EU-China Trade and intra-EU Trade: Substitute or Complementary?

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Abstract: This paper examines how EU-China trade affected intra-EU trade. The estimation shows that when a country's share of trade with China increased, its share of trade with EU partners declined. This suggests that stronger trade links with China resulted in weaker trade links among EU countries. Furthermore, the "disintegration" effect of the export to China was stronger than that of import from China, meaning that the influence of China as an export destination was greater than that of China as a source of import. An extended analysis shows that the disintegration effect was most strongly felt in trade links among EU core countries, less strongly felt in trade links between EU core and periphery countries, and least strongly felt in trade links among EU periphery countries. In comparison, we find that EU import from the US and India significantly weakened and strengthened intra-EU trade respectively. Estimation results using product level data demonstrate that the effects depend on the types of products we are concerned with. Whether using gross value or value added, the conclusions remain valid.

Key words: EU-China trade, intra-EU trade, substitute, complementary

1. Introduction

The research question of this paper is whether there was a "China effect" for EU trade disintegration. Specifically, did EU-China trade weaken trade links within the EU? In the EU, the trade policy is defined by the European Commission and is the same for all the European countries. Nevertheless, each country develops its own bilateral links with China.

Two trends motivate us to research this question. The first trend is the declining share of intra-EU trade, in some sense, reflecting a process of EU trade disintegration. The most recent development occurred in the summer of 2016, when Britain voted to leave the EU. Consequently, the trade share within the EU is seen as an index of "EU importance", capturing the sentiment of a "big family" among EU member states (König and Ohr, 2013; König, 2015). However, the following three facts exhibit a growing decline of "EU importance". First, for the EU as a whole, the share of trade among EU countries has been reduced. As seen in Figure 1, for EU-28, intra-EU trade share has begun to decline since its peak in 1999-2003. Compared with 2003, the share of

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export, import and total trade among EU countries has decreased by 6%, 3% and 4% respectively in 2015. Second, for EU member states, the share of trade with EU partners has also declined, though to a different degree. After 2000, the share of export to EU partners declined for most EU member states. In Germany and the Netherlands, for example, the share fell by 7% and 5% in 2015 compared to 2000. The situation for import was slightly different. In Germany and the Netherlands, for example, the former showed relative stability in 2015 compared with 2000, while the latter declined by 7%. Finally, for EU countries with similar levels of development, the trade share occurring among them have also declined. Following Adam and Moutos (2008), we regard eleven countries, including Austria, Belgium, Denmark, Finland, France, Germany, the Netherlands, Ireland, Luxembourg, Sweden and the United Kingdom, as "northern countries". From 2000-2015, the share of export trade among them (Intra-EU11) fell by 7% while the share of import trade remained approximately the same.

The second trend is the growing trade links between the EU and China. First, China's share of the EU's foreign trade has increased, as shown in Figure 2. In 2015, China's shares of EU's export, import and total trade were 4%, 7% and 5%, respectively. Compared with 1995, China's share increased by 3%, 6% and 4%, respectively. Second, for EU member states, China's share of trade has also increased. In Germany and the Netherlands, for example, China's share of export rose by 5% and 1% in 2015 compared with 2000. China's share of import rose by about 5% and 9%, respectively. Finally, for EU countries with similar levels of development, the share of trade between them and China has also increased. Taking EU-11 as an example, China's share of export and import rose by 3% and 5% compared with 2000 respectively.

From these two trends, it is natural to conjecture that the declining intra-EU trade share may be ascribed to the increasing EU-China trade links. However, before controlling for other variables, we cannot conclude that there exists a causal relationship between them. To this end, we obtain data from EU countries from 1995 to 2015 to examine how trade between the EU and China affected the trade among EU countries. Our contribution lies in five aspects. First, we extend the studies on the "China effect" to the research field of market integration. Until now, the "China effect" literature has largely ignored this topic, with most existing research dedicated to studying the quantity effect, price effect, technological progress effect and welfare effect of China's foreign trade on other countries. Second, we offer a quantitative explanation of EU trade disintegration from an economic angle. Prior to this, research on this subject has been generally qualitative, using a political and social angle. Third, we study the impact of EU-China trade on intra-EU trade in an average sense and also analyze the "heterogeneity" of this impact. In particular, we find the impacts depend on the countries and the types of products we are concerned with. Fourth, we assess the "China effect" by using not only trade in gross value, but also trade in value added. Moreover, we compare the effects of EU-China trade to that of EU-US trade and EU-India trade. Fifth, we adopt instrumental variables analysis to address endogeneity.

