigation into knowledge-based value chains. As suggested by Ada et al. [80] and Joshi et al. [81], the development of research and practical investigation lays the foundation for long-term competitive advantage within these value chains.

Since a significant number of SITC products included in the study are classified as non-competitive, it seems impractical to focus resources on stimulating their production for export to China. However, these products are essential for ensuring the food security of EE countries. Additionally, DRC data indicates that some countries have domestic cost advantages for producing certain types of food and agriculture products, but they do not benefit from advantages in foreign trade. According to Masters and Winter-Nelson [64], Erokhin et al. [21], and Nowak and Różańska-Boczula [82], it is recommended that policy measures in these non-competitive sectors focus on promoting domestic production and integrating domestic farmers into domestic supply chains.

6. Conclusions

The elaborated approach to the assessment of advantages made it possible to identify the comparative, trade, competitive, and cost advantages of EE countries in the production and trade of food and agricultural products with China. Based on the principle of stage-by-stage exclusion of SITC positions with weaker advantages from the analysis, agricultural products were grouped into four categories according to their degree of competitiveness. It is found that competitive advantages of EE countries in agricultural trade with China concentrate in technology-intensive and capital-intensive sectors, including crops (maize, oilseeds, barley), cereal preparations, edible products and preparations, feeding stuff for animals, meat of bovine animals, and milk and dairy products. For some EE countries, con-

ditional and marginal advantages are identified across horticultural sectors (fruits and fruit preparations, vegetables) and food processing industries (preserved fruits, and juices, confectionery foods and preparations).

Matching of the identified advantages of EE countries with China's needs in agricultural imports allowed the authors to identify four promising areas for the development of China-EE trade: shift of consumption patterns in China towards value-added food products (edible products and preparations, cereal preparations, sugar, milk, cheese), booming industrial demand for crops for non-food uses (maize, oilseeds, barley), demand for processed feeding stuff for animals from cattle breeding facilities, and promotion of niche products (high-value meat and fish products, confectionery). Approaches to the implementation and development of advantages were differentiated according to the degree of competitiveness of SITC positions. The principle is that competitive sectors (C and CC groups) should be supported to develop externally oriented advantages and expand exports, while non-competitive ones (MC and NC groups) should focus on domestic markets.

The authors' approach is not free from limitations. First, using one country (China) as a model trading partner may distort the picture of the overall foreign trade advantages of countries included in the study. This simplification was applied purposefully to identify specific opportunities for the development of food trade with China. However, it is advisable to expand the range of trading partners to get a more objective picture. Second, the approach does not take into account the impact of trade policy measures on trade volumes, but only reflects current trade indicators (exports, imports). Third, the study period is limited to 2022 due to the availability of reliable data on trade and agricultural production across EE countries and China. Newer data for 2023 was not yet available across all the databases the authors used for the study. Specifically, the UNCTAD Data Center only provides data up to 2022, and China's foreign trade statistics report only preliminary data for 2023. Therefore, the authors decided that focusing on the 2000–2022 timeframe would produce reliable results not compromised by the incompatibility of data across sources. The use of data for 2023 may distort the findings, in particular for Ukraine, due to the disruption or distortion of food supply chains due to the Russia-Ukraine war. Nevertheless, the authors' approach to the assessment of advantages can serve as one of the options for solving the research problem of optimal linking trade and competitive advantages with production capabilities of individual countries.

Author Contributions

Study conception and design: Vasilii Erokhin; data collection: Anna Ivolga, Natalia Lazareva, Victoria Germanova; analysis and interpretation of results: Vasilii Erokhin, Elena Igonina, Alexander Sofin; draft manuscript preparation: Vasilii Erokhin; manuscript revision: Vasilii Erokhin. All authors reviewed the results and approved the final version of the manuscript.

Funding

This research received no external funding.

Data Availability

All data used in the study are available from the corresponding author upon request.

Conflict of Interest

All authors disclosed no conflict of interest.

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Appendix A

Table A1. Categories of agricultural products included in the study.

