Asia Europe Journal (2023) 21:351–379
https://doi.org/10.1007/s10308-023-00675-9

ORIGINAL PAPER

EU and China's comparative advantage, trade complementarity and trade specialization dynamics in agricultural products

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Received: 3 December 2020 / Revised: 16 February 2023 / Accepted: 9 July 2023 /
Published online: 17 July 2023

Abstract

This paper aims to analyse the comparative advantage of selected agricultural products for both EU and China in the context of EU-China bilateral trade and explore how the trade specialization changes along with the economic development based on the data between 2001 and 2017. First, we obtain the static results from both a comparative advantage perspective and a trade complementarity perspective. We then analyse three types of trade specialization dynamics by using the OLS regression and Markov transition probability matrix from a more dynamic perspective. Results show that EU's comparative advantage includes meat products, dairy products, animal originated products, preparations of cereals or milk products, beverages, wool and vegetable textile fibres. China has a comparative advantage in fish, animal originated products, edible vegetable, lac, gums, resins, vegetable, plaiting materials, preparations of vegetables, silk, wool and vegetable textile fibres. We also find that both EU and China have unstable trade specialization for their agricultural products trade and we give policy implications for EU-China bilateral trade based on the results.

Introduction

The EU and China trade relationship has a long history going back to the Silk Road during the Pax Romana and Zheng He's Seven Voyages during 1405–1433. The modern trade relationship between the EU and China started in 1975. Being the world's

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biggest exporter and importer, the EU is the leading investor and recipient of foreign investment and the biggest aid donor. China has become the EU's largest import trading partner and the second largest export trading partner (EC 2016). The total trade between the EU and China was €606 billion in 2018, composed of €395 billion in imports (20% of EU imports) and €211 billion in exports (10.8% of EU exports). China's accession to the WTO in 2001 can be considered a milestone for Chinese trade with the EU in agricultural products. Both imports and exports of the EU with China have been increasing since 2002. Since 2009, the gap between exports and imports has been increasing year by year and the agricultural trade surplus of the EU historically reached a peak in 2016 with a €7.818.8 billion surplus, of which €12.830.9 billion were for exports and €5.012.1 billion were for imports (Eurostat 2017).

This paper uses the notion of comparative advantage and trade complementarity to analyse selected agricultural products for both the EU and China in the context of EU-China bilateral trade relations. According to the international trade theory of David Ricardo, countries should trade products that have comparative advantages so as to increase their welfare. Trade complementarity can indicate, for example, to what extent Country A (the EU)'s exports correspond to Country B (China)'s imports and vice versa. It therefore can provide useful information for decisions on establishing mutual trade agreements between trading partners.

The study quantifies the comparative advantages of both the EU and China in specific agricultural products from both static and dynamic perspectives. In doing so, this study adopts firstly Balassa's revealed comparative advantage index (BRCA) and secondly an updated index called the normalized revealed comparative advantage index (NRCA). Given that these indexes' results are based on trade data of previous years in the long term, the results can be used to delineate the main trade characteristics between the two partner countries. It is also the same with the trade complementarity index (TCI). The results show which agricultural products denote comparative advantages for the EU and which products denote comparative advantages for China; therefore, the indexes imply which products should be traded between the two countries and the results of the trade complementarity index can inform the two regions about which agricultural products should be considered when negotiating trade agreements.

Moreover, this study further identifies three types of trade specialization dynamics for agricultural products in the EU and China so as to see how the trade specialization changes along with the economic development of the EU and China. The trade specialization here borrows from the notion of comparative advantage. The first type of trade specialization dynamics is related to how the comparative advantage index changes from one period to the next. The second type of trade specialization dynamics is in relation to the degree of mobility of the comparative advantage for every two adjacent years within a whole defined research period. The third type of trade specialization dynamics predicts the trends of comparative advantage for the future based on the trade performance over the research time period.

Research related to analysing comparative advantage and agricultural trade specialization dynamics in the context of EU-China bilateral trade relationship is rare. This paper therefore has filled in the research gap by using the updated agricultural trade data at more refined agricultural products for both the EU and China. Results show

that EU's comparative advantage includes meat products, dairy products, animal originated products, preparations of cereals or milk products, beverages, wool and vegetable textile fibres. China has a comparative advantage in fish, animal originated products, edible vegetable, lac, gums, resins, vegetable, plaiting materials, preparations of vegetables, silk, wool and vegetable textile fibres. We also find that both EU and China have unstable trade specialization for their agricultural products trade. We further discuss policy implication for the future EU-China bilateral trade in this paper.

The following sections have been divided into four parts. In the 'Literature review' section, we will give a brief review on the related literature. Methodology and data will be presented in the 'Methodology and data' section, followed by results. The last section is the conclusion and policy implications.

Literature review

The existing literature on trade comparative advantages and trade complementarity is abundant. They provide both theoretical and empirical foundations for this paper. In this section, the current literature will be summarized from three main perspectives: studies in relation to different countries, time periods and products (sectors); the application of various comparative advantage and complementarity indexes; studies related to trade specialization dynamics.

Literature relating to China and other countries

Of specific interest to this research are the studies that have put a focus on Asia and other emerging areas notably China. Fang and Beghin (2000) researched the comparative advantages of major Chinese crops during 1988 and 1999. Adams et al. (2004) explained why China is so competitive by analysing China's revealed comparative advantage for its general export performance from 1970 to 2002. Ahmad et al. (2018) analysed the comparative advantages of Indian and Chinese bilateral merchandize trade from 1985 to 2012. The comparative advantages of the agricultural sector of Vietnam in 2014 have also been studied by Hoang et al. (2017). Selek and Kebakile (2017) analysed the comparative advantages of Botswana's beef industry for the period 1961 to 2011. Esquivias (2017) put the focus on agricultural trade between East Java, Indonesia and six main ASEAN countries during 2007–2013, and Elryah (2015) illustrated Sudan's agricultural products between 2000 and 2013. The comparative advantages of Nigeria and India in the context of bilateral trade relations, between 2000 and 2014 which covered 20 major product categories, have been studied in the work of Ibrahim and Shehu (2016). Kumar and Ahmed (2015) measured the revealed comparative advantages in bilateral trade between India and Sri Lanka in different sectors from 1975 to 2013. Moreover, the tuna industry in Thailand between 1996 and 2006 had been studied by Kuldilok et al. (2013).

A second group of studies relate to Europe, especially the EU and adjacent countries. Carraresi and Banterle (2015) analysed the comparative advantages of the food industry and agriculture sector at the 2-digit level in the intra-EU market from 1995 to 2011, while Bojnec and Fertö (2009) studied the agri-food sector in eight Central European

and Balkan countries from 1995 to 2007. Sahinli (2012)'s work explained the comparative advantages for Turkey and the EU in their bilateral relationship in the agricultural sectors for the year 2008; Serin and Civan (2008) also studied the EU's comparative advantages with Turkey during the period 1995 to 2005 in the agricultural sector, but they especially focused on the fruit and vegetable industries. Some other studies analysed the comparative advantages of food industry in Russia, Ukraine and other EU countries (Gorton et al. 2000; Qineti et al. 2009; Ishchukova and Smutka 2013).

Literature on the application of comparative advantage and complementarity indexes

The current literature not only analyses the different countries with different year durations but also applies different indicators (indexes) to obtain the results. The most used index in the current empirical research is Balassa (1965)'s revealed comparative advantage (hereafter BRCA) which was first introduced by Liesner (1958). Essentially, BRCA measures the share of a specific country's export in a given product in the total exports of this specific country as a fraction of the share of world exports in this given product in the total world exports.