The remainder of the paper is structured as follows. Section 2 is a literature review. Section 3 introduces our empirical strategy. Section 4 provides a brief description of our data sources. Section 5 presents our estimation results and Section 6 conducts extended analyses. Section 7 concludes.

insert Figure 1 and Figure 2

2. Literature review

The question we are concerned with is related to two strands of literature. One is related to EU integration, and the other is related to the "China effect".

2.1 The literature on EU integration

There are two research angles worth noting in the field of EU trade integration. The first is about the trade effect of EU integration. Badinger and Breuss (2004) find that income growth was the main reason for the expansion of intra-EU trade from 1960 to 2001. The impact of trade cost reduction was found to be insignificant. Badinger and Breuss (2011) also review almost all the quantitative studies on the effects of EU integration. They conclude that unlike the positive effects of the first four rounds of EU enlargement, in the last round of EU enlargement (2004 and 2007), new member states benefited the most, while old members benefited less or, in some cases, suffered. Egger and Pfaffermayr (2013) examine the trade effects of EU enlargement from 1960 to 2001. Their empirical results showed that the formation and expansion of the EU produced trade creation effects, especially in the earlier stage of integration. They also find that in the process of EU enlargement, trade between core and periphery countries, as well as trade between periphery countries, grew faster than that among core countries. The reason is that in the early stages of integration, there existed a relatively strong effect of trade diversion within the EU.

The second is about the impact of external factors on European trade integration. Adam and Moutos (2008) examine the impact of the EU-Turkey Customs Union (signed in 1995 and implemented in 1996) on intra-EU trade. The empirical research shows that the customs union of EU and Turkey reduced the export of the southern EU countries to the northern EU countries but didn't affect the export of the latter to the former. They attribute this to the relatively low technological sophistication of the southern EU countries which had a competitive relationship with Turkey. Aichele et al. (2016) investigate the possible impact of the Transatlantic Trade and Investment Partnership Agreement (TTIP) on intra-EU trade. Their empirical research based on the new quantitative trade model shows that TTIP between the EU and the US will decrease intra-EU trade. Trade creation generated by TTIP's positive income effects will not be enough to offset trade diversion caused by preference erosion. They also find that, compared with using trade in gross value, trade diversion will be stronger when using trade in value added. Likewise, compared to intra-EU trade volume, intra-EU trade share will be more strongly affected.

2.2 The literature on the "China Effect"

Considering the huge increase of China's trade in Europe, the impacts are the main interests for economists and politicians.

From a trade point of view, there are four research angles worth noting in the field of the "China effect". The first aspect is the quantity effect. Eichengreen and Tong (2006) find that China's rapid economic growth had different impacts on different countries. Low-income countries exporting labor-intensive products were affected negatively, while high-income countries producing capital-intensive goods were affected positively. There is extensive literature on the quantity effects of China's exports to Europe, Asia, Africa and Latin America, written by Jenkins and Edwards (2006), Greenaway et al. (2008), Jenkins et al. (2008) and Giovannetti et al. (2013).

The second aspect is the price effect. Pain et al. (2006) find that imports from China reduced inflation in OECD countries by 0.1% annually between 1996 and 2005 and that inflation in the Euro area decreased by 0.2% annually between 2001 and 2005. Kamin et al. (2006) show that since 1993,

China's exports reduced US import inflation by 0.8% annually. Auer and Fischer (2008) argue that the impact of exports from low-income countries should also not be neglected. From 1997 to 2006, PPI in the U.S. manufacturing sector declined by 2% annually with China accounting for more than half of that total. Villoria (2009) concludes that China's export expansion had a negative impact on the export prices of major exporters in sub-Saharan Africa. Bugamelli et al. (2010) believe that China's entry into the international market had a significant impact on the Italian industrial sector, with increasing competition essentially forcing local enterprises to lower prices. Moreover, Fu et al. (2012) further find that middle-income countries had price competition with China, and high-income countries had price competition with China on low-tech products, while China's influence on low-income countries was not through price competition but market expansion.

The third aspect is the welfare effect. For the United States, Autor et al. (2013) and Autor et al. (2014) find that in areas that had a close trade relationship with China, workers often had lower incomes and less employment opportunities, resulting in greater reliance on social security and disability insurance. Balsvik et al. (2015) find similar employment effects but have no evidence of wage effects in a research on Norway. Thewissen and van Vliet (2019) analyze the effects of Chinese trade competition across 17 sectors in 18 OECD countries. Their empirical findings reveal overall employment declines in sectors more exposed to Chinese imports. However, Hsieh and Ossa (2011) study the spillover effects of productivity growth in China and find that, on average, the welfare level of China's trading partners increased by 0.7% due to the improved terms of trade.