SITC groups	Products
001	Live animals
011	Meat of bovine animals, fresh, chilled or frozen
012	Other meat and edible meat offal, fresh, chilled or frozen
016	Meat and edible meat offal, salted, in brine, dried or smoked
017	Meat and edible meat offal, prepared or preserved
022	Milk and cream and milk products other than butter or cheese
023	Butter and other fats and oils derived from milk
024	Cheese and curd
025	Eggs, birds', and egg yolks, fresh, dried or otherwise preserved
034	Fish, fresh (live or dead), chilled or frozen
035	Fish, dried, salted or in brine
036	Crustaceans, mollusks, and aquatic invertebrates
037	Fish, crustaceans, mollusks and other aquatic invertebrates
041	Wheat (including spelt) and meslin, unmilled
042	Rice
043	Barley, unmilled
044	Maize (not including sweet corn), unmilled
045	Cereals, unmilled (other than wheat, rice, barley and maize)
046	Meal and flour of wheat and flour of meslin
047	Other cereal meals and flours
048	Cereal preparations and preparations of flour or starch of fruits/vegetables
054	Vegetables, fresh, chilled, frozen or simply preserved
056	Vegetables, roots and tubers, prepared or preserved
057	Fruits and nuts (not including oil nuts), fresh or dried
058	Fruit, preserved, and fruit preparations (excluding fruit juices)
059	Fruit juices and vegetable juices, unfermented
061	Sugars, molasses and honey
062	Sugar confectionery
071	Coffee and coffee substitutes
072	Cocoa
073	Chocolate and other food preparations containing cocoa
074	Tea and mate
075	Spices
081	Feeding stuff for animals (not including unmilled cereals)
091	Margarine and shortening
098	Edible products and preparations
222	Oilseeds and oleaginous fruits

Source: UNCTAD [11].

Table A2. RCAav values for selected agricultural products in EE countries in 2000–2022.

SITC group	BG	CZ	HU	MD	PL	RO	SK	UA
001	0.247	0.401	0.507	0.276	0.208	0.315	0.445	0.543
011	0.440	0.637	3.111*	0.438	0.333	1.116*	0.308	0.876
012	0.146	0.276	0.820	1.112*	0.712	0.468	1.120*	0.481
016	0.378	0.720	0.539	0.683	0.504	0.111	0.579	0.594
017	0.701	1.224*	0.612	0.422	0.723	0.267	0.311	0.370
022	0.229	0.979	2.976*	0.497	2.070*	0.750	0.724	1.607*
023	0.562	0.611	0.834	1.088*	1.375*	0.629	0.599	0.823
024	0.308	1.973*	0.455	0.635	0.976	1.303*	1.273*	0.589
025	0.599	0.803	0.201	0.552	0.700	0.764	0.545	0.602
034	0.200	0.272	0.397	0.274	0.909	0.808	0.117	0.748
035	0.867	0.714	0.446	1.215*	0.468	0.535	0.376	0.634
036	0.297	0.433	0.278	0.336	0.583	0.231	0.303	0.260
037	0.946	0.765	0.683	0.759	0.317	1.200*	0.526	0.587
041	0.162	0.467	0.435	0.516	0.540	0.803	1.362*	0.800
042	0.453	0.550	0.805	0.220	0.696	0.745	0.558	0.764
043	0.820	0.703	0.448	0.438	0.141	0.716	0.497	6.115*
044	4.406*	0.664	0.952	0.177	0.602	0.534	0.290	9.458*
045	0.764	0.222	0.770	0.300	0.379	0.660	0.666	0.730
046	0.555	0.468	0.641	0.702	0.290	0.178	0.472	0.912
047	0.269	0.504	0.825	0.598	0.750	0.594	0.262	0.673
048	0.905	0.925	0.906	0.611	2.006*	0.966	3.001*	0.814
054	0.668	3.012*	0.472	0.803	1.712*	0.877	0.826	1.179*
056	0.837	0.713	0.889	0.547	1.509*	0.542	0.554	0.440
057	0.249	0.802	0.500	1.666*	1.050*	0.309	0.346	0.576
058	0.915	1.026*	0.971	0.860	3.337*	0.537	2.999*	2.150*
059	0.760	0.907	0.832	1.375*	4.022*	0.821	1.407*	0.792
061	0.831	1.117*	1.301*	0.664	2.731*	1.374*	0.925	1.222*
062	0.770	0.930	1.227*	1.099*	1.954*	2.112*	0.876	0.667
071	0.374	0.884	1.009*	0.821	1.285*	0.855	0.624	0.531
072	0.499	0.303	0.875	0.479	0.808	0.642	0.387	0.824
073	1.178*	1.347*	1.448*	0.601	0.791	3.447*	1.546*	0.777
074	0.904	0.450	0.885	0.224	1.273*	0.268	0.707	0.265
075	0.428	0.598	0.673	0.539	1.046*	0.490	0.265	0.482
081	5.007*	4.120*	5.070*	0.380	5.457*	0.534	0.911	6.084*
091	1.079*	0.600	0.847	0.885	0.976	0.222	0.557	1.807*
098	1.526*	2.004*	3.018*	0.466	4.448*	6.112*	3.007*	0.821
222	2.802*	0.755	0.404	0.759	0.824	0.803	0.715	5.145*

