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PAPER

# An Analysis of EU-China Agricultural Trade Relations in the Context of Brexit – the Perspective of Trade Specialisation Dynamics

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**Abstract** This paper uses trade data from 2001 to 2017 to analyse comparative advantage of both the EU27 (excluding the UK) and China by employing Balassa's revealed comparative advantage index (BRCA) and the normalised revealed comparative advantage index (NRCA). Two broad types of trade specialisation dynamics have been analysed by using OLS regression analysis, together with Markov transition probability, Shorrocks' mobility index, and regression trend analysis. The results show that the majority of the agricultural products are in the comparative disadvantage category, and that although the EU has a strong comparative advantage in several agricultural products, its probability to keep these advantages is lower than for China.

**Keywords:** EU27, China, agricultural product trade, comparative advantage, trade specialisation, Brexit.

**JEL Classification:** F13, F15, Q17, Q18.

## 1. Introduction

The agricultural sector is an essential sector for both the EU and China. In the EU-28, it represents 6 per cent of its GDP, it offers about 44 million job opportunities and more than 500 million consumers rely on the sector (EC 2017). In China, the sector matters not only for the well-being of 1.4 billion Chinese people but also in terms of the Chinese Central Government's stability and legitimacy. Moreover, the agricultural sectors of both the EU and China have undergone significant changes in the last five decades and these changes are mostly mirrored through the perspective of agricultural and trade policies as well as through the socio-economic environment.

The Common Agricultural Policy (CAP) of the European Union (EU) plays an important role in re-organizing and administrating the EU agricultural sector; since its implementation in 1962 and especially in the last three decades, significant reforms

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have been changing the CAP from a market-distorted policy towards a more market-orientated policy. Since the reform and the opening-up policy in 1979 and the accession of China to the World Trade Organization (WTO) in late 2001, China's agricultural policy has also been revised dramatically in order to meet the needs of world economic integration and the commitments undertaken under the WTO auspices. With China stepping into the domain of world economic integration, China's agricultural trade has been decentralized and its policies are much more market-oriented compared with the centrally-planned regime before 1978 and shortly after. These new policies have indeed provided a favorable platform for EU-China agricultural trade.

As one of the most obvious benefits arising from the opening-up policy of China and from its aggressive economic policies, disposable income has been increasing significantly. An emerging middle class in China has led to a higher demand for quality agricultural and food products. However, demand growth is in conflict with the limitation of Chinese domestic supply due to various reasons for example: the scarcity of both arable land and of water resources; the food safety issue; environmental degradation and pollution. China therefore needs to import large amounts of such products to satisfy its domestic demand and this, in turn, can provide a good opportunity for the EU to strengthen its agricultural trade with China. Moreover, under the pressure of the forthcoming Brexit, the EU should maintain a stable trade relationship with China and China ought to seize the chance of enhanced trade relations by means of doing more trade in the agricultural sector.

In such a background, it is necessary to conduct a study to analyse the EU-China evolving agricultural trade specialisation in a long term framework (from 2001 to 2017) covering a few significant years such as China's accession to the WTO (in 2001), before and after the crisis (in 2008). However, trade specialisation can be reflected from many perspectives and in this study it will be conceptualized using the notion of comparative advantage. The paper has adopted two indexes for measuring comparative advantage which are Balassa's Comparative Advantage Index (BRCA) and the Normalised Comparative Advantage index (NRCA). It should be noted that trade specialisation is not static and that it is evolving along with the changes of trade policies and of the domestic and international economic environment. Therefore, this study analyses dynamics of trade specialisation patterns in both the EU and China for agricultural products trade by using an OLS model, a one-step Markov transition probability matrix (followed by a mobility index), and a trend analysis method based on the preliminary results of the NRCA index. It will be interesting to see how the trade pattern changes along with the growth of these two large economies.

The rest of the paper is structured as follows: the ensuing section will provide a concise literature review in relation to the studies on comparative advantage; section 3 will clarify the methodology and the data used, and section 4 will show the empirical results with an analysis; finally, some important points will be drawn in section 5 as concluding remarks.

## 2. Literature review

The concept of comparative advantage is a key component in the study of international trade, and comparative advantage can be measured using various methods such as real exchange rates, purchasing power parity or revealed trade comparative advantage (Latruffe 2010). The earliest attempt to quantify trade comparative advantage is Balassa (1965)'s Revealed Comparative Advantage Index (BRCA). The nature of the index is that it calculates the share of an exported product of a country in its trading partner's market to the share of world's exports of the same products in the world's total exports. Based on the nature of BRCA, a few different modified indexes have been developed by different people such as Vollrath (1991)'s Relative Export Advantage Index (RXA) and Relative Import Advantage Index (RMA); Banterle and Carraresi (2007)'s Net Export Index (NEI) and the Grubel-Lloyd Index (GL); Dalum et. al (1998)'s Revealed Symmetric Comparative Advantage Index (RSCA); and the Normalised Comparative Advantage Index (NRCA) developed by Yu et al. (2009). These different indexes provide many alternatives for quantifying trade comparative advantage.

The analysis of trade comparative advantage is quite popular and common in terms of the scope of international trade research and the related studies are usually conducted from two perspectives: the first one is a country-wide analysis while the second one is a sector-wide analysis. More specifically, the so called country-wide analysis means that the study of comparative advantage is at country level and is not specified into different sectors (see Ahmad et al. (2018)) while the so called sector-wide analysis is for those studies that focus on different sectors of various countries such as the agricultural sector (Hoang et al. 2017a), and the services sector (Nath et al. 2015). However, studies from the second perspective are more refined and this is the approach taken in this study. For example, Carraresi and Banterle (2015) focus on the food industry and agricultural sector of Central and East-European Countries (CEECs); Bojnec and Fertö (2009) study the agri-food sector of the Central European and Balkan countries; Sudan's agricultural products are analysed in Elryah (2015) and the dairy industry of the EU member countries are researched by Drescher and Maurer (1999); Fang and Beghin (2000) analyse China's major crop sectors while Bavorová (2003) interest in the Czech Republic's sugar industry. However, these above-cited studies only analyse a specific sector for a single country. Some of the other studies therefore analyse the comparative advantage of specific sectors of two or more countries in a context of bilateral or multilateral trade relations. For example, Sahinli (2012) analyses the Turkey-EU agricultural sector and Serin and Civan (2008) focus on the Turkey-EU fruit and vegetable industry; Esquivias (2017) illustrates the comparative advantage of agricultural product trade between East Java, Indonesia and six ASEAN exporting countries while Bulgaria's and the Czech Republic's agri-food sectors are studied by Gorton et al. (2000).