The fourth aspect is the technological effect. Bloom et al. (2016) conduct an empirical study by using data of 12 European countries from 1996 to 2007. They find that imports from China not only increased the R&D expenditure, the number of patents and IT technology of enterprises, but also promoted the transfer of employment to innovative and technologically advanced enterprises. Iacovone et al. (2013) study the "creative destruction" effect of competition from China on Mexican enterprises with the conclusion that China promoted the innovation of Mexican enterprises. Lu and Ng (2013) use data of American manufacturing industry from 1971 to 2001 to investigate the impact of imports on the skill content of the industry. They ascertain that import competition contributed to the improvement of the skill content of the industry in all imports, regardless of whether it was from China or not. By studying the number of granted patents of American enterprises, Autor et al. (2016) conclude that the Chinese import competition did not promote American enterprises to innovate. At the same time, Chinese import competition led to a decline of employment opportunities, sales revenue, and R&D expenditure of American enterprises. By studying R&D of manufacturing enterprises in the United States, Hombert and Matray (2018) show that firms with larger R&D expenditure suffered less than those with smaller R&D expenditure. As a result, these firms could improve product differentiation and reduce the competition of Chinese products.

2.3 Remarks

We have five remarks on the literature about EU integration. First, as for the declining share of intra-EU trade, the current literature has not offered a convincing explanation. Second, with respect to trade disintegration, the extant literature is mainly qualitative and from political point of view. Third, for quantitative researches from economic perspective, the focus is still primarily on the impact of EU's trade agreements with traditional trading partners, and less concentrated on the impact of trade links with China. Although China has not signed trade agreements with the EU, the former is the second largest trading partner of the latter and the latter is the largest trading partner of the former.

Fourth, the existing literature mostly studies the impact of trade by using gross value instead of value added. Fifth, as for the heterogeneity of the impact of external trade, the current literature has room for improvement.

Concerning the literature about the China effect, we can first notice that, the impact of China's foreign trade has been studied from the perspective of quantity, price, welfare and technological progress, all the while the ignoring the impact of market integration. Second, as far as trade links between the EU and China are concerned, there are already some papers investigating how China's exports affect the EU in terms of quantity effects (such as Giovannetti et al., 2012), price effects (such as Pain et al., 2006; Bugamelli et al., 2010; Fu et al., 2012), welfare effects (Mion and Zhu, 2013) and technological progress effects (Monfort et al., 2008; Bloom et al., 2016; Mion and Zhu, 2013). Yet, there still exists no literature on how China's foreign trade has affected EU integration.

3. The strategy of identification

In order to examine whether EU-China trade weakened the trade links among EU countries and produced the so-called disintegration effect, we design the following identification strategy.

3.1 The estimation equation

König and Ohr (2013) and König (2015) proposed the index of "EU importance", the proportion of trade with EU partners in the foreign trade of an EU country. Following this, we use the trade share to examine whether there was a "China effect" on disintegration. Specifically, we construct the following estimation equation:

$$imshare_{ijt} = \alpha_0 + \alpha_1 Cimshare_{it} + \sum_k \alpha_k Ctrl1_{it}^k + \sum_l \alpha_l Ctrl2_{jt}^l + \sum_h \alpha_h Ctrl3_{ijt}^h + \varepsilon_{ijt} \quad , \quad (1)$$

In Eq. (1), t is the year. $imshare_{ijt}$ is the explained variable, which refers to the proportion of EU country j in the import of EU country i. The core explanatory variable is $Cimshare_{it}$, which refers to the proportion of China in the imports of EU country i. $Ctrl1_{it}$ represents the variables reflecting characteristics of country i, $Ctrl2_{jt}$ refers to the variables reflecting the characteristics of country j, and $Ctrl3_{ijt}$ reflects the characteristics of the combination of EU country i and country j. ε is the error term. If the import share from China reduced the import share from EU partners, then $\alpha_1 < 0$.

Similarly, we build up an estimation equation for export share, which is as the following:

$$exshare_{ijt} = \beta_0 + \beta_1 Cexshare_{it} + \sum_k \beta_k Ctrl1_{it}^k + \sum_l \beta_l Ctrl2_{jt}^l + \sum_h \beta_h Ctrl3_{ijt}^h + \gamma_{ijt}, \quad (2)$$

In Eq. (2), $exshare_{ijt}$ is the explained variable, that is, the share of EU country j in the export of EU country i. $Cexshare_{it}$ is the core explanatory variable, that is, China's share in the export of EU country i. If the share of export to China reduced the share of export to EU partners, then $\beta_1 < 0$.

3.2 Endogeneity

The model specification incurs endogeneity problem, including omitted variables, reverse causality, measurement error, and so on. We adopt instrumental variables analysis to deal with it. Taking $Cimshare_{it}$ as an example, our idea is to use the average value of the import shares of EU countries other than country i from China as the instrumental variable. Specifically, there are three types of

instrumental variables:

Type 1: The simple average of the import shares of EU countries other than country *i* from China is used an instrumental variable:

$$IV1Cimshare_{it} = \sum_{m=1,m\neq i}^{n} Cimshare_{mt}/n, \quad (3)$$

In Eq.(3), $Cimshare_{mt}$ represents the import share from China by EU country *m*. *n* denotes the number of EU countries except *i*.