The BRCA approach is the most widely used method to identify comparative advantage (Balassa and Noland 1989). This has been proved by many examples from the current literature; for example, Brakman and Marrewijk (2017) used the BRCA to compare the results between using gross export value and value-added trade flows. Also, studies such as Ahmad et al. (2018), Elryah (2015), Kuldilok et al. (2013), Sahinli (2012), Drescher and Maurer (1999), Laursen (2015) and Qineti et al. (2009) all have used this index.

Besides the BRCA index, there are some other ways to quantify comparative advantage; however, most of these are derived from BRCA, such as the revealed symmetric comparative advantage (RSCA) introduced by Dalum et al. (1998) and Laursen (1998), Vollrath's (1991) revealed trade advantage (RTA) and normalized revealed comparative advantage (NRCA) which was developed by Yu et al. (2009). Moreover, there are some other measurements such as Lafay (1992)'s trade balance index (TBI), export market share (EMS), comparative export performance (CEP) and net export index (NEI).

Recent work usually applies two or more different indexes to measure comparative advantage. Some studies use both BRCA and RTA,[1] such as Ishchukova and Smutka (2013), Fertö and Hubbard (2003), Bojnec and Fertö (2009) and Bavorová (2003); other studies apply both BRCA and CEP, like Serin and Civan (2008). Concerning the studies on trade complementarity, Ibrahim and Shehu (2016) used TCI as a tool to analyse the trade potential between two trading partners (Nigeria and India), while Kumar and Ahmed (2015) used BRCA and TCI at the same time. They have built a relatively firm methodology foundation for further research. In terms of comparative advantages, BRCA, RSCA, NRCA and RTA are the most popular measurements for researching comparative advantages, while the TCI indicator is the main method used to analyse trade complementarity.

[1] Note that when RTA is used, RXA and RMA need to be used for getting the result of the RTA which is expressed as RTA = RXA-RMA. Also, revealed competitiveness (RC) is a similar concept to RTA; however, the small difference is RC = lnRXA-lnRMA.

Literature on trade specialization dynamics

Trade specialization represented by comparative advantage is dynamic not static. It changes along with structural change in an economy due to different factors. Theoretically, the changes rely on three elements: (1) the role of factor accumulation (Findlay (1970)); (2) the endogeneity of technological change (Krugman (1979)); (3) the influence of agglomeration economies (Krugman (1985)). It implies that trade specialization which is conceptualized by the concept of comparative advantage in this study is dynamic and it evolves endogenously over time.

According to Hinloopen and Marrewijik (2001), three types of trade specialization are defined: first, the changes of the comparative advantage index from one period to the next; second, the degree of mobility for every two adjacent years during a whole research period; third, the trends of comparative advantage over a research period and predictions for the future. Empirically, Hoang et al. (2017) study the dynamic comparative advantages of Vietnam in its agricultural sector and Proudman and Redding (2000) analyse the evolving trade pattern for France, Germany, Japan, the UK and the USA in the manufacturing sectors. This study therefore follows the ideas of the three dynamic types and it analyses the trade specialization dynamics of the EU and China respectively in terms of agricultural products trade in the context of EU-China bilateral trade relations.

Literature gaps have emerged after analysing the existing studies on comparative advantages and trade complementarity. Though there are many studies analysing comparative advantages and trade complementarity between different trading partners, studies of EU-China bilateral trade are rare. When it comes to EU-China agricultural products trade relations from the perspective of comparative advantages, there is even much less literature from the dynamic point of view. Although Andreosso-O'Callaghan and Li (2018) recently studied agricultural products trade potential between the EU and China, the study only uses a descriptive statistical analysis, and it has also highlighted the notion of trade complementarity between the two trading partners in agricultural products.

Moreover, research in the current literature on this topic is not up to date and the latest research is the analysis for the period 1975 to 2013 (see Kumar and Ahmed 2015). Therefore, this paper will fill in these two main research gaps by analysing the comparative advantages and trade complementarity for both the EU and China in terms of the agricultural products in the context of bilateral trade relationship from 2001 to 2017.

Methodology and data

The results of comparative advantage and trade complementarity will be analysed from both static and dynamic perspectives. Thus, the methodology used in this paper will be a broad two-step approach analysis. The first step is to obtain the static results from both a comparative advantage perspective and a trade complementarity perspective. The second step is to analyse three types of trade specialization dynamics.

Quantifying comparative advantage and trade complementarity (step 1)

The first step is the static analysis which starts by getting the results of comparative advantage and trade complementarity indexes by using the BRCA indicator, the NRCA indicator and the TCI indicator. According to Balassa (1965 and 1977), the BRCA can be expressed as follows:

$$\mathrm{BRCA}_{ij}^{t} = \frac{X_{ij}^{t} \Big/ X_{i}^{t}}{X_{wj}^{t} \Big/ X_{w}^{t}} \tag{1}$$

where X_{ij}^{t} is the country i exports of products j in time t; X_{i}^{t} is the country i's total exports in time t; X_{wj}^{t} is the world's exports of product j in time t; and X_{w}^{t} is the world's total exports in time t.

In addition, we also apply the NRCA as a substitute indicator of the BRCA index to overcome the shortcomings of BRCA index. Yu et al. (2009) had proposed the NRCA index which is capable of allowing comparisons across commodities, countries and time. Yu et al. (2009)'s NRCA index can be expressed as follows:

$$\mathrm{NRCA}_{ij}^{t} = \frac{X_{ij}^{t}}{X_{w}^{t}} - \frac{X_{i}^{t} \times X_{wj}^{t}}{X_{w}^{t} \times X_{w}^{t}} \tag{2}$$

where X_{ij}^{t} is the country i's exports of product j in time t; X_{w}^{t} is the world's total exports in time t; X_{i}^{t} is the country i's exports in time t; and X_{wj}^{t} is the world's exports of product j in time t.

The results derived from NRCA will be symmetric ranging from −1/4 to +1/4 with 0 being the comparative-advantage-neutral point and can be used for making comparisons across countries and time.

The trade complementarity index (TCI) is applied to calculate the degrees of trade complementarity of the EU and China. The TCI index was introduced by Michaely (1996) and is as follows:

$$\mathrm{TCI}_{\mathrm{EU}}^{j} = 100 \times \left(1 - \frac{\sum \left| M_{\mathrm{China}}^{j} - X_{\mathrm{EU}}^{j} \right|}{2}\right) \tag{3}$$

$$\mathrm{TCI}_{\mathrm{China}}^{j} = 100 \times \left(1 - \frac{\sum \left| M_{\mathrm{EU}}^{j} - X_{\mathrm{China}}^{j} \right|}{2}\right) \tag{4}$$

where $\mathrm{TCI}_{\mathrm{EU}}^{j}$ is the trade complementarity index of the EU; $\mathrm{TCI}_{\mathrm{China}}^{j}$ is the trade complementarity index of China; M_{China}^{j} is the share of China's imports in product j in China's total imports; M_{EU}^{j} is the share of the EU's imports in product j in the

Table 1 Three research time periods for the first type of trade specialization dynamics

	$t1$	$t2$
Period 1	2001	2008
Period 2	2008	2017
Period 3	2001	2017

EU's total imports; X^{j}_{EU} is the share of the EU's exports in product j in the EU's total exports; and X^{j}_{China} is the share of China's exports in product j in China's total exports.

The results from Eqs. (3) and (4) are measured in percentage terms, and the index of 40% is considered the critical value, which means that a TCI index over 40% is indicative of a strong trade complementarity (Kumar and Ahmed 2015).