However, the comparative advantage of a sector in a country is not static. It changes along with structural change in an economy due to different factors. Theoretically, the changes rely on three elements: i) the role of factor accumulation (see Findlay (1970); Deardorff (1974)); ii) the endogeneity of technological change (see Krugman (1987));

iii) the influence of agglomeration economies (see Krugman (1991) and Fujita et al. (1999)). It implies that trade specialisation 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 specialisation are defined: first, the changes of the comparative advantage index from one period to the next; secondly, the mobility versus persistence of the trade specialization for every two adjacent years during a whole research period; finally, the trends of comparative advantage over the research period and predictions for the future. Empirically, Hoang et al. (2017b) study the dynamic comparative advantage 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 will therefore follow the ideas of the three dynamic types and will analyse the trade specialisation dynamics for the EU and China respectively in terms of agricultural products in the context of EU-China bilateral trade relations.

Though research on the comparative advantage concept is abundant at both the sector-wide level and country-wide level and especially in the agricultural sector, when it comes to EU-China agricultural products bilateral trade relations, studies are rare and even rarer in terms of analysing dynamic agricultural trade specialisation. This paper will therefore fill this research gap and it will use Brexit as the background of the analysis with an "anti-monde" (or counterfactual) assumption, implying that the UK is not in the EU for the whole research period from 2001 to 2017.

## 3. Methodology and data

In general, there are two main steps of the methodology. The first step involves using Balassa's Revealed Comparative Advantage Index (hereafter BRCA) and the Normalised Revealed Comparative Advantage Index (hereafter NRCA) to quantify the comparative advantage of the EU and China respectively in a number of selected agricultural products. The second step is based on the results obtained from the BRCA and NRCA values, or from a static statistical descriptive analysis leading to preliminary results; these results will be followed by a dynamic analysis for the three types mentioned earlier, namely by using first an OLS regression model, second a Markov one-step transition probability matrix along with a Shorrocks (1978)'s mobility index, and third a regression trend analysis. Each method will be explained further in the following subsections. The data used for this paper will be introduced in the latter part of this section.

### *3.1 Quantifying comparative advantage (Step 1)*

According to Balassa (1965 and 1977), the measurement of the BRCA can be expressed as follows:

$$BRCA_{ij}^{t} = \frac{X_{ij}^{t} / X_{i}^{t}}{X_{wj}^{t} / X_{w}^{t}} \tag{1}$$

Where,
$X_{ij}^{t}$ = Country i's exports of product j in time t;
$X_{i}^{t}$ = Country i's total exports in time t;
$X_{wj}^{t}$ = World's exports of product j in time t;
$X_{w}^{t}$ = World's total exports in time t.

A BRCA>1 denotes a comparative advantage, whereas conversely a BRCA<1 implies no comparative advantage (or the existence of a comparative disadvantage); when BRCA=1, it implies neutral comparative advantage. However, the BRCA can only indicate that country i has a comparative advantage in a product j (or conversely no comparative advantage); however, when putting two countries together with the same product, with both a BRCA>1, the results cannot tell which country has a stronger comparative advantage and vice versa. Moreover, the distribution of the BRCA index is asymmetric because the interval of comparative disadvantage is between 0 and 1 while the interval of comparative advantage is spread between 1 and infinity. Also the asymmetric issue will violate the assumption of normality of the error terms in regression models and this is why the BRCA is not selected for the later regression analysis (Dalum et al. 1998).

Thankfully, another index (the NRCA) which is a modified version of the BRCA by Yu et al. (2009) is adopted here and it allows to overcome the shortcomings of the BRCA. The expression of the NRCA is given as follows:

$$NRCA_{ij}^{t} = \frac{X_{ij}^{t}}{X_{w}^{t}} - \frac{X_{i}^{t} * X_{wj}^{t}}{X_{w}^{t} * X_{wj}^{t}} \tag{2}$$

Where,
$X_{ij}^{t}$ = Country i's exports of product j in time t;
$X_{w}^{t}$ = World's total exports in time t;
$X_{i}^{t}$ = Country i's total exports in time t;
$X_{wj}^{t}$ = World's exports of product j in time t.

The results derived from (2) are symmetric ranging from -0.25 to +0.25 with 0 being the comparative-advantage-neutral point (comparative advantage above 0, disadvantage below 0) and it can easily be used for making comparisons across regions/countries (the EU and China) or time (years).

### *3.2 Measurements of dynamic trade specialisation (Step 2)*

For the measurement of the first type of dynamic trade specialisation, this paper has adopted the OLS regression method which is built by Hart and Prais (1965) and which was first used in this context by Cantwell (1989)[1].

[1] 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 production of the selected countries. However, it did not use the NRCA indicators.

The OLS regression model for the first type can be written as:

$$NRCA_{ij}^{t2} = \alpha_i + \beta_i NRCA_{ij}^{t1} + \varepsilon_{ij}, (\varepsilon_{ij} \sim n.i.d.(0,\sigma)) \quad (3)$$

Where,

$NRCA_{ij}^{t2}$ Country i's NRCA result in product j at time 2 ($t_2$: final year)

$NRCA_{ij}^{t1}$ Country i's NRCA result in product j at time 1 ($t_1$: initial year)

$\alpha_i$ = A constant

$\beta_i$ = A regression coefficient to be estimated

$\varepsilon_{ij}$ = residual terms.

Three time periods are designed for the OLS regression, with the year 2008 epitomizing a structural break in the data, as shown below:

| | $t_1$ | $t_2$ |
|---|---|---|
| **Period 1** | 2001 | 2008 |
| **Period 2** | 2008 | 2017 |
| **Period 3** | 2001 | 2017 |

Making the year 2008 as the cut point for the long-term three sub-periods allows us to see the stability of comparative advantage before and after the economic crisis happening in 2008.