Type 2: The weighted average of the import shares of EU countries except country *i* from China is used as an instrumental variable:

$$IV2Cimshare_{it} = \sum_{m=1,m\neq i}^{n} \theta_{mt} Cimshare_{mt}, \quad (4)$$

In Eq.(4), θ_{mt} denotes the weight, which means the GDP share of EU country *m* in EU's total GDP. The rest is the same as Eq. (3).

Type 3: The China's share in EU (excluding country *i*) total imports is used as an instrumental variable:

$$IV3Cimshare_{it} = \sum_{m=1,m\neq i}^{n} Cimport_{mt} / \sum_{m=1,m\neq i}^{n} import_{mt}, \quad (5)$$

In Eq.(5), $Cimport_{mt}$ and $import_{mt}$ represent the imports of EU country m from China and the world respectively. The rest is the same as Eq. (3).

The rationality of using these variables as instrumental variables is that, the import share of EU country *i* from China may be related to that of other EU countries from China, but the import share of EU country *i* from EU country *j* has little relation with the import shares of other countries from China.

The instrumental variables for *Cexshare* are constructed in a similar manner.

3.3 Heterogeneity

The levels of economic development in EU member states and their trade links with China are different. As a result, China's foreign trade is expected to have differing degrees of impact. EU countries can be grouped into different "clubs" according to their time of EU accession and their levels of economic development. In this paper, we divide them as EU core and periphery countries. Correspondingly, trade among EU countries can be divided into three categories: intra-Core trade, intra-Peri trade and Core-Peri trade. In order to investigate the heterogeneity of the "China effect" in this regard, we set intra-Core trade as the baseline and introduce interaction terms between *Cimshare* (or *Cexshare*) and *intraPeri* and *CorePeri* respectively:

$$imshare_{ijt} = \alpha_0 + \alpha_1 Cimshare_{it} + \alpha_2 intraPeri_{ij} * Cimshare_{it} + +\alpha_3 CorePeri_{ij} * Cimshare_{it} + \sum_k \alpha_k Ctrl1_{it}^k + \sum_l \alpha_l Ctrl2_{jt}^l + \sum_h \alpha_h Ctrl3_{ijt}^h + \varepsilon_{ijt}, \quad (6)$$

The China effect also depends on the types of trade products. According to BEC, products can be divided into three categories: capital goods, intermediate goods and consumer goods. In addition,

according to Rauch (1999), products can also be classified into three categories: homogeneous goods, goods with reference prices and differentiated goods. In the extended analyses, we will conduct research in this regard.

3.4 Gross value and value added

In the era of vertical integration, the production is divided into different segments, different countries undertake different segments, and each country plays a role in this value chain. The traditional trade statistics method, namely trade in gross value, cannot capture the reality of international division of labor. By contrast, trade in value added (TiVA) is becoming a more reliable statistical method (Lindenet al., 2007; Koopman et al., 2010; Xing and Detert, 2010; Johnson and Noguera, 2012). TiVA traces the value added by each industry and country in the production chain to the final export, and then allocates the value added to these source industries and countries (OCED, 2021). [5] For a country like China, which has the advantage of processing and assembly, using trade in gross value instead of trade in value added leads to overestimation of its exports. Thus in extended analyses, we will use trade in value added or more precisely domestic value added content of gross exports to conduct empirical studies on the "China effect".

4. Variables, data sources and descriptive statistics

In this section, we introduce the variables and data sources, and make descriptive statistics of the variables involved.

4.1 Variables

We have two types of explained variables. The first type is defined in gross value, $imshare_{ij}$, the share of EU country *j* in the gross imports of EU country *i*, and $exshare_{ij}$, the share of EU country *j* in the gross exports of EU country *i*. The second type is defined in value added, $VAexshare_{ij}$ ($=EXGR\_DVA_{ij} / EXGR\_DVA_i$), the share of EU country *j* in the domestic value added content of gross exports of EU country *i*. $EXGR\_DVA_{ij}$ is domestic value added content of gross exports of EU country *i* to EU country *j* and $EXGR\_DVA_i$ is domestic value added content of gross exports of EU country *i* to the world.[6] However, considering data limitations, we won't make similar analyses for imports. [7]

Similarly, we also have two types of core explanatory variables. The first type is defined in gross value, $Cimshare_i$, China's share in the gross imports of EU country *i*, and $Cexshare_i$, China's share in the gross exports of EU country *i*. The second type is defined in value added, $VACexshare_i$, ($=EXGR\_DVA_{iCN} / EXGR\_DVA_i$), China's share in the domestic value added content of gross exports of EU countries. $EXGR\_DVA_{iCN}$ is domestic value added content of gross exports of EU country *i* to China and $EXGR\_DVA_i$ is domestic value added content of gross exports of EU country *i* to the

[5] Organization for Economic Co-Operation and Development, 2021, "Trade in Value Added," https://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm.