Methods of measuring trade specialization dynamics (step 2)

For the measurement of the first type of dynamic trade specialization, this study adopts the OLS regression method which was built by Hart and Prais (1965) and which was first used in this context by Cantwell (1989).[2] The OLS regression model for the first type can be written as:

$$NRCA^{t2}_{ij} = \alpha_i + \beta_i NRCA^{t1}_{ij} + \varepsilon_{ij}, \left(\varepsilon_{ij} \sim n.i.d.(0, \sigma)\right) \tag{5}$$

where $NRCA^{t2}_{ij}$ is the country i's NRCA result in product j at time 2 ($t2$ represents final year); $NRCA^{t1}_{ij}$ is the country i's NRCA results in product j at time 1 ($t1$ represents initial year); α_i is the A constant; β_i is the A regression coefficient to be estimated; and ε_{ij} is the residual terms.

Making the year 2008 as the cutoff point for the long-term three sub-periods allows the study to see the changing pattern of the trade specialization before and after the economic crisis of 2008. Hence, three time periods are designed for the OLS regression as indicated in Table 1.

The estimated β coefficient will indicate the different changing patterns of the trade specialization. When $0 < \beta < 1$, products with an initial weak comparative advantage gain comparative advantage through time, while products with a strong initial comparative advantage lose their comparative advantage; when $\beta > 1$, it implies that a comparative advantage will become stronger (or weaker) for products with a strong (or weak) initial comparative advantage; when $\beta = 0$, there is no relationship between comparative advantage over time; and when $\beta < 0$, the comparative advantage indexes initially below the average value will eventually be above the average value and vice versa.

However, following Cantwell (1989), the case when $\beta > 1$ indicates two possible answers as mentioned above. Therefore, in order to find out the trends of trade specialization for each selected time period, Hart (1976) provides a way to make

[2] It should be noted that Cantwell (1989) used the OLS model which was built by Hart and Prais (1965) to identify the changing pattern of international trade and the production of a selected number of countries. However, it did not use the NRCA indicators.

comparisons between β and the correlation coefficient R from the same regression model which can be shown as follows:

$$\frac{\sigma_{\mathrm{i}}^{t2}}{\sigma_{\mathrm{i}}^{t1}} = \frac{|\ \beta_{\mathrm{i}}\ |}{|\ R_{\mathrm{i}}\ |} \tag{6}$$

where R_i is the correlation coefficient from (5) and σ is the standard deviation of the variables $NRCA_{ij}^{t2\&t1}$.

When $\beta = \mathrm{R}$, specialization tends to stay unchanged; when $\beta > \mathrm{R}$, the degree of trade specialization rises; and when $\beta < \mathrm{R}$, trade specialization falls.

For the second type of trade specialization which refers to mobility and persistence, a one-step Markov transition probability matrix is applied. Firstly, with the help of the results of the NRCA index, this study leaves the NRCA indexes which are less than or equal to 0 as one class named group 1 (denoting a comparative disadvantage); then, a quartile method is used to classify the rest of NRCA indexes into three other groups, namely group 2, group 3 and group 4, where group 2 refers to a weak comparative advantage; group 3 denotes medium comparative advantage; and group 4 represents the case of a strong comparative advantage.

The one-step transition probability shows the possibility of the NRCA index moving from an initial state to other states within two adjacent years; and after obtaining the probability matrix, Shorrocks (1978)'s mobility index (hereafter M index) is used to assess the trace[3] of the transition probability matrix in order to obtain the degree of the mobility. The equation of the M index can be written as follows:

$$M = n - tr(P)/(n-1) \tag{7}$$

where n is the number of groups (4 groups as mentioned earlier), P is the transition probability matrix and tr(P) is the trace of transition probability matrix.

A higher M index implies a greater mobility while a lower M index mirrors a lower mobility which can be considered relative persistence; when $M = 0$, this implies a perfect immobility.

For the last type of trade specialization dynamics, a regression trend analysis method is employed to investigate the trend of trade specialization at an agricultural product level from 2001 to 2017. The same method is applied for the trade complementarity index in order to predict the trends of TCI for the future. Therefore, the regression trend analysis model can be defined as follows:

$$NRCA_{\mathrm{ij}}^{t} = \alpha_{\mathrm{ij}} + \beta_{\mathrm{ij}} t + \varepsilon_{\mathrm{ij}}^{t} \tag{8}$$

where t is the time index which is from 2001 to 2017 individually and β_{ij} is the regression coefficient that shows the trends of NRCA of selected agricultural products.

[3] The trace of the transition probability matrix, which is denoted as tr(P), refers to the sum of the elements on the principal diagonal in the matrix.

$$TCI_{ij}^{t} = \alpha_{ij} + \beta_{ij} t + \varepsilon_{ij}^{t} \tag{9}$$

where t is the time index which is also from 2001 to 2017 individually and β_{ij} is the regression coefficient that represents the trends of the TCI of defined agricultural products.

When β_{ij} is close to 0, country i's trade specialization in product j can be considered stable; when $\beta_{ij} > 0$, the trend shows that the country is gaining a comparative advantage (or trade complementarity) in product j over time; while when $\beta_{ij} < 0$, it shows a trend towards a loss of comparative advantage (or trade complementarity).

Data and the definition of agricultural products

The trade data from 2001 to 2017 for the purpose of calculating the results of the BRCA index and NRCA index are collected from the Trade Map Database. The agricultural products in this study are defined by the harmonized system at the 4-digit level which is from HS01 to HS24 plus HS50 to HS53.[4] Therefore, 245 agricultural products in total are covered in the study. However, to facilitate the analysis and interpretation, all the 4-digit level agricultural products are compressed into 2-digit level. Moreover, the first type of dynamics and the second type have integrated all the agricultural products into the whole agricultural sectors for both the EU and China. Also, in order to facilitate the presentation of the results, all the NRCA indexes are multiplied by 10,000.

Empirical results

In this section, results of the comparative advantages and trade complementarity derived from the BRCA index equation and NRCA index equation will be firstly analysed in the 'Comparative advantage of agricultural products in the EU and China' section, followed by an analysis of the results of trade complementarity by using the TCI index in the 'Trade complementarity of both the EU and China' section. After that, a regression analysis of three types of trade specialization for both the EU and China can be found in the 'Trade specialization dynamics' section.

Comparative advantage of agricultural products in the EU and China

The results of the BRCA index and NRCA index[5] have shown that for the EU, between 2001 and 2017, animal originated products, wool and vegetable textile are the product groups that always enjoy a comparative advantage. The EU has gained a comparative advantage in preparation of cereals or milk, beverages, meat and dairy products in the recent years.

[4] Ask authors on request for the descriptions of all agricultural products by using the harmonized system classification (HS).

[5] Table can be sent by authors upon request.

We break down the results into four different periods: during the first period (2001~2005), both the BRCA index and the NRCA index indicate that the EU had a comparative advantage in animal originated products (2.64 and 0.05 respectively), wool (1.91 and 0.08) and vegetable textile fibres (1229.74 and 0.16), while for cotton, the BRCA index shows a comparative advantage (44.13) while the NRCA index shows a comparative disadvantage (−0.18).

In the second period, from 2006 to 2009, both BRCA and NRCA show a comparative advantage for the EU in animal originated products (2.97 and 0.07), wool (2.43 and 0.10) and vegetable textile fibres (7.71 and 0.13). However, only the BRCA index shows that coffee and tea is the product category for the EU with a comparative advantage with a value of 7.56.