The estimated β coefficient will indicate the different changing patterns of the comparative advantage. 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 (conversely weaker) for products with a strong (conversely weak) initial comparative advantage; when $\beta=1$, there is stability in terms of the degrees of comparative advantage (unchanged trade specialisation); when $\beta=0$, there is no relation between comparative advantage; 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 $\beta>1$ is not a necessary case to identify if the changing pattern of trade specialisation is from comparative disadvantage to advantage and vice versa. Therefore, in order to find out the trends of trade specialisation for each selected time period, Hart (1976) provides a way to make comparisons between β and the correlation coefficient R from the same regression model which can be shown as follows:

$$\frac{\sigma_i^{t2}}{\sigma_i^{t1}} = \frac{|\beta_i|}{|R_i|} \quad (4)$$

Where,

$R_i$ = Correlation coefficient from (3)

$\sigma$ = Standard deviation of the variables $NRCA_{ij}^{t2\&t1}$

When β=R, specialisation trend stays unchanged; when β>R, the degree of trade specialisation rises; and when β<R, the degree of trade specialisation falls.

For the second type of trade specialisation which is in relation to mobility and persistence, a one-step Markov transition probability matrix is applied here. Firstly, with the help of the results of the NRCA, we leave the NRCA indexes which are less or equal to 0 as one class named Group1 (denoting a comparative disadvantage); then, we use the quartile method to classify the rest of the NRCA indexes into three other groups namely Group 2, Group 3, and Group 4 respectively. Group 2 refers to a weak comparative advantage situation; Group 3 denotes medium comparative advantage and Group 4 represents the case of a strong comparative advantage.

The one-step transition probability shows the probability of the NRCA index to move 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[2] of the transition probability matrix in order to find out the extent of the mobility. The equation of the M index can be written as follows:

$$M= n\text{-}tr(P)/n\text{-}1 \tag{5}$$

Where,
$n$ = Number of groups (we have four groups here)
$P$ = Transition probability matrix
$tr(P)$ = Trace of P.

A high M index implies greater mobility while a lower M index mirrors a lower mobility which denotes relative persistence; finally, if M=0 this implies perfect immobility.

For the last sequence of trade specialisation dynamics, this paper employs a regression trend analysis method to investigate and predict the trend of trade specialisation in agricultural products over the research period (2001-2017) and in the future. The regression trend analysis model can be defined as follows:

$$NRCA_{ij}^{t} = \alpha_{ij} + \beta_{ij} t + \varepsilon_{ij}^{t} \tag{6}$$

Where,
$t$ = time index which is from 2001 to 2017 respectively
$\beta_{ij}$ = regression coefficient that shows the NRCA of selected agricultural products' trends.

When $\beta_{ij}$ is close to 0 at a 10 per cent significant level, country i's trade specialisation in product j can be considered as stable; when $\beta_{ij}>0$, a trend shows that the country is gaining a comparative advantage in product j over time, while when $\beta_{ij}<0$, it shows a trend towards a loss of comparative advantage.

[2] 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.

### *3.3 Data and agricultural products*

The trade data from 2001 to 2017 for the purpose of calculating the results of the BRCA index and NRCA indices 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 are from HS01 to HS24 plus HS 50 to HS53. Therefore, 245 agricultural products in total are covered in this 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 and the second type of trade specialisation dynamics have integrated all the agricultural products into the 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 10000.

As mentioned in the introduction section, this study is conducted in the background of Brexit with an assumption that the UK is not in the EU for the research period which is from 2001 to 2017. In doing so, when calculating the index of BRCA and NRCA the trade data of the UK are deducted from the EU and it is why the term of EU27 are used in this paper.

## 4. Empirical results

In this section, all the results will be analysed in the following 4 subsections. Section 4.1 focuses on analysing the preliminary results of both the BRCA and the NRCA indices by using statistical descriptive methods; section 4.2 analyses the results from the usage of the OLS regression method; section 4.3 discusses the degree of mobility of both the EU and China's comparative advantage in the agricultural sectors over time and finally in section 4.4 the results relating to the EU and China's trends in terms of comparative advantage at a product level for the future are analysed.

### *4.1 Analysis of the preliminary results*

Since a comparative advantage is not a static concept especially in a long term period, it is pointless to analyse comparative advantage for each single year. Instead, it makes more sense to interpret comparative advantage in different subsequent time periods within a long term year range. Therefore, the study has grouped 4 time periods within the 17 years from 2001 to 2017 and has calculated the average value for both the BRCA index and NRCA index.

**Table 1.** Average value of the BRCA and NRCA indexes for the 4 periods from 2001 to 2017 in the EU27

| HS Code and Product Category | 2001-2005 | | 2006-2009 | | 2010-2013 | | 2014-2017 | |
|---|---|---|---|---|---|---|---|---|
| | BRCA | NRCA | BRCA | NRCA | BRCA | NRCA | BRCA | NRCA |
| 01 Live Animals | 0.10 | -0.07 | 0.09 | -0.08 | 0.16 | -0.09 | 0.24 | -0.10 |
| 02 Meat | 0.21 | -0.27 | 0.22 | -0.34 | 0.74 | -0.15 | ***1.77*** | ***0.57*** |
| 03 Fish | 0.64 | -0.12 | 0.61 | -0.15 | 0.35 | -0.32 | 0.32 | -0.46 |