[6] According to TiVA, domestic value added embodied in exports (*EXGR_DVA*) covers value added generated anywhere in the domestic economy. For more details about the indicator *EXGR_DVA* and its data source, please refer to https://stats.oecd.org/ and *Guide to OECD's Trade in Value Added (TiVA) Indicators* (2018 edition).

[7] Although there are indicators $IMGR_{ij}$ (gross imports of country *i* from country *j*) and $IMGR\_DVA_{ij}$ (domestic value added content of gross imports of country *i* from country *j*) in TiVA database, their difference ($IMGR_{ij}$ - $IMGR\_DVA_{ij}$) is not simply equivalent to the value added from country *j* embodied in the gross imports of country *i* from country *j*. Accordingly, ($IMGR_{ij}$ - $IMGR\_DVA_{ij}$) / ($IMGR_i$ - $IMGR\_DVA_i$) is not equal to the share of country *j* in the foreign value added content of gross imports of country *i*. $IMGR_i$ is gross imports of EU country *i* from the world and $IMGR\_DVA_i$ is domestic value added content of gross imports of EU country *i* from the world.

world.

In Eq. (1) and Eq. (2), the control variables are represented by *Ctrl1* and *Ctrl2*. *Ctrl1* refers to the characteristics of EU country *i*, including $lnGDP_i$, $lnpcGDP_i$ and $lnPop_i$, which in turn represent GDP, per capita GDP and population of EU country *i*. *Ctrl2* refers to the characteristics of EU country *j*, similar to those of EU country *i*. Following Helpman and Krugman (1985), Helpman (1987), Badinger and Breuss (2004), Egger and Pfaffermayr (2013), we introduce another three variables, G_{ij}, S_{ij} and R_{ij}, into the model:

G_{ij}: The sum of the economic size of EU countries *i* and *j*, and take logarithm as the following:

$$G_{ijt} = \ln(GDP_{it} + GDP_{jt}), \quad (8)$$

S_{ij}: The similarity of economic size of EU countries *i* and *j*, as the following:

$$S_{ijt} = \ln\left[1 - \left(\frac{GDP_{it}}{GDP_{it}+GDP_{jt}}\right)^2 - \left(\frac{GDP_{jt}}{GDP_{it}+GDP_{jt}}\right)^2\right], \quad (9)$$

R_{ij}: The differences in endowments between EU countries *i* and *j*, as the following:

$$R_{ijt} = \ln\left|\frac{GDP_{it}}{Population_{it}} - \frac{GDP_{jt}}{Population_{jt}}\right|, \quad (10)$$

$lnDist_{ij}$ is the log value of the distance between EU countries *i* and *j*. $Landlock_i$ is a dummy variable for landlocked countries. *Ctrl3* represents the characteristics of the combination of EU countries *i* and *j*:

$Contig_{ij}$ is a dummy variable indicating whether EU countries *i* and *j* are bordered. $Comlang_{ij}$ is a dummy variable of common official language of EU countries *i* and *j*. $Comcur_{ij}$ is a dummy variable of common currency of EU countries *i* and *j*. $Comleg_{ij}$ is a dummy variable of common legal origin of EU countries *i* and *j*.

Following Krieger-Boden and Soltwedel (2010), we also introduce two variables representing the degree of participation of EU countries *i* and *j* in globalization, $EconFree_i$ and $EconFree_j$.

4.2 Data sources

This paper uses several data sources. Data of trade in gross value is from IMF-DOTS. Data of trade in value added is from TiVA. [8]Data about GDP, GDP per capita and population is from WDI. Data related to the gravity model, namely *lnDist*, *Landlock*, *Contig*, *Comlang*, *Comcur* and *Comleg*, is from CEPII. Data for *EconFree* is from the Economic Freedom Ranking published by the Fraser Institute.

In the sample period, the EU was in the process of dynamic adjustment. For the construction of our sample, we apply the following principle. In 1995-2003, it is EU-15. In 2004-2006, it is EU-25. In 2007-2012, it is EU-27. In 2013-2015, it is EU-28. As a result, we attain an unbalanced panel with an observation value of 10170.

Table 1 is the descriptive statistics of the variables involved.

