An Analysis of the Impact of EU Membership on the Export of Agricultural Products from Central and Eastern European Countries to China

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Abstract. Given the importance of the agricultural sector for Central and Eastern European countries (CEEC) and their close trade relations with the European Union (EU), this study aims to examine the impact of EU membership on agricultural exports from CEEC to China. We use a gravity model and a panel dataset to econometrically estimate the impact by looking at trade flows from 2002 to 2021. The estimation results indicate that the range of exported products is significantly and positively related to CEEC membership in the EU. By contrast, in the case of the estimation of the impact on the volume of trade, the results are not statistically significant.

Keywords: Agricultural trade · 17 + 1 Cooperation · Gravity model · China · Eastern Europe · European Union

1 Introduction and Literature Review

The 17 + 1 Cooperation, which is part of the Belt and Road Initiative (BRI) [1, 2], is a comprehensive cooperation mechanism involving 17 Central and Eastern European countries (CEEC)[1] on the one hand and China on the other. The cooperation was initiated in 2011 and formally established in 2012 as the 16 + 1 Cooperation, however, after Greece joined it in 2019, the cooperation was transformed into the 17 + 1 Cooperation. Among the 17 CEEC countries, we can distinguish 12 countries that are members of the European Union (EU) and 5 countries that are not EU members. Given that EU member states enjoy the benefits of the European single market, which facilitates trade within the bloc, this study aims to examine the impact of EU membership on Sino-CEEC trade relations. In particular, given the importance of the agricultural sector to the economies of the 17 CEEC, this study aims to investigate the impact of EU membership on the export of agricultural products from the 17 CEEC to China.

[1] Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, North Macedonia, Montenegro, Poland, Romania, Serbia, Slovakia and Slovenia.

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After the formal establishment of the 17 + 1 Cooperation, China's agricultural imports from the 17 CEEC increased from $524.4 million in 2012 to $2.3 billion in 2021, reflecting a compound annual growth rate of 18%. The importance of the agricultural sector for the 17 CEEC countries is best demonstrated by the share of the workforce it employs. More precisely, in Albania, it employs about 35% of the total workforce, in Bosnia and Herzegovina about 18%, in Serbia about 15%, in North Macedonia about 14%, etc. (World bank data). However, in some countries, the share is around 3%, namely the Czech Republic, Slovakia, and Estonia. Given that CEEC economies that are EU members enjoy free access to markets within the EU, it can be expected that their agricultural exports are predominantly oriented towards other EU countries. In other words, EU membership may result in trade divergence from China to the EU. However, looking at it from another perspective, EU membership can be beneficial for agricultural exports from CEEC countries to China, as countries can benefit from the EU's Common Agricultural Policy (CAP) and large subsidies given to the agricultural sector. Hence, CEEC countries that are EU members could be more competitive, which would promote exports to China. Therefore, to test the impact of EU membership on agricultural exports from CEEC countries to China, this study aims to analyze the export trends, structure, and variety of exported products. In addition, we use an econometric approach based on a gravity model to quantitatively assess the research question.

The existing literature on Sino-CEEC trade, in the context of the 17 + 1 Cooperation, provides studies on various aspects of the cooperation mechanism. Thus, [3] tried to assess the impact of the 17 + 1 Cooperation on Sino-CEEC trade relations. Using a set of indices, they concluded that the 17 + 1 Cooperation did not result in a significant increase in trade. However, they analyzed the first four years after establishing the cooperation, so the results of the cooperation could be relatively limited. On the other hand, [4] employed a gravity model and estimated a panel dataset consisting of 167 countries and covering the period from 2001 to 2019 to estimate the impact of the cooperation on Sino-CEEC trade flows. Similar to [3], their study does not find sufficient evidence that the 17 + 1 Cooperation resulted in significant trade creation. However, their findings suggest that the cooperation mechanism may be more helpful to non-EU CEEC countries in increasing trade flows with China, which motivates research on the impact of EU membership on Sino-CEEC trade. Unlike [3] and [4], a study by [5] concludes that the Belt and Road Initiative promotes Sino-CEEC trade relations. However, they used a different method, i.e., propensity score matching and a difference-in-differences approach. When it comes to agricultural trade, [6] used a series of indices and found that the exports of the 17 CEEC countries are complementary to China's imports, indicating great potential for agricultural trade. Besides, some other aspects of the 17 + 1 Cooperation, such as investments [7, 8], the mechanism of cooperation [9, 10], and the relationship with the Belt and Road Initiative [2, 11], have been discussed in the literature. However, to the best of our knowledge, no study has addressed the impact of EU membership on agricultural exports from CEEC countries to China. Therefore, this study aims to add to the literature by exploring a significant area. The significance of the research question stems from the importance of the agricultural sector for CEEC economies. In addition, given that most of the 17 CEEC countries are relatively small economies and the EU

is their main trading partner, it is important to explore whether they have the economic capacity to build closer trade relations with China at the same time.