| HS Code and Product Category | 2001-2005 | | 2006-2009 | | 2010-2013 | | 2014-2017 | |
|---|---|---|---|---|---|---|---|---|
| | BRCA | NRCA | BRCA | NRCA | BRCA | NRCA | BRCA | NRCA |
| 04 Dairy products | 0.41 | -0.14 | 0.46 | -0.17 | 0.72 | -0.12 | ***1.27*** | ***0.13*** |
| 05 Animal originated | ***2.76*** | ***0.05*** | ***3.19*** | ***0.07*** | ***2.75*** | ***0.08*** | ***2.98*** | ***0.11*** |
| 06 Live trees | 0.47 | -0.04 | 0.44 | -0.05 | 0.45 | -0.06 | 0.67 | -0.04 |
| 07 Edible vegetables | 0.02 | -0.18 | 0.01 | -0.24 | 0.01 | -0.32 | 0.01 | -0.41 |
| 08 Edible fruit and nuts | 0.05 | -0.24 | 0.10 | -0.30 | 0.10 | -0.42 | 0.09 | -0.60 |
| 09 Coffee, tea, etc. | 0.02 | -0.09 | ***7.06*** | -0.11 | 0.04 | -0.23 | 0.07 | -0.28 |
| 10 Cereals | 0.30 | -0.19 | 0.06 | -0.37 | 0.06 | -0.55 | 0.32 | -0.44 |
| 11 Milling products | 0.24 | -0.03 | 0.27 | -0.05 | 0.32 | -0.06 | 0.25 | -0.08 |
| 12 Oil seeds | 0.21 | -0.14 | 0.13 | -0.23 | 0.09 | -0.42 | 0.14 | -0.49 |
| 13 Lac, gums, resins | 0.51 | -0.01 | 0.53 | -0.01 | 0.36 | -0.03 | 0.50 | -0.02 |
| 14 Vegetable plaiting materials | 0.06 | 0.00 | 0.09 | 0.00 | 0.10 | 0.00 | 0.04 | -0.01 |
| 15 Animal or vegetable fats | 0.13 | -0.18 | 0.14 | -0.29 | 0.31 | -0.37 | 0.31 | -0.39 |
| 16 Meat preparations | 0.03 | -0.13 | 0.02 | -0.17 | 0.01 | -0.23 | 0.02 | -0.28 |
| 17 Sugar | 0.06 | -0.11 | 0.11 | -0.15 | 0.07 | -0.25 | 0.10 | -0.24 |
| 18 Cocoa | 0.13 | -0.10 | 0.18 | -0.13 | 0.39 | -0.14 | 0.43 | -0.17 |
| 19 Preparations of cereals or milk | 0.24 | -0.12 | 0.58 | -0.08 | ***1.21*** | ***0.07*** | ***2.77*** | ***0.74*** |
| 20 Preparations of vegetables | 0.06 | -0.16 | 0.08 | -0.21 | 0.11 | -0.26 | 0.17 | -0.30 |
| 21 Various edible preparations | 0.22 | -0.12 | 0.31 | -0.14 | 0.49 | -0.15 | 0.46 | -0.21 |
| 22 Beverages | 0.35 | -0.21 | 0.75 | -0.10 | ***1.54*** | ***0.30*** | ***1.74*** | ***0.50*** |
| 23 Food wastes | 0.10 | -0.15 | 0.11 | -0.21 | 0.10 | -0.32 | 0.17 | -0.37 |
| 24 Tobacco | 0.09 | -0.14 | 0.07 | -0.15 | 0.08 | -0.20 | 0.05 | -0.24 |
| 50 Silk | 0.31 | -0.01 | 0.38 | -0.01 | 0.51 | -0.01 | 0.33 | -0.01 |
| 51 Wool | ***1.85*** | ***0.07*** | 2.41 | 0.09 | 2.15 | 0.09 | 1.97 | 0.08 |

| HS Code and Product Category | 2001-2005 | | 2006-2009 | | 2010-2013 | | 2014-2017 | |
|---|---|---|---|---|---|---|---|---|
| | BRCA | NRCA | BRCA | NRCA | BRCA | NRCA | BRCA | NRCA |
| 52 Cotton | **46.54** | -0.16 | 0.25 | -0.19 | 0.27 | -0.26 | 0.15 | -0.30 |
| 53 Vegetable textile fibers | **1318.24** | **0.16** | 8.27 | 0.13 | 7.18 | 0.13 | 8.45 | 0.20 |
| **Number of products with a comparative advantage** | **4** | **3** | **4** | **3** | **5** | **5** | **7** | **7** |

Source: Authors' own calculation based on trade data from Trade Map database (2001-2017).
Note: for a full description of each product area, please refer to the appendix.

As shown in Table 1, in the first period (2001-2005), there were only 4 kinds of agricultural products in the EU27 showing a comparative advantage (hereafter CA) according to the results of the BRCA index; these are HS05 (2.76), HS51 (1.85), HS52 (46.54), and HS53 (1318.24); this accords broadly with the results of the NRCA index; according to the results of the NRCA index, there were 3 products with a CA, namely HS05 (0.05), HS51 (0.07), and HS53 (0.16). The number of products with a CA has increased to 7 in the most recent period (2014-2017) and for this period both the BRCA index and NRCA index have shown a CA for the identical product groups which are HS02 (BRCA:1.77, NRCA:0.57), HS04 (BRCA:1.27, NRCA: 0.13), HS05 (BRCA: 2.98, NRCA: 0.11), HS19 (BRCA: 2.77, NRCA: 0.74), HS22 (BRCA: 1.74, NRCA: 0.5), HS51 (BRCA: 1.97, NRCA: 0.08), and HS53 (BRCA: 8.45, NRCA:0.2). Also, HS05, HS51, and HS53 always show a CA in the four periods which indicates that the EU has a stable CA for these three product groups. However, the EU27 gained a CA in products such as HS02, HS04 only in the recent years.

**Table 2.** Average value of the BRCA and NRCA indexes for 4 periods from 2001 to 2017 in China

| HS Code and Product Category | 2001-2005 | | 2006-2009 | | 2010-2013 | | 2014-2017 | |
|---|---|---|---|---|---|---|---|---|
| | BRCA | NRCA | BRCA | NRCA | BRCA | NRCA | BRCA | NRCA |
| 01 Live Animals | 0.02 | -0.12 | 0.02 | -0.19 | 0.01 | -0.19 | 0.01 | -0.22 |
| 02 Meat | 0.10 | -0.53 | 0.01 | -0.95 | 0.02 | -1.05 | 0.01 | -1.21 |
| 03 Fish | 0.94 | -0.04 | ***1.03*** | ***0.03*** | ***1.06*** | ***0.05*** | 0.84 | -0.19 |
| 04 Dairy products | 0.05 | -0.39 | 0.03 | -0.67 | 0.07 | -0.72 | 0.09 | -0.76 |
| 05 Animal originated | ***7.49*** | ***0.29*** | ***5.05*** | ***0.29*** | ***4.46*** | ***0.29*** | ***3.91*** | ***0.28*** |
| 06 Live trees | 0.14 | -0.11 | 0.12 | -0.17 | 0.13 | -0.16 | 0.14 | -0.17 |
| 07 Edible vegetables | ***1.10*** | ***0.02*** | 0.76 | -0.13 | 0.68 | -0.18 | 0.46 | -0.38 |