[8] Please refer to https://stats.oecd.org/.

insert Table 1

5. Estimation results

The empirical work is divided into three parts. First, the benchmark model is established. Second, the "China effect" is introduced into the model. Third, robustness checks are carried out.

5.1 Benchmark model

In this paper, the estimation equation is built upon the gravity model. There are different versions of the gravity model. Instead of deciding which gravity model should be selected, we try as many versions as possible. Taking import share as the explained variable, we obtain the results shown in Table 2. From column (1) to column (7), the difference only lies in how to introduce variables related to GDP, GDP per capita and population. Considering the impact of external shocks, we have controlled the year effect.

In column (1)-column (7), the estimated coefficients of the control variables related to gravity model are similar. The coefficient of *lnDist* is significantly negative, which means that the farther from country *i* to country *j*, the lower the share of country *j* in country *i*'s import. The coefficient of *Landlock* is significantly negative meaning that if country *i* is landlocked, the lower the share of country *j* in country *i*'s import. The coefficients of *Comcur* and *Comleg* are significantly positive, which indicates that if the two countries are bordered, share the same official language, have the same currency and legal origin, the higher the share of country *j* in country *i*'s import. $EconFree_i$ and $EconFree_j$ are significantly positive, meaning that the deeper countries *i* and *j* are integrated into globalization, the higher the share of country *j* in country *i*'s import.

With respect to GDP, GDP per capita and population, their estimation results vary in different model specifications. In column (1), like Bergstrand (1985), only GDPs of country *i* (importer) and country *j* (exporter) are introduced. The coefficient of $lnGDP_i$ (importer) is significantly negative, while that of $lnGDP_j$ (exporter) is significantly positive. In column (2), GDPs per capita of importers and exporters are introduced. The coefficient of $lnpcGDP_i$ (importer) is significantly negative, while that of $lnpcGDP_j$ (exporter) is significantly positive. In column (3), we introduce GDPs per capita of importers and exporters and the population of both sides. The coefficients of $lnpcGDP_i$ and $lnPop_i$ (importer) are significantly negative, while those of $lnpcGDP_j$ and $lnPop_j$ (exporter) are significantly positive. In column (4), like Bergstrand (1989), we introduce GDPs and GDPs per capita of importers and exporters. The coefficients of $lnGDP_i$ and $lnpcGDP_i$ (importer) are negative, but only the former is significant. The coefficients of $lnGDP_j$ and $lnpcGDP_j$ (exporter) are significantly positive and negative respectively. In column (5), like Glick and Rose (2002), we introduce the product of GDPs of importers and exporters by $lnGDP_i{*}lnGDP_j$ and the product of GDPs per capita of importers and exporters by $lnpcGDP_i{*}lnpcGDP_j$. The former is positive, the latter is negative, and both are significant. In column (6), like Adam and Moutos (2008), Krieger-Boden and Soltwedel (2010), Soloaga and Winters (2001), we introduce GDPs and population of importers and exporters. $lnGDP_i$ and $lnPop_i$ (importer) are significantly negative and positive. $lnGDP_j$ and $lnPop_j$ (exporters) are significantly positive. In column (7), like Helpman and Krugman (1985), Helpman (1987), Badinger and Breuss (2004), Egger and Pfaffermayr (2013), we introduce the sum of GDPs (*G*), the similarity of GDPs (*S*) between importers and exporters and the difference of endowments (*R*) between importers and exporters. The coefficient of *G* is significantly positive, the coefficient of *S* is significantly negative, and the coefficient of *R* is also significantly negative.

In order to make the follow-up work operable, we choose column (3) with the highest goodness of fit as the basis of model specification. [9]

insert Table 2

5.2 Introducing the "China effect"

Based on the model specification of column (3) in Table 2, the variables representing the "China effect" are introduced. The results are shown in columns (1) and (2) in Table 3. In column (1), the explained variable is the import share of country *i* from EU partners (*imshare*). We introduce the import share of country *i* from China (*Cimshare*), whose coefficient is negative but not significant. In column (2), the explained variable is the export share of country *i* to EU partners. We introduce *Cexshare*, whose coefficient is - 0.0774 and significant, which means that the higher the share of country *i*'s exports to China, the lower the share of country *i*'s exports to EU partners. In terms of the magnitude of this impact, if the share of export to China increased by 10%, the share of export to EU partners decreased by 0.8%. The results of Table 3 show that for EU countries, on average, the stronger their trade links with China (especially exports), the weaker their trade links with EU partners.