The number of product categories showing a comparative advantage starts to increase in the third period (2010~2013). The results of the BRCA index accord with the results of the NRCA index in the case of 5 product categories for the EU showing a comparative advantage. They are animal originated products (2.56 and 0.08 respectively), preparations of cereals or milk (1.14 and 0.05), beverages (1.52 and 0.31), wool (2.22 and 0.10) and vegetable textile fibres (6.62 and 0.13).

In the latest period (2014~2017), 7 product categories are categorized by both the BRCA index and the NRCA index as denoting a comparative advantage for the EU. These product groups are meat (1.63 and 0.53), dairy products (1.22 and 0.12), animal originated products (2.66 and 0.11), preparations of cereals or milk (2.52 and 0.71), beverages (1.63 and 0.48), wool (2.19 and 0.11) and vegetable textile fibres (7.50 and 0.20).

Focusing on China, between 2001 and 2017, animal originated products, vegetable plaiting materials, silk, wool and vegetable textile fibres are the product groups for China to enjoy a comparative advantage. In the recent years, China has obtained a comparative advantage in fish, lac, gums and resins. However, China has lost its comparative advantage in preparations of vegetables and edible vegetables, cotton, coffee and tea.

Between 2001 and 2005, the results of the BRCA index accord broadly with the results of the NRCA index with the only exception of cotton (70.45 and −0.15). According to both the BRCA and NRCA index,[6] China had a comparative advantage in animal originated products (7.49 and 0.29), edible vegetable (1.10 and 0.02), vegetable plaiting materials (1.88 and 0.00), preparations of vegetables (2.06 and 0.28), silk (8.09 and 0.19), wool (2.28 and 0.18) and vegetable textile fibres (232.08 and 0.03).

In the second period (2006~2009), China has a comparative advantage in fish (1.03 and 0.03), animal originated products (5.05 and 0.29), lac, gums, resins (1.00 and 0.00), vegetable plaiting materials (1.54 and 0.00), preparations of vegetables (1.38 and 0.18), silk (5.49 and 0.17), wool (2.06 and 0.16) and vegetable textile fibres (2.37 and 0.05). However, only the BRCA index indicates that coffee and tea (68.84) is a product category with a comparative advantage for China during this period.

[6] Table can be sent by authors upon request.

In the third period (2010~2013), in contrast with the EU, the number of product categories for China with a comparative advantage starts to decrease. Both the BRCA and NRCA indexes show that China has a comparative advantage in fish (1.06 and 0.05), animal originated products (4.46 and 0.29), lac, gums, resins (1.51 and 0.03), vegetable plaiting materials (1.68 and 0.01), silk (6.90 and 0.18), wool (2.70 and 0.23) and vegetable textile fibres (2.39 and 0.05) (7 product categories in total).

Coming to the most recent time period (between 2014 and 2017), there are 6 product categories for which the BRCA index and the NRCA index denote a comparative advantage for China. They are animal originated products (3.91 and 0.28), lac, gums, resins (2.49 and 0.10), vegetable plaiting materials (2.51 and 0.01), silk (7.29 and 0.15), wool (2.13 and 0.15) and vegetable textile fibres (2.04 and 0.05).

Trade complementarity of both the EU and China

In general, most of the agricultural product categories have a strong degree of trade complementarity (TCI > 40%) for both the EU and China.[7] Overall, between 2001 and 2017, China can always match the demand of EU's imports in edible vegetables and milling products, whereas the EU can always match with China's import structure in coffee and tea (Tables 10, 11, 12 and 13 in the Appendix). However, China has lost its trade complementarity in tobacco but it has obtained new complementarity in meat preparation and wool. The EU's trade complementarity in cotton has disappeared in the recent years but it has gained new trade complementarity in cereals and animal or vegetable fats.

Between 2001 and 2005, the EU had 21 product categories that were highly matched with Chinese imports, while China had 23 categories of product which strongly matched EU imports.

Among the 29 product categories, during 2001 and 2005, only dairy products, oil seeds and animal or vegetable fats show TCI results less than the critical value of 40% in both the EU and China which denotes a low degree of trade complementarity. For China, the product groups that are over 40%, matching with EU imports, are meat (57.32%), edible vegetables (46.22%), milling products (58.45%) and tobacco (78.76%), while the EU product categories that have an index over 40%, matching with Chinese imports, are coffee and tea (76.95%) and cotton (61.32%).

Product categories with a degree of trade complementarity for the EU higher than for China are live animals, animal originated products, edible fruit and nuts, cereals, lac, gums, resins, vegetable plaiting materials, cocoa, beverages, silk and vegetable textile fibres, while the degree of trade complementarity of China is higher than the EU's in fish, live trees, meat preparations, sugar, preparations of cereals or milk, preparations of vegetables, various edible preparations, food wastes and wool.

[7] Table can be sent by authors upon request.

Between 2006 and 2009, both the EU and China show a low degree of trade complementarity in only dairy products and animal or vegetable fats. Meat, fish, edible vegetables, cereals, milling products, oil seeds and tobacco are the only product categories for China which match the EU's import structures, while for the EU countries, its exports strongly match with Chinese imports in coffee, tea and cotton.

In terms of the product categories with high values in the TCI index (>40%) for both the EU and China, the TCI indexes of the EU are higher than China's in live animals, edible fruit and nuts, lac, gums, resins, vegetable plaiting materials, sugar, various edible preparations, beverages, food wastes and silk. By contrast, the TCI indexes of China in animal originated, live trees, meat preparations, cocoa, preparations of cereals or milk, preparations of vegetables, wool and vegetable textile fibres are higher than the EU's.

In the third period (2010~2013), both the EU and China show a low degree of trade complementarity in only three product categories: dairy products, oil seeds and cotton. China has strong TCI indexes in edible vegetables, milling products, meat preparations, tobacco and wool, and this is not the case for the EU. However, the EU has strong TCI indexes in coffee, tea, cereals and animal or vegetable fats, and this is not the case for China.

Among the products with TCI indexes over 40% for both the EU and China, the EU's trade complementarity is higher than China's in live animals, animal originated products, edible fruit and nuts, lac, gums, resins, vegetable plaiting materials, sugar, various edible preparations and beverages, while China's trade complementarity is higher than the EU's in meat, fish, live trees, cocoa, preparations of cereals or milk, preparations of vegetables, silk and vegetable textile fibres.

In the most recent period (from 2014 to 2017), both the EU and China show a low degree of trade complementarity in oil seeds and cotton. China can highly match the EU's imports demand in edible vegetables, milling products, meat preparations and wool, and this is not the case for the EU. However, the EU is able to strongly satisfy Chinese import demand in dairy products, coffee, tea, cereals and animal or vegetable fats, and this is not the case for China.

The EU's trade complementarity is stronger than China's in live animals, animal originated products, edible fruit and nuts, lac, gums, resins, vegetable plaiting materials, cocoa, preparations of cereals or milk, preparations of vegetables, beverages and vegetable textile fibres, whereas China's trade complementarity is stronger than the EU's in meat, fish, live trees, sugar, various edible preparations, food wastes, tobacco and silk.

Trade specialization dynamics

For the first type of trade specialization dynamics, Table 2 shows the OLS regression results by using the NRCA index over the three defined time periods for the EU and China respectively. All the regression coefficients are significant at the 1% level. In each time period and for both the EU and China, the β-s

Table 2 The OLS regression (type 1) results for both the EU and China over the three periods

EU	Year period	β	r^2	R	β/R
EU	2001~2008	1.176***	0.64	0.80	1.47
	2008~2017	1.828***	0.24	0.49	3.73
	2001~2017	1.537***	0.08	0.28	5.49
China	2001~2008	1.589***	0.76	0.87	1.82
	2008~2017	1.111***	0.89	0.95	1.17
	2001~2017	1.690***	0.63	0.79	2.14

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; and R denotes correlation coefficient

Table 3 Group classification of the EU's NRCA index

States	Explanations	NRCA cut-points	Average no. of products
Group1	Comparative disadvantage	≤ 0	214
Group2	Weak comparative advantage	≤ 0.001045	8
Group3	Medium comparative advantage	≤ 0.0491	15
Group4	Strong comparative advantage	>0.0491	8

are all greater than 1 which implies that for both the EU and China, agricultural product categories with an initial strong comparative advantage gain more comparative advantage, while product categories with an initial weak comparative advantage lose comparative advantage. This situation happens in all the three defined time periods.