| HS Code and Product Category | 2001-2005 | | 2006-2009 | | 2010-2013 | | 2014-2017 | |
|---|---|---|---|---|---|---|---|---|
| | BRCA | NRCA | BRCA | NRCA | BRCA | NRCA | BRCA | NRCA |
| 08 Edible fruit and nuts | 0.20 | -0.34 | 0.23 | -0.57 | 0.21 | -0.66 | 0.16 | -0.94 |
| 09 Coffee, tea, etc. | 0.40 | -0.10 | ***68.84*** | -0.18 | 0.36 | -0.28 | 0.48 | -0.26 |
| 10 Cereals | 0.04 | -0.44 | 0.01 | -0.87 | 0.01 | -1.03 | 0.00 | -1.07 |
| 11 Milling products | 0.02 | -0.07 | 0.03 | -0.14 | 0.07 | -0.15 | 0.16 | -0.15 |
| 12 Oil seeds | 0.96 | -0.03 | 0.43 | -0.34 | 0.30 | -0.57 | 0.28 | -0.69 |
| 13 Lac, gums, resins | 0.60 | -0.01 | ***1.00*** | ***0.00*** | ***1.51*** | ***0.03*** | ***2.49*** | ***0.10*** |
| 14 Vegetable plaiting materials | ***1.88*** | ***0.00*** | ***1.54*** | ***0.00*** | ***1.68*** | ***0.01*** | ***2.51*** | ***0.01*** |
| 15 Animal or vegetable fats | 0.09 | -0.31 | 0.07 | -0.71 | 0.04 | -0.90 | 0.09 | -0.86 |
| 16 Meat preparations | 0.51 | -0.11 | 0.59 | -0.17 | 0.48 | -0.22 | 0.49 | -0.24 |
| 17 Sugar | 0.09 | -0.19 | 0.09 | -0.33 | 0.07 | -0.44 | 0.07 | -0.42 |
| 18 Cocoa | 0.04 | -0.19 | 0.07 | -0.32 | 0.09 | -0.37 | 0.08 | -0.45 |
| 19 Preparations of cereals or milk | 0.17 | -0.23 | 0.10 | -0.43 | 0.10 | -0.48 | 0.09 | -0.62 |
| 20 Preparations of vegetables | ***2.06*** | ***0.28*** | ***1.38*** | ***0.18*** | 0.94 | -0.03 | 0.75 | -0.15 |
| 21 Various edible preparations | 0.12 | -0.23 | 0.09 | -0.42 | 0.12 | -0.46 | 0.18 | -0.54 |
| 22 Beverages | 0.05 | -0.52 | 0.02 | -0.90 | 0.02 | -0.94 | 0.05 | -1.06 |
| 23 Food wastes | 0.04 | -0.27 | 0.12 | -0.44 | 0.23 | -0.49 | 0.35 | -0.48 |
| 24 Tobacco | 0.24 | -0.19 | 0.66 | -0.14 | 0.30 | -0.27 | 0.27 | -0.31 |
| 50 Silk | ***8.09*** | ***0.19*** | ***5.49*** | ***0.17*** | ***6.90*** | ***0.18*** | ***7.29*** | ***0.15*** |
| 51 Wool | ***2.28*** | ***0.18*** | ***2.06*** | ***0.16*** | ***2.70*** | ***0.23*** | ***2.13*** | ***0.15*** |
| 52 Cotton | ***70.45*** | -0.15 | 0.59 | -0.23 | 0.64 | -0.23 | 0.56 | -0.26 |
| 53 Vegetable textile fibers | ***232.08*** | ***0.03*** | ***2.37*** | ***0.05*** | ***2.39*** | ***0.05*** | ***2.04*** | ***0.05*** |
| **No. of Products with a comparative advantage** | **8** | **7** | **9** | **8** | **7** | **7** | **6** | **6** |

Source: Author's own calculation based on trade data from Trade Map (2001-2017).
Note: for a full description of each product area, please refer to the appendix.

Turning to China's standpoint, Table 2 illustrates the average value of both the BRCA

and NRCA indexes for the four periods from 2001 to 2017 for China. According to the results of the BRCA shown in the table, in the first period (2001-2005), China had a CA in 8 agricultural product groups namely: HS05 (7.49), HS07 (1.10), HS14 (1.88), HS20 (2.06), HS50 (8.09), HS51 (2.28), HS52 (70.45), and HS53 (232.08); the NRCA indices shown for the same period denote 7 product groups in which China had a CA and the only difference is HS52 with a NRCA equal to -0.15. Again, the results of the two indices broadly point to the same direction. By contrast with the EU27, the number of agricultural product groups decreased to 6 in the most recent period (2014-2017) according to the results of both the BRCA and NRCA. Also, HS05, HS14, HS50, HS51, and HS53 always show a CA in the last 17 years which implies that these product groups in China have a relatively stable CA pattern.

**Table 3.** Product groups in the EU27 and China with a CA in two limit periods

| Country | Products (HS Code) | 2001-05 | 2014-17 |
|---|---|---|---|
| **EU(27)** | Meat and edible meat offal (02) | **N** | ***Y*** |
| | Dairy products (04) | **N** | ***Y*** |
| | Animal originated products (05) | ***Y*** | ***Y*** |
| | Preparations of cereals or milk; pastrycooks' products (19) | **N** | ***Y*** |
| | Beverages, spirits and vinegar (22) | **N** | ***Y*** |
| | Wool, animal hair; horsehair yarn and woven fabric (51) | ***Y*** | ***Y*** |
| | Cotton (52) | ***Y*** | **N** |
| | Vegetable textile fibers; paper yarn and woven fabrics of paper yarn (53) | ***Y*** | ***Y*** |
| **China** | Animal originated products (05) | ***Y*** | ***Y*** |
| | Edible vegetables and certain roots and tubers (07) | ***Y*** | **N** |
| | Lac; gums, resins and other vegetable saps and extracts (13) | **N** | ***Y*** |
| | Vegetable plaiting materials (14) | ***Y*** | ***Y*** |
| | Preparation of vegetable, fruit, nuts or other parts of plants (20) | ***Y*** | **N** |
| | Silk (50) | ***Y*** | ***Y*** |
| | Wool, animal hair; horsehair yarn and woven fabric (51) | ***Y*** | ***Y*** |
| | Cotton (52) | ***Y*** | **N** |
| | Vegetable textile fibers; paper yarn and woven fabrics of paper yarn (53) | ***Y*** | ***Y*** |

*Source: Authors' own work.*

*Note:* "N" refers to product without comparative advantage; "Y" implies product with comparative advantage.