2 Stylized Facts

Figure 1 illustrates China's total agricultural imports and imports from the 17 CEEC countries. The figure shows that after the formal establishment of the cooperation, in 2012, China's imports from the 17 CEEC countries grew significantly faster than total imports, which may indicate a positive impact of the cooperation mechanism on trade flows. Figure 2 presents China's agricultural imports from EU CEEC countries and non-EU CEEC countries. This figure shows a rapid increase in imports from non-EU CEEC countries between 2013 and 2017, which was followed by a large decline in the following two years. On the other hand, the trend of imports from EU CEEC countries seems more stable. Rapid growth in imports from non-EU CEEC countries may indicate that being outside the EU promotes exports to China, however, the more stable trend of EU CEEC countries could mean that EU membership is associated with larger exports to China. Figure 3 shows the range of agricultural products that China imports from all over the world, as well as from 17 CEEC countries. The figure indicates a relatively stable range of total imports, while the range of imports from the 17 CEEC countries was constantly growing during the observed period, except for 2019 and 2020. Figure 4 illustrates the range of imports from EU CEEC countries and non-EU CEEC countries. The figure shows stronger growth in the range of products imported from non-EU CEEC countries; however, the range never reaches the level of the EU CEEC countries. As mentioned in the introduction part, EU member countries are stronger economies whose agricultural sector receives more subsidies, so their export capacity is stronger compared to non-EU CEEC countries.

To sum up, CEEC countries that are members of the EU have higher exports to China, as well as a larger range of exported products, indicating a positive impact of EU membership on CEEC agricultural exports to China. On the other hand, the exports of non-EU CEEC countries and the range of exported products grew much faster, which may indicate that EU membership impedes Sino-CEEC trade.

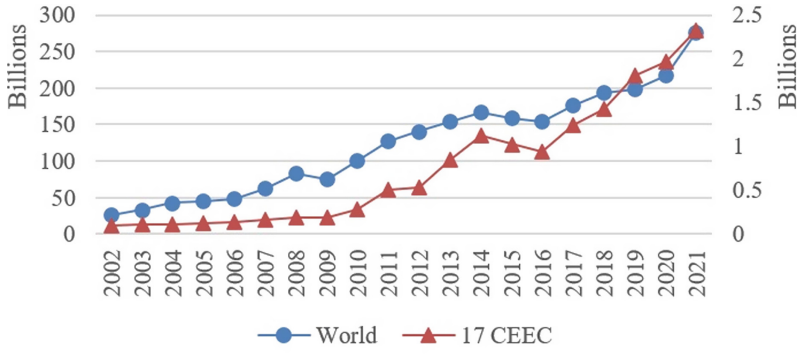

Fig. 1. China's imports of agricultural products from the world (primary axis) and the 17 CEEC (secondary axis).

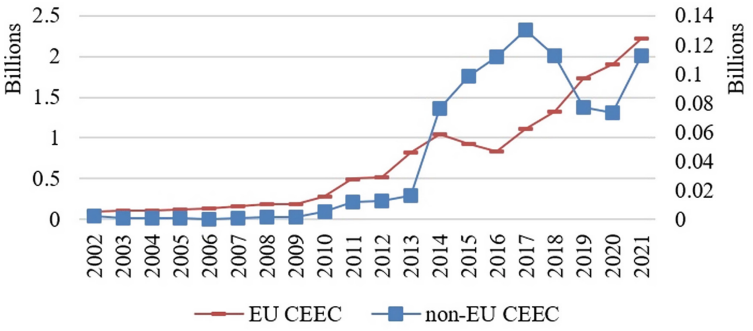

Fig. 2. China's imports of agricultural products from the EU CEEC (primary axis) and non-EU CEEC (secondary axis).

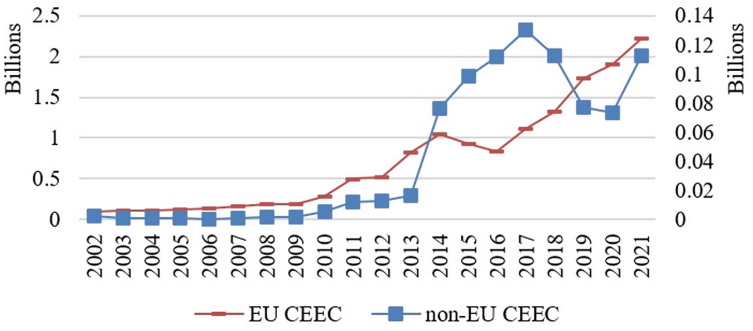

Fig. 3. Range of varieties of China's total imports (primary axis) and imports from CEEC (secondary axis).