To identify the first type of trade specialization dynamics given the two possibilities from β in Table 2, the alternative method needs to be used, which is a comparison between β and the correlation coefficient R. The results are shown in the last column of Table 2; and all the β are larger than R which indicates that the degree of trade specialization rises for both the EU and China in all the three time periods. This also indicates that the economic crisis in 2008 had no significant influence on the agricultural products trade specialization dynamics for both the EU and China, and that China's accession to the WTO enhanced trade specialization for both the EU and China.

For the second type, after grouping the results of the NRCA indexes of the 245 selected agricultural products from 2001 to 2017 for the EU, the numbers of the agricultural products in each group vary from year to year, but on average, as the last column in Table 3 shows, there are 214 products in group 1, 8 products in group 2, 15 products in group 3 and 8 products in group 4. It therefore shows that for most agricultural products, the EU has a comparative disadvantage in its agricultural trade relations with China.

In terms of the degree of mobility within the four groups, the movement from a comparative disadvantage to a strong comparative advantage is defined as 'forward moving', while the movement from a strong comparative advantage to a comparative disadvantage is termed as 'backward movement'. Table 4 depicts the transition

Table 4 The Markov transition probability matrix of the NRCA index (EU)

Observations: 4165	Group 1	Group 2	Group 3	Group 4
Group 1 (comparative dis.)	0.9339	0.0357	0.0289	0.0015
Group 2 (weak CA)	1.0000	0.0014	0.0000	0.0000
Group 3 (medium CA)	0.3663	0.0000	0.3199	0.3534
Group 4 (strong CA)	0.0000	0.0000	0.6049	0.3951
M index	0.7832			

Source: authors' own calculation based on the NRCA results (4-digit level) of the EU

Table 5 The group classification of China's NRCA index

States	Explanations	NRCA cut-points	Average no. of products
Group 1	Comparative disadvantage	≤0	197
Group 2	Weak comparative advantage	≤0.01207	21
Group 3	Medium comparative advantage	≤0.0697	19
Group 4	Strong comparative advantage	>0.0697	7

probability of the trade specialization from one group (or state) in the current year to another group (or state) in the next year for the EU.The probabilities which are highlighted on the diagonal represent the stability of each group. The agricultural products with a comparative disadvantage have a 93.4% probability of keeping this comparative disadvantage, while the products with a medium comparative advantage and a strong comparative advantage have a 32.0% and 39.5% probability respectively to stay in the same state. However, the products in group 2 with weak comparative advantage have a very low probability (0.14%) of retaining the weak comparative advantage.

For the products initially with a comparative disadvantage (in group 1), there is a 3.57%, 2.89% and 0.15% chance to move forward in the next year into group 2, group 3 and group 4 respectively. For the products initially with a weak comparative advantage (in group 2), there is 100% chance that they will lose the comparative advantage to become comparative disadvantage products next year, and there are no chances to move forward to group 3 and group 4 from group 2. Products initially with a medium comparative advantage will have a 36.63% chance of moving backwards to the comparative disadvantage group in the following year and a 0% probability of forming the weak comparative advantage group next year. However, it has a 35.34% chance of moving forward to strong comparative advantage the following year. For the products with initially a strong comparative advantage, there is a 60.49% probability that they will move backwards to the medium comparative advantage group; however, it is impossible for these products to become products with a comparative disadvantage or a weak comparative advantage. The *M* index is 0.783, which represents a high degree of mobility for the EU's agricultural products trade specialization.

Table 6 The Markov transition probability matrix of the NRCA index (China)

Observations: 4165	Group 1	Group 2	Group 3	Group 4
Group 1 (comparative dis.)	0.8420	0.1092	0.0472	0.0016
Group 2 (weak CA)	1.0000	0.0000	0.0000	0.0000
Group 3 (medium CA)	0.4974	0.0000	0.3129	0.1897
Group 4 (strong CA)	0.0000	0.0000	0.5324	0.4676
M index	0.7924			

Source: author's own calculation based on the NRCA results (4-digit level) of China

From the Chinese point of view, there are on average 197 products, 21 products, 19 products and 7 products in group 1, group 2, group 3 and group 4 respectively (see Table 5). Although the number of products in group 1 is smaller than in the case for the EU, it still takes the biggest portion compared to the numbers of products in other groups.

As the probabilities highlighted in Table 6 show, products with a comparative disadvantage will stay in the same group with a high probability (84.2%), while as the in the case of the EU, products in group 2 have 0 probability to still stay in the same group 2, but there is a 100% probability for the products with a weak comparative advantage of moving backwards to group 1. Products in group 3 have a 31.3% probability of staying in the same group 3, while products initially in group 4 will have a 46.8% chance of still having a strong comparative advantage.

There is a 10.92%, 4.72% and 0.16% probability respectively for the products initially in the comparative disadvantage group (group 1) to move forward to group 2, group 3 and group 4. Note that products with an initially weak comparative advantage have no chance of moving forward to both group 3 and group 4. Products in group 3 will have a 49.74% chance of moving backwards to the comparative disadvantage group and a 18.97% chance of moving forward to the strong comparative advantage group. Moreover, products in the strong comparative advantage group will have a 53.24% chance of moving backwards to the medium comparative advantage group. Finally, the *M* index for China is 0.792 which is slightly higher than the EU, and it also implies a high degree of mobility in terms of China's agricultural products trade specialization.

For the third type of trade specialization dynamics, in the EU, there are 6 agricultural product groups showing a trend according to which they will gain a comparative advantage, and this trend can be proved by the comparison between the NRCA in 2017 and the NRCA in 2001 (see the corresponding positive number in the last column in Table 7). These product groups are meat, dairy products, animal originated products, preparations of vegetables, beverages and wool. The result for HS50 which is silk is very close to 0 which indicates an unchanged pattern in the future. The rest of the products show a downward trend in the future which implies a loss of comparative advantage vis-à-vis China.