Table 3 summarizes the agricultural product groups for both the EU27 and China that show a CA in either or both of the time periods 2001-2005 and 2014-2017[3]. From China's standpoint (bottom part of the table) and for the period 2001-05, edible vegetables and certain roots and tubers; vegetable plaiting materials; preparation of vegetable, fruit, nuts or other parts of plants; and silk all show a CA whereas this is not the case for the EU27. However, for animal originated products (such as wool, animal hair; horse hair yarn and woven fabric), cotton, vegetable textile fibers, paper yarn and woven fabrics and paper yarn, the results show a CA for both the EU27 and China in this period (2001-05).

For the most recent period (2014-17), agricultural product groups in which the EU27 had a CA and China did not have a CA were meat and edible meat offal; dairy products; preparations of cereals or milk; pastry cooks' products; beverages, spirits and vinegar. For products such as lac; gums, resins and other vegetable saps and extracts; vegetable plaiting materials; and silk, China has a CA in sharp contrast with the EU27. A comparison between the two periods shows that the EU27 has lost its CA in cotton while China lost its CA in edible vegetables and certain roots and tubers; preparation of vegetable, fruit, nuts or other parts of plants; and cotton. However, in the same two periods, the EU27 had gained a CA in meat and edible meat offal; dairy products; preparations of cereals or milk; pastrycooks' products; beverage, spirits and vinegar, while in China a comparative disadvantage was changed into a CA for products such as lac; gums, resins and other vegetable saps and extracts.

### *4.2 Dynamic analysis (type 1)*

Table 4 below shows the OLS regression results for the NRCA indexes over the three defined time periods for the EU27 and China respectively. All the regression coefficients are significant at the 1 per cent level; however, the $r^2$ for the EU27 and for the second and the third periods are relatively low implying a priori a low explanatory power of the model. However, the data is well explained in the case of China.

In each time period and for both the EU27 and China, β are all greater than 1 which implies that for both the EU27 and China, agricultural product groups with an initial strong CA gain more CA whilst product groups with an initial weak CA lose CA. This situation happens in all the three defined time periods.

Furthermore, all the β are larger than R (correlation coefficient) which indicates that the degree of trade specialisation rises for both the EU27 and China in all the three time periods. This also tells that the economic crisis in 2008 had no significant influence on the agricultural products trade specialisation in both the EU27 and China, and that China's accession to the WTO enhanced the trade specialisation for both. When combined with the results obtained for both β and R, the trade specialisation in agricultural products can be defined as divergent trade patterns for both the EU27 and China.[4]

[3] Note that the results in Table 3 are summarized by using only the NRCA index. The BRCA index is not used for Table 3.

[4] Trade patterns can be defined by type of trade specialisation. When trade specialisation rises, trade patterns point towards divergent trade patterns while when trade specialisation falls, trade patterns tend to converge.

**Table 4,** The OLS regression results for both the EU and China over three periods

| EU27 | Year period | β | $r^2$ | R | β/R |
|---|---|---|---|---|---|
| | **2001-2008** | 1.163*** | 0.65 | 0.80 | 1.45 |
| | **2008-2017** | 1.898*** | 0.23 | 0.48 | 3.94 |
| | **2001-2017** | 1.500*** | 0.07 | 0.26 | 5.69 |
| **China** | **Year period** | **β** | **$r^2$** | **R** | **β/R** |
| | **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 |

Source: Authors' own calculation by using Stata. *** p<0.01, ** p<0.05, * p<0.1 and R denotes correlation coefficient.

### 4.3 Analysing the degree of mobility of trade specialisation (type 2)

After grouping the NRCA indices of the 245 selected agricultural products from 2001 to 2017 for the EU27, the numbers of the agricultural products in each group vary from year to year but on average, as the last column in Table 5 shows there are 214 products in Group1, 8 products in Group 2, 16 products in Group 3, and 8 products in Group 4. Therefore, it shows that for most agricultural products, the EU27 has a comparative disadvantage in its agricultural trade relations with China.

In terms of the degree of mobility within the four groups, this paper defined the movement from a comparative disadvantage to a strong CA as "forward moving" while the move from a strong CA to a comparative disadvantage is termed a "backward movement". Table 6 depicts the transition probability from one group (or state) in the current year to another group (or state) in the next year for the EU27[5]. The probabilities which are highlighted on the diagonal represent the stability of each group. The agricultural products with a comparative advantage have a 94.1 per cent probability to keep this comparative advantage while the products with a medium CA and a strong CA have a 36.1 per cent and a 32.5 per cent probability respectively to stay in the same state. However, the products of group 2 (weak CA) have a 0 probability to stay in the weak CA group and there is a 100 per cent probability for these products to move backward to group 1. There is a 26.7 per cent probability for Group 3 to move backward to Group 1. For those products with a strong CA (group 4), there is no chance that they will move backward to the comparative disadvantage group but a 67.5 per cent probability that they will move backward to the medium CA group while Group 3 has a 37.3 per cent probability to move forward to Group 4. Finally, Group 1 has probabilities of 3.2 per cent, 2.6 per cent, and 0.13 per cent to move forward to Group 2, Group 3, and Group 4 respectively.

[5] Note that the results in Table 6 are the average probability value on transition probabilities of 16 pairs of each two adjacent years from 2001 to 2017 (e.g. 2001-2002, 2002-2003, 2003-2004, … , 2016-2017) and Table 8 for the case of China is the same. The mobility indexes in Table 6 and 8 are also average values derived from the 16 transition probability matrixes of the EU and China respectively.