Note: * Product groups with comparative advantage.
Source: Authors' development based on UNCTAD [11].

Table A3. RTAav values for selected agricultural products in EE countries in 2000–2022.

SITC group	BG	CZ	HU	MD	PL	RO	SK	UA
001	–0.154	–0.712	–0.601	–1.273	–0.202	–0.317	–0.726	–0.454
011	–1.027	–0.504	2.143**	–0.826	–0.481	–0.511	–1.163	–0.102
012	–0.995	0.663*	–0.994	–0.947	–0.089	–1.059	–0.402	–0.823
016	–0.801	–1.008	–1.021	0.888*	–0.345	0.076*	–0.147	–0.325
017	–1.002	–0.372	–0.824	–1.045	–0.226	–0.548	–0.852	–0.411
022	–0.612	–0.955	1.564**	–0.468	3.378**	–0.250	–0.046	1.148**
023	–0.990	–1.074	–0.707	–0.622	–0.071	–0.767	–0.120	–0.057
024	–0.517	2.116**	–1.015	0.701*	–0.008	–0.922	–1.089	–0.814
025	0.735*	–1.375	–0.810	–1.130	–0.976	0.759*	0.372*	–1.136
034	–1.086	–0.226	–0.544	–1.755	0.873*	–1.347	–0.851	–0.973
035	–0.264	–0.850	–0.628	–0.827	–0.547	–0.942	–0.630	–1.444
036	–0.511	–1.214	–1.222	–0.204	–1.262	–1.024	–0.552	–0.820
037	–0.879	–0.301	–1.751	1.008*	–0.935	–1.555	–1.013	–0.712
041	–1.061	–1.000	–0.603	–0.831	–1.743	0.823*	–1.508	–1.056
042	–0.880	–0.782	–0.852	–0.664	–1.005	–0.475	0.169*	–0.550
043	–1.473	–0.943	–1.843	0.958*	–0.473	–0.641	–0.387	4.207**
044	2.076**	–0.846	–0.076	–0.854	–0.102	–1.116	–0.500	6.118**
045	–1.307	–1.305	–0.714	–0.562	–0.637	–0.804	–1.116	–0.991
046	–0.849	–0.599	–1.001	–1.214	–0.999	–0.352	–0.902	–1.275
047	–0.905	–0.634	–1.026	–1.347	–1.007	–0.755	–0.741	–0.537
048	–1.332	1.098*	–0.378	–0.830	2.435**	–0.661	1.224**	1.006*
054	–2.444	2.135**	–0.552	–0.614	0.981**	–1.235	–0.730	–0.752
056	–0.823	–0.075	–0.667	–1.555	1.058**	–1.068	–0.322	–0.233
057	–0.102	–0.497	–1.029	1.389**	–0.084	–0.647	–0.668	–0.856
058	–0.007	–0.084	–0.812	–0.074	1.117**	–0.825	2.003**	2.122**
059	–1.485	0.448*	0.587*	1.067**	0.724**	–0.314	–0.075	–0.403
061	–0.769	–0.111	–0.438	–0.202	0.155**	–0.008	–0.004	0.781**
062	–0.500	0.247*	0.895*	–0.861	0.936**	2.017**	–0.138	0.673*
071	–1.008	–0.505	–0.831	–0.332	–0.473	–0.144	–0.452	–0.411
072	–0.814	–1.148	–1.275	–1.001	–0.801	–1.071	–0.800	–0.682
073	0.985**	0.815**	–1.577	0.803*	1.278*	1.835**	–0.237	–1.278
074	–0.070	–0.674	–0.860	–0.266	0.851**	–0.892	–1.218	–1.005
075	–0.994	–0.317	–0.934	–0.473	–0.450	–1.094	–0.932	–0.542
081	2.174**	1.994**	2.114**	-1.285	2.002**	-0.736	-0.711	3.321**
091	–0.802	–1.008	–0.820	–0.861	–0.018	–1.111	–0.387	–0.048
098	–0.347	2.430**	1.995**	–1.128	1.926**	1.544**	2.730**	–0.116
222	3.588**	–0.814	–0.769	–0.374	1.013*	–0.512	–0.456	3.702**