In China, there are only two product groups showing an upward trend in terms of obtaining a comparative advantage in the future, and this is also proved by the positive

Table 7 Trend analysis results for the EU at a 2-digit level between 2001 and 2017

Products	β	r^2	NRCA (2001)	NRCA (2017)	Difference between 2017 and 2001
HS01	−0.004***	0.747	−0.056	−0.13	−0.074
HS02	0.059***	0.453	−0.196	0.503	0.699
HS03	−0.028***	0.816	−0.131	−0.5	−0.369
HS04	0.020***	0.47	−0.126	0.211	0.337
HS05	0.005***	0.809	0.0346	0.127	0.0924
HS06	−0.001	0.099	−0.0324	−0.0651	−0.0327
HS07	−0.021***	0.882	−0.157	−0.507	−0.35
HS08	−0.033***	0.884	−0.203	−0.766	−0.563
HS09	−0.018***	0.808	−0.0884	−0.341	−0.2526
HS10	−0.029***	0.556	−0.165	−0.709	−0.544
HS11	−0.005***	0.869	−0.0294	−0.0995	−0.0701
HS12	−0.034***	0.931	−0.0752	−0.613	−0.5378
HS13	−0.002***	0.505	−0.0107	−0.0229	−0.0122
HS14	−0.000***	0.633	−0.00322	−0.00669	−0.00347
HS15	−0.020***	0.555	−0.123	−0.469	−0.346
HS16	−0.014***	0.945	−0.111	−0.336	−0.225
HS17	−0.014***	0.814	−0.103	−0.305	−0.202
HS18	−0.008***	0.597	−0.07	−0.262	−0.192
HS19	0.062***	0.656	−0.098	1.131	1.229
HS20	−0.014***	0.914	−0.139	−0.363	−0.224
HS21	−0.009***	0.75	−0.104	−0.255	−0.151
HS22	0.057***	0.876	−0.16	0.691	0.851
HS23	−0.020***	0.878	−0.134	−0.382	−0.248
HS24	−0.010***	0.812	−0.138	−0.287	−0.149
HS50	0.000**	0.239	−0.0133	−0.00945	0.00385
HS51	0.002***	0.45	0.0912	0.0992	0.008
HS52	−0.012**	0.33	−0.225	−0.351	−0.126
HS53	0.002	0.111	0.111	0.184	0.073

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; "2017–2010" refers to results of NRCA (2017) minus NRCA (2001)

value of the dispersion between the NRCA in 2017 and the NRCA in 2001 (see the last column in Table 8). These two product groups are lac, gums, resins (HS13) and vegetables plaiting materials (HS14). The rest of the product groups show that they are tending to lose their comparative advantage in the future vis-à-vis the EU.

However, in the EU, the degree of trade complementarity tends to decrease in edible vegetables (HS07), meat preparations (HS16), sugar (HS17), silk (HS50), wool (HS51), cotton (HS52) and vegetable textile fibres (HS53); in China, fish (HS03), dairy products (HS04), cereals (HS10), vegetable plaiting materials (HS14), animal or vegetable fats (HS15), meat preparations (HS16) and sugar (HS17) are the product groups for which China trend to lose trade complementarity vis-à-vis the EU's demand (see Table 9).

Table 8 Trend analysis results for China at a 2-digit product level between 2001 and 2017

Products	β	r^2	NRCA (2001)	NRCA (2017)	Difference between 2017 and 2001
HS01	−0.007***	0.749	−0.0877	−0.218	−0.1303
HS02	−0.054***	0.838	−0.272	−1.259	−0.987
HS03	−0.009	0.137	0.135	−0.272	−0.407
HS04	−0.029***	0.736	−0.248	−0.802	−0.554
HS05	−0.001	0.008	0.358	0.322	−0.036
HS06	−0.004***	0.432	−0.0729	−0.185	−0.1121
HS07	−0.030***	0.908	0.11	−0.423	−0.533
HS08	−0.045***	0.912	−0.255	−0.996	−0.741
HS09	−0.015***	0.449	−0.0529	−0.27	−0.2171
HS10	−0.052***	0.789	−0.339	−1.044	−0.705
HS11	−0.006***	0.675	−0.053	−0.15	−0.097
HS12	−0.054***	0.951	0.0759	−0.779	−0.8549
HS13	0.008***	0.498	−0.00478	0.0707	0.07548
HS14	0.001***	0.458	0.00621	0.0164	0.01019
HS15	−0.046***	0.705	−0.171	−0.865	−0.694
HS16	−0.011***	0.479	−0.0339	−0.276	−0.2421
HS17	−0.020***	0.747	−0.146	−0.444	−0.298
HS18	−0.021***	0.818	−0.116	−0.49	−0.374
HS19	−0.030***	0.909	−0.134	−0.661	−0.527
HS20	−0.036***	0.888	0.312	−0.184	−0.496
HS21	−0.024***	0.834	−0.149	−0.569	−0.42
HS22	−0.042***	0.803	−0.346	−1.118	−0.772
HS23	−0.017***	0.572	−0.197	−0.41	−0.213
HS24	−0.013*	0.213	−0.163	−0.304	−0.141
HS50	−0.003**	0.365	0.245	0.131	−0.114
HS51	−0.00047	0.003	0.151	0.137	−0.014
HS52	−0.006	0.075	−0.172	−0.239	−0.067
HS53	0.002	0.124	−0.00316	0.0555	0.05866

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; "2017–2001" refers to results of NRCA (2017) minus NRCA (2001)

Conclusion

This paper has analysed the EU and China's comparative advantages and trade complementarity in selected agricultural products both qualitatively and quantitatively. The fact is that the EU highly produces a variety of crops which include cereals, potatoes, sugar beet, vegetables (tomatoes, carrots and onions) and fruits (apples, oranges and grapes); livestock and meat which includes cattle (veal and beef meat), sheep and goats (sheep and goat meat) and pig (pig meat); and milk and dairy

Table 9 Trend analysis of TCI for both the EU and China at a 2-digit product level between 2001 and 2017

HS code and product group	EU	China
01.Live animals	−0.406	0.172
02.Meat	0.908**	0.034
03.Fish	−0.063	−0.868***
04.Dairy products	1.274***	−0.957***
05.Animal originated products	0.01	−0.123
06.Live trees	0.379*	0.827**
07.Edible vegetables	−0.511***	0.046
08.Edible fruit and nuts	0.528***	1.024***
09.Coffee, tea etc.	−0.104	0.258
10.Cereals	0.241	−2.745***
11.Milling products	−0.401*	1.083***
12.Oil seeds	0.132	0.149
13.Lac, gums, resins	0.465***	−0.246*
14.Vegetable plaiting materials	−0.041	−1.676***
15.Animal or vegetable fats	1.795***	−0.581***
16.Meat preparations	−2.086***	−0.803***
17.Sugar	−0.742***	−0.891**
18.Cocoa	1.023**	0.823***
19.Preparations of cereals or milk	0.352	0.334***
20.Preparations of vegetables	0.615***	−0.298
21.Various edible preparations	0.362**	−0.174
22.Beverages	1.212***	1.777***
23.Food waste	−0.855	−0.105
24.Tobacco	1.170**	0.094
50.Silk	−0.886***	0.880***
51.Wool	−2.409***	0.481**
52.Cotton	−2.499***	0.081*
53.Vegetable textile fibres	−0.612**	−0.098

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

products such as whole milk, skimmed milk and dairy products which are processed from the raw milk product. Tables 10, 11, 12, and 13

The national and international trade policies are playing an important role in EU-China agricultural trade. The agricultural products have a comparative advantage mainly because of policy support or protection. For example, China's comparative advantage on rice can be traced back to the strong protection, whereas EU's comparative advantage in dairy products is largely influenced by the abolition of milk quotas in the EU.

China focuses its production on cereal products which are rice, wheat, corn millet and sorghum; beans such as soy beans; and tuber crops like potatoes. Also, China highly produces oil products such as peanuts, rapeseeds and sesame.

Besides, cotton, red and yellow flax, sugarcane, sugar beet, tobacco, vegetables and fruits are also the main agricultural products of China. These different products in the EU and China are determined by each country/region's natural endowments and quality of labour force, as well as its agricultural policies.

Results of the quantitative analysis show that the EU's comparative advantage in the international agricultural products trade is in meat products, dairy products, animal originated products, preparations of cereals or milk products, beverages, wool and vegetable textile fibres. Moreover, the EU will retain or even increase its comparative advantage for the EU in these products. However, the EU should be aware of those product groups which also will lose comparative advantage in the future, for example, edible vegetables, coffee, tea, sugar, cocoa and food waste.