**Table 5.** The groups of EU27'S NRCA index

| States | Explanations | NRCA cut points | No. average |
|---|---|---|---|
| **Group1** | comparative disadvantage | <=0 | 214 |
| **Group2** | weak comparative advantage | <=0.00102 | 8 |
| **Group3** | medium comparative advantage | <=0.0447 | 16 |
| **Group4** | Strong comparative advantage | >0.0447 | 8 |

Source: Authors' own calculation.

**Table 6.** The Markov transition probability matrix for the NRCA (EU27)

| Obs.4165 | Group1 | Group2 | Group3 | Group4 |
|---|---|---|---|---|
| **Group1 (comparative dis.)** | 0.9405 | 0.0324 | 0.0258 | 0.0013 |
| **Group2 (Weak CA)** | 1.0000 | 0.0000 | 0.0000 | 0.0000 |
| **Group3 (Medium CA)** | 0.2667 | 0.0000 | 0.3607 | 0.3726 |
| **Group4 (Strong CA)** | 0.0000 | 0.0000 | 0.6752 | 0.3248 |
| **M index** | 0.7913 | | | |

Source: Authors' own calculation based on the NRCA results of the EU27.

For China, there are on average 197 products, 21 products, 19 products, and 7 products in Groups 1, 2, 3, and 4 respectively (Table 7). Although the number of products in Group 1 is smaller than is the case for the EU27, it still takes the most portion of all the products. As the probabilities highlighted in Table 8 show, products that have a comparative disadvantage will still stay in the same group with a high probability (84.2 per cent) while, as in the case of the E27, Group 2 products have a 0 probability to still stay in the same group but there is a 100 per cent probability that products with a weak CA will move to group 1 (comparative disadvantage). Products in Group 3 have a 31.3 per cent probability to stay in the same group while Group 4 products have a 46.8 per cent chance to still have a strong CA. Therefore, the products with a strong CA in China tend to have more stability than the products in the EU27. It is worth to notice that products with a medium CA have a higher probability compared with the EU27 case to change backward to the comparative disadvantage group with a 49.7 per cent probability. Moreover, products with a medium CA have a lower probability than the EU27 to move forward to the strong CA group with only a 19 per cent probability. Eventually, the

probabilities of Group1 moving forward to Group 2, Group 3, and Group 4 are 10.9 per cent, 4.72 per cent, and 0.16 per cent respectively.

**Table 7.** The groups of China's NRCA index

| States | Explanation | NRCA cut points | No. average |
|---|---|---|---|
| **Group1** | comparative disadvantage | <=0 | 197 |
| **Group2** | weak comparative advantage | <=0.01207 | 21 |
| **Group3** | Medium comparative advantage | <=0.0697 | 19 |
| **Group4** | strong comparative advantage | >0.0697 | 7 |

Source: Authors' own calculation.

**Table 8.** The Markov transition probability matrix for the NRCA (China)

| Obs.4165 | Group1 | Group2 | Group3 | Group4 |
|---|---|---|---|---|
| **Group1 (Comparative dis.)** | 0.8420 | 0.1092 | 0.0472 | 0.0016 |
| **Group2 (Weak CA)** | 1.0000 | 0.0000 | 0.0000 | 0.0000 |
| **Group3 (Medium CA)** | 0.4974 | 0.0000 | 0.3129 | 0.1897 |
| **Group4 (Strong CA)** | 0.0000 | 0.0000 | 0.5324 | 0.4676 |
| **M index** | 0.7924 | | | |

Source: Authors' own calculation based on the NRCA results of China.

The mobility index M has shown that the degree of mobility of the agricultural products trade specialisation of the EU27 and China are roughly similar. For the EU27, the mobility index is 0.7913 while for China the mobility index is 0.7924. However, China still has a little more mobility than the EU27 in terms of agricultural trade specialisation.

### *4.4 Analysing the trends of trade specialisation at a product level (type 3)*

In the EU27, there are five 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 last column in Table 9). These product groups are meat and edible meat offal (HS02), dairy products, birds' eggs, honey, edible products of animal origin (HS04); animal originated products (HS05); preparations of cereals or milk; pastrycooks' products (HS19); and beverages, spirits and vinegar

(HS22). Although the product group of silk (HS50) has a result that very close to 0 at 5 per cent level, it still shows an unchanged pattern to some degree. The rest of the products show a downward trend in the future which implies a loss of comparative advantage vis-à-vis China; however, the results for HS06 and HS51 are not significant.

**Table 9.** Trends analysis results for the EU27 at product level

| Products | B | $r^2$ | NRCA (2001) | NRCA (2017) | 2017-2001 |
|---|---|---|---|---|---|
| HS01 | -0.003*** | 0.605 | -0.0517 | -0.115 | -0.0633 |
| HS02 | 0.061*** | 0.48 | -0.175 | 0.536 | 0.711 |
| HS03 | -0.027*** | 0.832 | -0.11 | -0.502 | -0.392 |
| HS04 | 0.020*** | 0.511 | -0.106 | 0.2 | 0.306 |
| HS05 | 0.005*** | 0.832 | 0.0312 | 0.134 | 0.1028 |
| HS06 | -0.0003 | 0.012 | -0.0268 | -0.0508 | -0.024 |
| HS07 | -0.018*** | 0.867 | -0.143 | -0.459 | -0.316 |
| HS08 | -0.029*** | 0.875 | -0.184 | -0.686 | -0.502 |
| HS09 | -0.016*** | 0.792 | -0.0806 | -0.311 | -0.2304 |
| HS10 | -0.025*** | 0.443 | -0.143 | -0.638 | -0.495 |
| HS11 | -0.004*** | 0.803 | -0.0293 | -0.0881 | -0.0588 |
| HS12 | -0.030*** | 0.916 | -0.062 | -0.545 | -0.483 |
| HS13 | -0.001*** | 0.441 | -0.00994 | -0.0199 | -0.00996 |
| HS14 | -0.000*** | 0.593 | -0.0029 | -0.00603 | -0.00313 |
| HS15 | -0.017*** | 0.51 | -0.111 | -0.472 | -0.361 |
| HS16 | -0.012*** | 0.93 | -0.101 | -0.305 | -0.204 |
| HS17 | -0.012*** | 0.762 | -0.0961 | -0.273 | -0.1769 |
| HS18 | -0.006*** | 0.44 | -0.0621 | -0.23 | -0.1679 |
| HS19 | 0.064*** | 0.666 | -0.0877 | 1.146 | 1.2337 |
| HS20 | -0.011*** | 0.878 | -0.126 | -0.322 | -0.196 |
| HS21 | -0.007*** | 0.661 | -0.0968 | -0.233 | -0.1362 |
| HS22 | 0.059*** | 0.872 | -0.148 | 0.673 | 0.821 |
| HS23 | -0.018*** | 0.873 | -0.123 | -0.361 | -0.238 |
| HS24 | -0.008*** | 0.784 | -0.124 | -0.259 | -0.135 |
| HS50 | 0.000** | 0.325 | -0.0119 | -0.00853 | 0.00337 |
| HS51 | 0.001 | 0.061 | 0.0817 | 0.0774 | -0.0043 |
| HS52 | -0.010** | 0.289 | -0.202 | -0.314 | -0.112 |
| HS53 | 0.003 | 0.126 | 0.112 | 0.186 | 0.074 |