Note: * product groups with relative trade advantage; ** product groups for which RCA and RTA match.
Source: authors' development based on UNCTAD [11].

Table A4. LIav values for selected agricultural products in EE countries in 2000–2022.

SITC group	BG	CZ	HU	MD	PL	RO	SK	UA
001	–0.015	–0.047	–0.340	–0.255	–0.002	–0.113	–0.141	–0.158
011	–0.340	–0.132	0.833**	–0.130	–0.048	–0.272	–0.086	0.813*
012	–0.214	–0.040	–0.101	–0.128	0.079*	–0.170	–0.423	–0.270
016	–0.628	–0.262	–0.256	–0.221	–0.109	–0.019	–0.375	–0.016
017	–0.345	–0.128	–0.043	0.047*	–0.095	–0.173	–0.279	–0.286
022	–0.009	0.495**	1.027**	–0.023	1.133**	0.008*	0.246*	1.021**
023	–0.117	–0.200	–0.372	–0.375	–0.221	–0.238	–0.165	0.930*
024	–0.204	1.078**	–0.111	–0.299	0.710*	–0.100	–0.112	–0.333
025	–0.339	0.061*	–0.080	0.200*	–0.089	–0.086	–0.073	–0.142
034	–0.099	–0.123	–0.135	–0.387	0.388*	0.112*	0.140*	–0.076
035	–0.042	–0.247	–0.309	–0.444	–0.116	–0.334	–0.355	–0.148
036	–0.234	–0.038	–0.247	–0.329	–0.379	–0.201	–0.402	–0.076
037	0.076*	–0.300	–0.415	–0.401	–0.202	–0.083	–0.227	–0.318
041	–0.015	–0.052	–0.252	0.088*	–0.018	–0.002	–0.129	–0.287
042	–0.117	–0.107	–0.074	–0.103	–0.113	0.128*	–0.015	–0.114
043	–0.239	–0.154	–0.011	–0.576	–0.541	–0.214	0.421*	1.576**
044	1.048**	–0.045	0.028*	–0.429	–0.370	–0.107	–0.245	1.998**
045	–0.103	–0.138	–0.233	0.317*	–0.429	–0.333	–0.314	–0.046
046	–0.277	–0.220	–0.642	–0.078	–0.018	–0.168	–0.111	–0.173
047	–0.318	–0.162	–0.300	–0.020	–0.199	–0.114	–0.237	–0.224
048	0.524**	0.877*	0.117*	–0.173	1.814**	1.012*	1.509**	0.917*
054	–0.155	1.140**	–0.228	–0.022	-0.002	–0.472	–0.224	–0.004
056	–0.214	–0.148	–0.004	–0.276	–0.075	–0.313	–0.410	–0.140
057	–0.333	–0.109	–0.309	–0.081	–0.126	–0.226	–0.387	–0.097
058	0.370**	–0.067	–0.047	–0.350	0.972**	–0.059	0.918**	1.550**
059	–0.202	–0.030	–0.115	1.004**	1.058**	–0.156	–0.122	0.811*
061	–0.460	–0.125	–0.099	–0.133	1.236**	–0.014	0.811*	0.992**
062	–0.237	–0.144	–0.012	–0.542	0.813**	1.400**	0.703*	0.620*
071	–0.118	0.057*	–0.158	–0.566	–0.077	–0.150	–0.400	–0.115
072	–0.052	–0.266	–0.829	–0.281	–0.138	–0.121	–0.208	–0.343
073	0.248**	–0.172	0.802*	–1.000	–0.222	1.309**	–0.021	0.275*
074	–0.007	–0.150	–0.250	–0.980	–0.195	–0.448	–0.139	–0.303
075	–0.766	–0.348	–0.176	0.668*	–0.313	–0.237	–0.475	–0.266
081	1.112**	1.005**	1.173**	–0.209	1.006**	–0.139	–0.502	1.257**
091	–0.400	–0.476	–0.400	–0.622	–0.369	–0.016	–0.666	–0.015
098	0.676*	0.998**	1.084**	–0.244	1.172**	1.313**	1.075**	0.744*
222	1.215**	–0.302	–0.281	0.015*	0.725*	–0.272	–0.244	1.609**

Note: * product groups with competitive advantage; ** product groups for which RCA, RTA, and LI match.
Source: authors' development based on UNCTAD [11].