From the Chinese viewpoint, fish, animal originated products, edible vegetable, lac, gums, resins, vegetable plaiting materials, preparations of vegetables, silk, wool and vegetable textile fibres are the products for which China has a comparative advantage in the world agricultural product markets. However, apart from lac, gums, resins and vegetable plaiting materials, China tends to lose its comparative advantage in the rest of these product categories in the future. Therefore, it is very important for China to explore how to maintain its comparative advantage in some products and also to exploit its new comparative advantage through structural change in the Chinese agricultural sector along with the reform of its agricultural policy.

Since China's accession to the WTO and the implementation of the Belt and Road Initiative (BRI), its bilateral trade in the agricultural sector with the EU has increased remarkably. Fang and Shakur (2018) find that China's demand for food imports continues unabated, and trade cost involving agricultural products between China and EU have been decreasing but still remain noticeably high. The situation brings both challenges and opportunities. On the one hand, globalization and the implementation of the BRI encourage China-EU bilateral trade. On the other hand, as EU is not the only economy that trades with China, the agricultural trade between EU and China is in danger of being diverted to other countries along the BRI. According to our research, to keep and increase the competitiveness in agricultural products, more attention should be placed on dairy products, coffee, tea, cereals and animal or vegetable fats for the EU because these products are only having strong trade complementarity on the EU side and highly fit into the Chinese import demand. However, they may lose competitiveness in the future. China should highly value products such as edible vegetables, milling products, meat preparations and wool which show a strong trade complementarity on only the Chinese side. In addition, negotiation of an FTA between China and EU may also protect agricultural trade to both EU and China and avoid trade diversion.

Appendix

Table 10 China's exports to EU28 from 2001 to 2017 in million US dollar

Product groups	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
01.Live animals	344	344	327	330	329	333	375	507	442	454	571	583	581	586	598	647	562
02.Meat	841	665	646	707	743	747	731	798	764	995	1075	980	989	1182	1057	902	917
03.Fish	2591	2873	3335	4056	4350	4745	4752	5181	6814	8807	10,989	11,323	12,526	14,074	13,324	13,705	13,255
04.Dairy products	192	194	222	234	267	302	461	621	340	405	499	534	545	586	606	590	588
05.Animal originated products	651	654	736	976	1012	996	1077	1367	1218	1357	1836	2057	2200	2293	1772	1772	2310
06.Live trees	35	43	49	64	77	105	132	149	188	206	229	256	275	410	300	330	336
07.Edible vegetables	1746	1883	2180	2537	3052	3715	4043	4222	4853	7477	8723	6906	7871	8226	9024	10,546	11,162
08.Edible fruit and nuts	435	555	752	916	1067	1284	1632	2104	2379	2679	3188	3772	4172	4318	5161	5485	5343
09.Coffee, tea etc.	542	552	624	865	927	989	1089	1315	1403	1657	2021	1943	2245	2453	2535	2981	3183
10.Cereals	1034	1650	2589	740	1412	1038	1967	673	618	539	609	443	514	445	322	429	674
11.Milling products	107	118	142	170	200	236	509	540	466	552	587	602	611	612	590	565	574
12.Oil seeds	911	940	1125	1196	1383	1323	1629	2043	1844	2048	2346	2627	2925	3114	2903	2674	2646
13.Lac, gums, resins	67	77	73	73	113	155	206	442	517	646	981	990	1151	1306	1272	1258	1349
14.Vegetable plaiting materials	43	44	46	43	49	53	59	66	59	64	85	91	89	104	125	121	129
15.Animal or vegetable fats	118	108	128	158	284	391	327	595	330	369	544	567	61	645	667	584	842
16.Meat preparations	2046	2327	2679	3489	4364	5491	5831	6036	4576	5864	7862	8952	8982	8882	8005	7942	9025
17.Sugar	156	227	196	252	418	462	566	677	771	1060	1290	1265	1452	1540	1562	1707	1760
18.Cocoa	27	36	55	70	110	124	147	200	130	213	315	333	386	476	442	426	376
19.Preparations of cereals or milk	413	454	527	653	759	861	920	993	985	1160	1502	1500	1532	1573	1528	1579	1651
20.Preparations of vegetables	1497	1757	2168	2578	3094	3781	5436	5842	4750	5545	6980	7562	7852	7634	7386	7338	7691
21.Various edible preparations	399	461	544	613	716	911	1103	1238	1299	1559	2006	2223	2465	2708	2977	3205	3356

Table 10 (continued)

Product groups	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
22.Beverages	572	597	622	743	718	1090	829	861	832	995	1183	1387	1341	1651	1994	2203	2221
23.Food waste	294	408	385	500	478	515	1003	1619	1763	1955	2057	2935	2734	3260	2665	2768	2659
24.Tobacco	386	433	493	514	537	566	639	742	878	1020	1141	1262	1322	1284	1351	1377	1327
50.Silk	827	767	824	1062	1336	1424	1397	1434	1288	1642	1746	1707	1630	1517	1270	1158	1114
51.Wool	1082	1069	1317	1715	1845	1997	2125	2087	1626	2362	2959	2584	2619	2522	2281	2141	1999
52.Cotton	3658	4894	6220	6587	7438	8877	9360	10,691	9601	13,067	15,498	14,839	17,547	16,304	15,799	14,966	15,133
53.Vegetable textile fibres	454	502	526	553	618	661	616	595	593	870	1131	1068	1285	1486	1568	1055	1057

Table 11 China's imports from EU28 from 2001 to 2017 in million US dollar

Product groups	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
01.Live animals	7	7	6	17	10	11	11	8	9	16	23	34	31	71	68	57	46
02.Meat	75	16	49	57	65	75	261	554	309	536	688	1089	1514	1450	2010	3610	2535
03.Fish	87	95	136	156	209	209	208	311	198	239	214	214	196	305	243	213	296
04.Dairy products	53	59	87	105	110	129	219	227	239	308	468	633	885	1115	814	893	1228
05.Animal originated products	25	21	31	54	52	50	58	73	85	139	151	127	160	164	154	173	220
06.Live trees	13	20	27	30	41	39	40	44	45	57	71	77	86	97	117	117	138
07.Edible vegetables	3	3	3	5	3	3	3	3	2	3	6	6	9	9	9	13	6
08.Edible fruit and nuts	2	4	6	11	17	34	43	46	41	49	59	71	84	110	82	111	123
09.Coffee, tea etc.	1	1	2	3	3	4	5	9	9	13	16	19	23	27	36	37	50
10.Cereals	57	30	123	23	180	3	25	58	121	125	88	17	86	269	1154	152	55
11.Milling products	20	30	40	27	41	37	13	18	25	78	36	54	53	56	76	63	72
12.Oil seeds	61	29	20	22	26	27	47	57	43	58	65	73	107	154	179	118	147
13.Lac, gums, resins	6	10	16	16	19	20	25	26	26	32	41	44	49	61	68	77	80
14.Vegetable plaiting materials	0	1	0	1	1	3	1	1	1	1	1	3	1	1	0	1	1
15.Animal or vegetable fats	9	39	13	23	29	39	53	96	63	109	171	257	713	301	321	303	310
16.Meat preparations	0	1	3	4	3	2	1	1	1	2	2	3	2	3	8	8	9
17.Sugar	11	8	10	12	18	50	23	32	26	27	30	52	54	61	67	67	77
18.Cocoa	19	24	31	37	39	38	43	51	78	123	184	211	252	368	382	234	229
19.Preparations of cereals or milk	55	58	54	43	67	110	139	168	171	236	505	749	1106	1400	2096	2588	3284
20.Preparations of vegetables	12	11	11	8	11	14	26	23	32	48	60	72	79	108	127	118	152
21.Various edible preparations	14	17	27	42	57	68	91	120	123	172	275	278	327	356	379	350	509
22.Beverages	107	103	132	184	314	452	673	872	801	1207	1955	2323	2166	2161	2511	2765	3221
23.Food waste	44	33	30	35	44	42	48	72	74	65	85	102	129	114	134	139	179
24.Tobacco	20	24	30	36	33	18	10	21	31	9	33	44	25	59	43	46	45