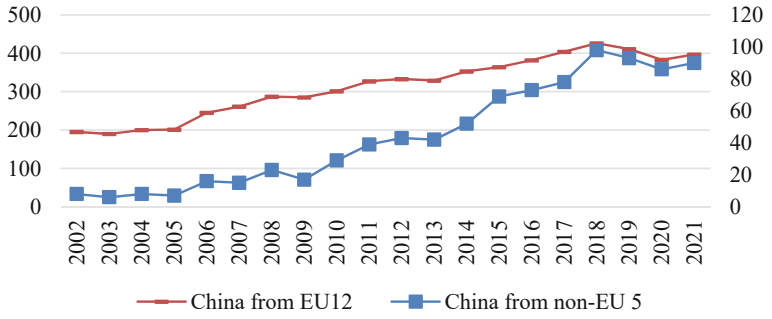

Fig. 4. Range of varieties of China's imports from the EU CEEC (primary axis) and non-EU CEEC (secondary axis).

3 Quantitative Analysis and Discussion

The gravity model, or the so-called "workhorse" of econometric analysis [12, 13], is widely used to analyze the impact of various factors on international trade. The model was

introduced in the 1960s as an empirical tool [14, 15], only to take on a more theoretically consistent form over time [16–19]. To estimate the impact of EU membership on the CEEC agricultural exports, we adjust the standard gravity equation by adding a dummy variable that takes the value 1 if the exporting country is an EU member, otherwise, it takes the value zero. Besides, we use the Poisson Pseudo Maximum Likelihood (PPML) estimator developed by [20]. Many authors have praised the estimator for its practicality [21–23]. Hence, the baseline gravity equation can be presented as follows:

$$X_{iChnt} = \exp\left[\beta_0 + \beta_1 Y_{it} + \beta_2 Y_{Chnt} + \beta_3 Dis_{iChn} + \beta_4 Pop_{it} + \beta_5 EU_{it} + \beta_6 Port_{it}\right] + e_{iChnt} \quad (1)$$

where: X_{iChnt} represents exports (variety of exports) from CEEC i to China in year t; Y_{it} stands for GDP of CEEC i in year t; Y_{Chnt} denotes China's GDP in year t; Dis_{iChn} stands for distance from CEEC i to China; Pop_{it} represents the population of CEEC i in year t; EU_{it} is the variable of interest, a dummy which equals 1 if CEEC i is a member of the EU in year t, otherwise 0; $Port_{it}$ is also a dummy variable and it takes value 1 if CEEC i has access to the sea, otherwise 0; and, e_{iChnt} is the error term. In the next step, we include time-fixed effects that control for the time trend and any other influences that are common to all countries but specific to certain years. The inclusion of time-fixed effects yields:

$$X_{iChnt} = \exp\left[\beta_0 + \delta_t + \beta_1 Y_{it} + \beta_3 Dis_{iChn} + \beta_4 Pop_{it} + \beta_5 EU_{it} + \beta_6 Port_{it}\right] + e_{iChnt} \quad (2)$$

It is important to note here that the inclusion of time-fixed effects absorbs the variable Y_{Chnt} since China is the only importing country in the current data set. However, this does not prevent the estimation of the variable of interest but contributes to a more precise estimation.

The data on CEEC agricultural exports, in USD, are obtained from the World Integrated Trade Solution (WITS) database. We use mirrored data as it is more reliable as imports are recorded more carefully compared to exports [22]. The data on GDP and population come from the World Bank. Bilateral distance measures the distance between the two capital cities of the countries in a country pair and it comes from the CEPII database. The two dummy variables are constructed by the author. We conduct two sets of estimations; first, we use trade volumes as the dependent variable; second, we use the range of exported products as the dependent variable.

Columns (1) and (2) of Table 1 contain the estimates obtained by estimating Eq. (1), while the estimates shown in columns (3) and (4) are obtained by estimating Eq. (2). Columns (1) and (3) show the results obtained using the volume of exports as the dependent variable, while columns (2) and (4) are obtained using the range of exports as the dependent variable. The results indicate a positive impact of the size of economies in a pair of countries on their bilateral trade and a negative impact of the distance between the two countries, which is in line with the theoretical expectation. The impact of variables population and port remains ambiguous as coefficients are not statistically significant or consistent across the estimations. When it comes to the variable of interest, the estimation results indicate a negative impact of EU membership on the volume of agricultural exports from the 17 CEEC countries to China. However, the coefficients are not statistically significant. In other words, the results suggest that, after controlling for the size of

Table 1. Estimation results.