Table A5. DRCav values for selected agricultural products in EE countries in 2000–2022.

SITC group	BG	CZ	HU	MD	PL	RO	SK	UA
001	1.178	1.251	1.182	1.200	1.084	1.173	1.114	1.215
011	0.842*	0.986*	0.314**	1.195	1.112	1.202	1.225	0.728*
012	1.186	1.350	1.326	1.240	1.099	1.159	1.176	1.059
016	1.271	1.276	1.245	1.096	1.125	1.275	1.085	1.114
017	1.023	1.105	1.290	1.307	1.264	1.202	1.145	1.228
022	1.201	1.022	0.361**	0.883*	0.421**	1.155	1.010	1.073
023	1.378	1.373	1.097	1.225	1.105	0.840*	0.758*	1.100
024	1.036	0.514**	1.256	1.173	0.765*	1.244	1.214	1.272
025	1.212	1.125	1.370	1.119	1.240	1.317	1.350	1.145
034	1.333	1.357	1.188	0.902*	1.088	1.193	1.293	1.202
035	1.182	1.300	1.203	1.144	1.337	0.777*	1.177	1.076
036	1.064	1.271	1.146	1.076	1.278	1.228	0.779*	1.115
037	1.005	1.094	1.099	1.225	1.311	1.301	1.142	1.099
041	1.204	1.115	1.462	1.303	1.165	1.184	1.101	1.247
042	1.075	1.136	1.100	0.860*	1.247	1.150	1.227	1.135
043	1.113	1.207	1.261	1.172	1.199	1.227	1.306	0.349**
044	0.427**	1.277	1.088	1.120	1.084	1.118	1.240	0.207**
045	1.152	1.150	1.102	1.019	1.120	0.614*	0.816*	1.190
046	1.200	1.096	1.344	1.255	1.111	1.242	1.200	1.145
047	1.149	1.315	1.227	0.712*	1.240	1.200	1.197	1.238
048	1.002	1.098	1.055	1.088	0.343**	0.789*	0.501**	1.088
054	1.227	0.422**	1.276	0.804*	0.626*	1.145	1.228	1.123
056	1.099	1.118	0.815*	1.135	1.012	1.354	1.103	1.317
057	1.374	1.124	1.340	1.029	1.149	1.442	1.119	0.914*
058	1.084	1.076	1.007	1.200	0.450**	1.205	0.427**	0.576**
059	1.150	1.100	1.104	1.055	0.326**	1.163	1.125	1.026
061	1.163	1.048	1.112	1.227	0.500**	1.097	1.008	1.014
062	1.199	1.145	0.700*	1.314	0.643**	0.313**	1.053	1.112
071	1.378	1.070	1.245	1.115	1.080	0.901*	1.229	0.909*
072	1.401	1.322	1.372	1.326	1.247	1.142	1.333	1.378
073	1.076	0.711*	0.849*	1.222	0.822*	0.525**	1.066	1.143
074	1.120	1.178	1.350	1.347	0.709*	1.202	1.217	1.227
075	1.358	1.195	1.447	1.140	1.090	1.187	1.198	1.158
081	0.678**	0.370**	0.417**	0.816*	0.558**	1.243	1.242	0.444**
091	1.250	1.255	1.221	0.930*	1.213	1.176	1.113	1.140
098	1.107	0.404**	0.376**	1.205	0.415**	0.429**	0.555**	1.099
222	0.312**	1.331	1.142	1.134	1.122	1.125	1.099	0.318**

Note: * Product groups with advantage on domestic resource costs; ** product groups for which RCA, RTA, LI, and DRC match.
Source: Authors' development based on UNCTAD [11] and national-level data of countries under study.