Table 11 (continued)

Product groups	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
50.Silk	2	3	5	7	10	8	8	12	12	15	18	17	18	12	10	9	13
51.Wool	172	175	186	210	224	245	311	345	299	347	476	435	452	449	415	395	389
52.Cotton	34	40	66	95	102	133	113	110	76	104	231	255	197	128	97	103	111
53.Vegetable textile fibres	104	97	164	208	226	228	252	199	167	241	349	235	333	444	425	412	391

Table 12 EU's exports to China from 2001 to 2017 in million US dollar

Product groups	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
01.Live animals	5	6	5	16	11	9	10	10	17	19	32	42	42	61	61	48	42
02.Meat	61	49	46	48	65	52	101	198	204	271	715	1085	1267	1335	2000	3321	2452
03.Fish	105	142	186	229	309	291	332	367	280	321	371	408	424	503	433	462	624
04.Dairy products	53	60	77	105	104	130	215	198	228	302	468	607	941	1052	1003	1189	1441
05.Animal originated products	36	43	61	87	99	98	120	162	196	182	253	229	271	300	267	272	351
06.Live trees	18	24	28	29	40	50	52	51	52	62	78	87	105	122	130	128	149
07.Edible vegetables	3	3	3	4	3	4	2	4	3	3	7	7	9	10	10	13	16
08.Edible fruit and nuts	4	8	7	12	22	42	42	47	36	70	73	77	104	107	85	104	112
09.Coffee, tea etc.	1	1	2	2	4	5	8	10	10	15	23	24	29	37	44	48	56
10.Cereals	50	34	82	61	89	1	22	56	86	87	68	14	74	293	907	123	45
11.Milling products	6	8	12	13	22	28	16	20	32	61	48	49	46	46	51	52	43
12.Oil seeds	43	23	14	18	19	32	46	51	44	55	77	66	80	120	139	126	161
13.Lac, gums, resins	3	6	10	13	9	11	18	17	20	20	32	32	30	35	37	31	45
14.Vegetable plaiting materials	0	0	0	0	0	0	0	0	1	0	1	0	2	0	0	0	0
15.Animal or vegetable fats	9	27	13	21	32	43	64	87	76	116	186	234	700	276	308	293	424
16.Meat preparations	2	4	6	2	3	2	2	14	4	4	5	9	9	11	7	15	19
17.Sugar	7	5	7	9	18	44	18	23	21	29	26	47	42	45	43	43	55
18.Cocoa	10	9	13	14	12	16	33	45	68	116	154	168	193	309	260	131	157
19.Preparations of cereals or milk	17	23	33	37	51	97	145	164	302	341	503	773	1112	1328	1588	2215	2875
20.Preparations of vegetables	3	9	9	9	10	16	21	24	36	47	56	63	70	88	106	107	138
21.Various edible preparations	13	20	34	43	48	61	82	108	127	197	288	259	327	352	311	312	417
22.Beverages	65	67	97	154	238	324	538	598	639	1079	1757	1891	1720	1728	1903	2169	2659
23.Food waste	11	16	13	22	24	25	34	50	66	56	71	86	124	120	127	136	212
24.Tobacco	8	8	5	19	12	3	16	19	27	19	37	35	34	29	21	27	18

Table 12 (continued)

Product groups	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
50.Silk	2	2	3	7	11	7	8	9	11	14	15	13	21	9	9	8	9
51.Wool	107	115	123	147	170	194	246	269	242	271	347	330	363	371	338	318	340
52.Cotton	25	27	58	71	78	104	95	94	68	89	247	219	151	105	75	96	90
53.Vegetable textile fibres	80	91	154	193	199	223	223	166	155	246	266	234	325	429	383	386	377

Table 13 EU's imports from China from 2001 to 2017 in million US dollar

Product groups	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
01.Live animals	8	8	8	9	9	14	15	17	17	18	16	12	11	14	9	7	7
02.Meat	64	28	12	4	8	22	28	41	32	46	56	45	47	47	33	28	33
03.Fish	545	320	519	662	964	1376	1609	1781	1522	1904	2251	1953	1850	1787	1713	1846	1996
04.Dairy products	44	19	9	4	10	17	20	53	70	106	131	147	176	185	223	163	160
05.Animal originated products	293	266	317	383	452	495	537	753	694	698	896	834	785	818	663	639	811
06.Live trees	22	31	45	57	64	75	86	85	76	73	73	64	63	68	60	52	61
07.Edible vegetables	259	284	303	347	436	578	691	760	607	760	924	715	769	770	671	783	790
08.Edible fruit and nuts	66	91	161	214	244	301	439	567	435	474	538	493	563	486	504	469	455
09.Coffee, tea etc.	98	114	136	158	168	191	243	305	300	380	460	477	544	620	526	522	570
10.Cereals	11	12	33	27	13	13	25	29	17	19	30	12	11	12	11	10	10
11.Milling products	2	2	3	3	3	5	11	10	7	10	34	16	23	17	19	18	19
12.Oil seeds	254	250	358	359	444	382	487	695	527	574	655	661	620	652	690	655	641
13.Lac, gums, resins	18	20	27	47	59	70	78	93	92	119	160	149	176	207	208	202	215
14.Vegetable plaiting materials	24	24	28	33	36	49	68	70	55	64	69	68	62	76	77	75	79
15.Animal or vegetable fats	19	17	33	28	44	112	111	61	54	48	79	100	102	106	107	84	132
16.Meat preparations	72	15	58	61	114	143	163	235	247	294	363	368	409	471	327	303	347
17.Sugar	25	26	34	54	66	76	86	105	79	77	88	82	93	99	88	84	99
18.Cocoa	2	8	6	11	19	29	49	64	29	51	74	72	140	178	102	59	30
19.Preparations of cereals or milk	53	58	61	80	94	99	126	150	158	174	199	176	189	194	183	190	197
20.Preparations of vegetables	325	399	485	555	635	678	1112	1120	857	858	979	829	727	657	636	607	569
21.Various edible preparations	27	34	43	46	59	74	104	126	125	147	191	207	249	283	278	283	345
22.Beverages	23	31	23	29	34	38	44	44	42	56	61	73	69	61	52	56	63
23.Food waste	36	25	30	41	42	66	107	165	123	183	188	208	305	288	310	357	575
24.Tobacco	39	54	62	66	70	65	83	106	138	164	196	146	127	170	122	119	111

Table 13 (continued)

Product groups	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
50.Silk	220	184	204	231	287	381	346	402	237	311	443	383	427	404	327	316	298
51.Wool	299	247	285	407	485	556	644	598	412	662	974	706	688	696	584	529	586
52.Cotton	196	232	264	274	384	453	587	704	546	745	886	587	667	647	509	517	543
53.Vegetable textile fibres	25	40	50	62	168	168	170	164	110	153	173	163	150	153	129	142	135

Funding This study was supported by the Fundamental Research Funds for the Central Universities, Zhongnan University of Economics and Law (2722022BY002).

Data Availability Not applicable

Code availability Not applicable

Declarations

Conflict of interest The authors declare no competing interests.

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