*Source: Authors' own calculation.* *** p<0.01, ** p<0.05, * p<0.1, "2017-2001" refers to results of NRCA (2017) minus NRCA (2001)

In China, there are only two product groups showing an upward trend in terms of

obtaining a comparative advantage in the future and it is also proved by the positive value of the dispersion between the NRCA in 2017 and NRCA in 2001. These two product groups are lac; gums, resins and other vegetable saps and extracts (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 EU27 and note that the results of HS03, HS05, HS24, HS51, HS52 and HS53 are insignificant in the regression analysis.

**Table 10.** Trends analysis results for China at product level

| Products | B | $r^2$ | NRCA (2001) | NRCA (2017) | 2017-2001 |
|---|---|---|---|---|---|
| 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 |

*Source: Authors' own calculation.* *** p<0.01, ** p<0.05, * p<0.1, "2017-2001" refers to results of NRCA (2017) minus NRCA (2001)

## 5. Conclusion

From 2001 to 2017, the number of agricultural products with a comparative advantage has increased from the EU27 standpoint whereas it has decreased from the viewpoint of China (see the last rows of Table 1 and Table 2). For the EU27, the trade specialisation is in animal originated products (HS05); wool, animal hair; horsehair yarn and woven fabric (HS51); and vegetable textile fibers; paper yarn and woven fabrics of paper yarn (HS53) which always shows a comparative advantage. Also, one should be aware of the fact that the EU27 has gained new trade specialisation in meat and edible meat offal (HS02) and dairy products, birds' eggs, honey, edible products of animal origin (HS04), all products gaining a comparative advantage in recent years. China is specialized in animal originated products (HS05); vegetables plaiting materials (HS14); silk (HS50); wool, animal hair; horsehair yarn and woven fabric (HS51); and vegetable textile fibers; paper yarn and woven fabrics of paper yarn (HS53).

Trade specialisation of both the EU27 and China in the agricultural sector has risen during the three periods and this is in line with economic development, especially in the framework of more open and market-orientated foreign trade policies of China as well as the by structural change. The degree of mobility of specialisation in both the EU27 and China in the agricultural products trade area is relatively high with two similar mobility indexes implying an unstable trade specialisation pattern for both countries. For the EU27, it is worth noting that the products that have a strong comparative advantage have a lower probability than China to stay in the strong comparative advantage group. For China, it is hard for those products having a medium comparative advantage to increase their comparative advantage and to move into the strong comparative advantage category.

These results imply the following: first, both the EU27 and China should find effective ways to enhance the comparative advantage for those products that have a weak comparative advantage and try to reduce the probability that they will fall into the comparative disadvantage group. Second, both the EU and China should enhance their trade complementarity; this is shown by the products where the EU27 has a comparative advantage corresponding to a comparative disadvantage for China and vice versa. Therefore, meat and edible meat offal (HS02); dairy products, birds' eggs, honey, edible products of animal origin (HS04); preparations of vegetables, fruit, nuts or other parts of plants (HS20) are the products for the EU27 which should be traded more with China while lac; gums, resins and other vegetable saps and extracts (HS13); vegetable plaiting materials (HS14); and silk (HS50) are the products for China that

should be traded more with the EU27. For the future, as the estimates show, most of the agricultural products tend to lose their comparative advantage while only a few products tend to gain a comparative advantage. This trend works for both the EU27 and China and it indicates that the EU27 and China should focus on changing more sustainable development methods in the agricultural sectors especially in the case of China. The natural-resource-intensive advantage for China will not last very long in the future and China should find new comparative advantage in the agricultural sector and at the same time maintain a comparative advantage in the traditional products.

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## Appendices: HS agricultural product classification at 2-digit level

HS01 Live animals

HS02 Meat and edible meat offal

HS03 Fish, crustaceans, molluscs, and other aquatic invertebrates

HS04 Dairy products, birds' eggs, honey, edible products of animal origin

HS05 Animal originated products

HS06 Live trees and other plants; bulbes, root; cut flowers and ornamental foliage

HS07 Edible vegetables and certain roots and tubers

HS08 Edible fruit and nuts; peel of citrus fruit or melons

HS09 Coffee, tea, mate and spices

HS10 Cereals

HS11 Milling products; malt, starches, inulin, wheat gluten

HS12 Oil seeds and oleaginous fruits; various grains, seeds and fruit, industrial or medicinal plants; straw and fodder

HS13 Lac; gums, resins and other vegetable saps and extracts

HS14 Vegetables plaiting materials

HS15 Animal or vegetable fats, waxes, oils, and their cleavage productss

HS16 Meat, preparations of fish or crustaceans, molluscs or other aquatic invertebrates

HS17 Sugars and sugar confectionery

HS18 Cocoa and cocoa preparations

HS19 Preparations of cereals or milk; pastrycooks' products

HS20 Preparations of vegetables, fruit, nuts or other parts of plants

HS21 Various edible preparations

HS22 Beverages, spirits and vinegar

HS23 Food industries, residues and wastes thereof; prepared animal fodder

HS24 Tobacco and manufactured tobacco substitutes

HS50 Silk

HS51 Wool, animal hair; horsehair yarn and woven fabric

HS52 Cotton

HS53 Vegetable textile fibers; paper yarn and woven fabrics of paper yarn