insert Table 3

5.3 Robustness checks

The results of columns (1) and (2) in Table 3 may be biased. There are several possibilities that may lead to estimation bias (for instance, *imshare* as the explained variable). First, *imshare* and *Cimshare* may be affected by a certain factor in the same direction at the same time, resulting in a positive correlation between the two variables. If this possibility is not taken into account, the negative impact of *Cimshare* on *imshare* may be underestimated. Second, *imshare* may have a reverse effect on *Cimshare*. The negative impact of *Cimshare* on *imshare* may be overestimated if the import share from EU partners reduced the import share from China. If *imshare* had a positive impact on *Cimshare* (because imports from EU partners and imports from China were complementary), the negative impact of *Cimshare* on *imshare* may be underestimated. Third, *Cimshare* may not capture the "China effect" very well, which may lead to measurement error and estimation bias. Concerning the endogeneity caused by these factors, in Table 3, some measures have already been taken. For example, we introduce multiple control variables, including the degree of globalization of importers and exporters, year dummy and many gravity model variables. In order to deal with measurement error, we use both *Cimshare* and *Cexshare* to capture the trade links between China and EU countries.

In order to better control the endogeneity, we introduce more specifications to our model. First, we lag the core explanatory variables by one year. Second, we use instrumental variable analysis.

5.3.1 Taking the lagged value

The core explanatory variables are lagged by one year. The estimation results are shown in columns (3) and (4) of Table 3. It can be found that the results of $EconFree_i$, $EconFree_j$ and gravity model variables have no large changes. As for the core explanatory variables, in column (3), when *imshare* is the explained variable, the coefficient of *Cimshare* is negative but not significant, as in column

[9] It should be pointed out that we have tried each of the seven models, and the "China effect" is consistent.

(1). In column (4), when *exshare* is the explained variable, the coefficient of *Cexshare* is significantly negative. The magnitude and significance level of the coefficient are the same as in column (2).

5.3.2 Instrumental variables analysis

We adopt three types of instrumental variables to study the "China effect". Among these three types of instrumental variables, the second type of instrumental variable is preferred. The corresponding estimation results are shown in columns (5) and (6) of Table 3.

The results of variables including $EconFree_i$, $EconFree_j$ and gravity model variables have not changed too much. The estimated coefficients of the basic variables, $lnpcGDP_j$, $lnPop_i$ and $lnPop_j$ have not changed much, and the estimated coefficients of $lnpcGDP_i$ have changed slightly.

As for the core explanatory variables, in column (5), the explained variable is *imshare*, and the estimated coefficient of *Cimshare* is -0.1616 and significant. The coefficient is now twenty five times as large as that in column (1). In column (6), the explained variable is *exshare*, and *Cexshare*'s estimated coefficient is -0.3782 and significant. The coefficient is now five times larger than that in column (2). This suggests that, if we do not consider endogeneity, the magnitude of the "China effect" will be underestimated. According to column (5), if the share of import from China increased by 10%, the share of import from EU partners decreased by 1.6%, while in column (6), if the share of export to China increased by 10%, the share of export to EU partners decreased by 3.8%.

6. Extended analyses

In this section, we have four aspects of extended analyses. The first one is to examine if the "China effects" on core and periphery countries are the same. The second one is to conduct an empirical analysis of the "China effect" from the perspective of trade in value added. The third one is to compare the effects of EU-China trade, EU-US trade and EU-India trade. The fourth one is to carry out empirical studies by using product level data. It should be noted that all the estimates here are based on instrumental variable analysis.

6.1 Core, periphery and the "China effect"

In the previous analyses, we have studied the average impact of trade links with China on trade links among EU countries. Considering the differences among EU countries and their contrasting trade links with China, we can also expect varying degrees of impact on their respective trade environment. Following Adam and Moutos (2008), we take EU-11 as the core countries (simply called Core) with other countries as the periphery countries (simply called *Peri*). Here, we examine how trade links among core countries (*intra-Core*), among periphery countries (*intra-Peri*) and between core and periphery countries (*Core-Peri*) were affected by trade links with China. With *intra-Core* as the baseline group, we introduce *intra-Peri*, *Core-Peri* and their interaction terms with *Cimshare* (or *Cexshare*) in the model. The estimation results are shown in columns (1) and (2) of Table 4.

In column (1), the coefficient of *Cimshare* is significantly negative, the coefficient of intra-*Peri***Cimshare* is significantly positive, and the coefficient of *Core-Peri***Cimshare* is significantly positive. According to the estimated coefficients, if the share of import from China increased by 10%, the share of import among EU core countries (baseline group) decreased by 2.85%, the share of import among periphery countries (*intra-Peri*) decreased by 0.34% and the share of import taking place between core and periphery countries (*Core-Peri*) decreased by 1.96%. In column (2), the

coefficient of *Cexshare* is significantly negative, the coefficient of *intra-Peri*Cexshare* is significantly positive, and the coefficient of *Core-Peri*Cexshare* is significantly positive. From the estimated coefficients, if the export share to China increased by 10%, the share of export among EU core countries (baseline group) decreased by 4.62%, the share of export among periphery countries (*intra-Peri*) decreased by 2.55% and the share of export between core and periphery countries (*Core-Peri*) decreased by 3.41%.