VARIABLES	(1)	(2)	(3)	(4)
	(value)	(variety)	(value, δ_t)	(variety, δ_t)
GDP_it	0.924**	0.557***	0.879***	0.622***
	(0.364)	(0.0579)	(0.233)	(0.0555)
GDP_Chnt	1.297***	0.398***		
	(0.154)	(0.0303)		
Distance_ij	−2.205	−1.656***	−9.049***	−1.683***
	(2.390)	(0.361)	(1.045)	(0.304)
Population_it	0.217	−0.00929	−0.0226	−0.0723
	(0.330)	(0.0535)	(0.206)	(0.0524)
EU_membership_it	−0.276	0.237***	−0.141	0.244***
	(0.480)	(0.0904)	(0.266)	(0.0827)
Port_it	−0.0847	0.00171	−0.410***	0.00501
	(0.160)	(0.0373)	(0.143)	(0.0342)
Constant	−28.95	−7.035**	70.44***	4.411*
	(20.70)	(3.058)	(8.979)	(2.518)
Observations	311	320	320	320
R-squared	0.693	0.887	0.822	0.786

Robust standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
Source: Author's estimation

the economies, their distance, and other factors captured by the rest of the independent variables, EU CEEC tend to export less to China compared to non-EU CEEC countries; but the evidence for this claim is not sufficient. In contrast, the statistically significant coefficients presented in columns (2) and (4) suggest that EU CEEC countries tend to export a greater range of agricultural products to China compared to non-EU CEEC.

These estimation results partly correspond to the findings of [4] who argued that non-EU CEEC may have benefited more from the 17 + 1 Cooperation, but they did not find sufficient evidence for that. The fact that non-EU CEEC countries have more difficult access to the EU common market compared to EU CEEC may affect their efforts to access the Chinese market. In other words, the EU CEEC may rely on the EU market and partially ignore the Chinese market, while non-EU CEEC countries may be more motivated to market their products in China. Also, the fact that most products exported to China are raw materials, such as "Wood and articles of wood; wood charcoal" (HS code'44), reflects China's growing need for resources. In this regard, one may conclude that EU CEEC countries supply other European economies with raw materials, while non-EU CEEC countries look for exports to China or other countries. When it comes to the range of exports, it could be expected that it is positively related to EU membership.

Table 2. Robustness check results.

	(1)	(2)	(3)	(4)
	(value)	(variety)	(value, δ_t)	(variety, δ_t)
(i)	−0.286	0.173**	−0.175	0.201***
	(0.465)	(0.0826)	(0.262)	(0.0778)
(ii)	−0.096	0.338***	−0.157	0.231*
	(0.329)	(0.122)	(0.365)	(0.126)

Robust standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
Source: Author's estimation

This is because EU countries receive higher subsidies through the European Common Agricultural Policy so that their producers can be more competitive internationally. This claim is supported by the fact that the main exports of Greece and Poland are "Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere…" (HS code' 44).

Table 2 shows the results of the robustness check estimation. The robustness check is conducted in two ways: (i) by estimating Eq. (1) and Eq. (2) after including an additional variable that reflects the contribution of the agriculture sector to a country's GDP; and (ii) By estimating Eq. (1) and Eq. (2) after shortening the observation period, i.e., from 2012 to 2022 It can be seen from Table 2 that the robustness check largely confirms the previously obtained results.

4 Conclusion

This study was designed to investigate the impact of EU membership on agricultural exports of 17 Central and Eastern European countries to China. The relevance of this topic comes from the importance of the agricultural sector for CEEC economies and the fact that the EU is their main trading partner. To investigate the impact of EU membership, we first analyzed the growth trends of Chinese imports from EU CEEC and non-EU CEEC countries, as well as the range of exported products, and in the next step, we used a gravity model to estimate the impact in an econometric way.

The analysis of trade growth trends shows a significantly stronger growth of trade flows from non-EU CEEC countries, especially in the first five years after the establishment of the 17 + 1 Cooperation. Similarly, the range of products exported by non-EU CIEC countries has increased rapidly. However, the volume of trade and the range of exported products of the EU CEEC countries remained much higher compared to non-EU countries. The faster growth in export volumes and the range of exported products of non-EU CEEC countries suggest that being outside the EU is positively associated with exports to China. On the other hand, the larger trade volumes and the range of exports of EU CEEC countries indicate that EU membership promotes trade with China. Finally, the econometric analysis shows a significant and positive impact of EU membership on

the range of agricultural exports. In contrast, the impact on trade volume is not statistically significant. The robustness check largely confirmed the estimation results, which increases the reliability of the estimation results.

This study contributes to the literature by analyzing a relevant topic that has not been addressed before. Given that the cooperation mechanism includes 17 CEEC countries, it is possible that the impact on a particular country differs from the general conclusion. Therefore, a more detailed analysis focusing on CEEC countries individually may increase the understanding of this topic.

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