In sum, the impact of trade links with China was the strongest on the trade among EU core countries, then the trade between EU core and periphery countries, and the least on the trade among EU periphery countries.

insert Table 4

6.2 BREXIT and the "China effect"

Britain is one of the largest economies in the EU. Nevertheless, its role is particular because it is not in the Euro zone. As one of China's largest European partners, it is necessary to examine the impact of this bilateral trade at the eve of BREXIT. To this end, we introduce interaction terms of *Cimshare*, *Cexshare* and a dummy variable *GBR* (whether Country i is Britain or not) in the model. The estimation results are shown in columns (3) and (4) of Table 4. In column (3), the coefficient of *Cimshare* is significantly negative, while the coefficient of *GBR*Cimshare* is significantly positive. According to the estimated coefficients, if the share of imports from China increased by 10%, the share of imports from EU partners decreased by 2.0%. If Britain is the importer, the share of imports from EU partners fell by only 0.68%. In column (4), the coefficient of *Cexshare* is significantly negative, while the interaction term *GBR*Cexshare* is significantly positive. According to the estimated coefficients, if the share of exports to China increased by 10%, the share of exports to EU partners decreased by 3.6%. If Britain is the exporter, its share of exports to EU partners fell by 1.9%. Compared with other countries, Britain's trade links with China had less impact on its trade links with EU partners. In this sense, its trade ties with China were not the "pusher" of BREXIT.

6.3 Trade in value added

Using domestic value added content of gross exports, the estimation results are shown in Table 5. In column (1), *Cexshare*'s coefficient is -0.263 and significant, which means that, if the share of export to China increased by 10%, the share of export to EU partners decreased by 2.63%. Comparing the results of Tables 3 and 5, we find that the impact of trade links with China on trade links among EU countries is similar, whether in gross value or in value added terms.

We also conduct an analysis of the "China effect" in EU core and periphery countries by using domestic value added content of gross exports. The corresponding estimation results are shown in column (2) in Table 5. According to the estimated coefficients, when the export share to China increased by 10%, the export share among EU core countries (*intra-Core*) decreased by 3.58%, the export share among periphery countries (*intra-Peri*) decreased by 1.03%, and the share of export taking place between core and periphery countries (*Core-Peri*) also decreased by 1.87%.

As for the "China effect" in Britain by using domestic value added content of gross exports, the corresponding estimation results are shown in column (3) in Table 5. According to the estimated coefficients, when the share of exports to China increased by 10%, the share of exports to EU partners decreased by 2.62%. If the UK is the exporter, its share of exports to EU partners fell by a

similar margin.

From Table 5, we find that when using trade in value added, the estimation results about the "China effect" are almost the same.

6.4 Is the "China effect" special?

In order to investigate the particularity of the "China effect", we introduce the trade of the EU with the United States and with India into the model. By doing so, the problem of omitted variables can be further relieved. The definitions and measurements of EU-US trade and EU-India trade are similar to those of EU-China trade. For *USimshare* and *INDimshare*, the corresponding instrumental variables are similar to those of *Cimshare*.

Cimshare, *USimshare* and *INDimshare* are introduced into the model at the same time. They are regarded as endogenous variables, and instrumental variable analysis is adopted. The estimation results are shown in Table 6. In column (1), *imshare* is the explained variable, *Cimshare*'s estimated coefficient is significantly negative, *USimshare*'s estimated coefficient is also significantly negative, and *INDimshare*'s estimated coefficient is significantly positive. In column (2), *exshare* is the explained variable, *Cexshare*'s estimated coefficient is significantly negative, *USexshare*'s estimated coefficient is positive but not significant, and *INDexshare*'s estimated coefficient is negative but not significant.

In sum, the estimated coefficients of *Cimshare* and *Cexshare* are significantly negative. The coefficient of *USimshare* is significantly negative but the coefficient of *USexshare* is insignificantly positive. The coefficient of *INDimshare* is significantly positive, while the coefficient of *INDexshare* is negative but insignificant. Compared to the EU's trade links with the United States and India, its trade links with China have more consistently and significantly negative.

For this result, especially the difference of the effect of imports from China, the United States and India, a complete explanation needs more detailed data. Here is a preliminary analysis based on the existing data. Given that Germany is the largest importer of the European Union, here is a simple analysis of it. France and Italy are Germany's main trading partners in the EU. In 2005, the top three products exported by France to Germany were "vehicles", "aircraft, spacecraft" and "machinery, mechanical appliances", accounting for 15%, 14% and 11% of France's exports to Germany respectively. In the same year, the top three products of Italy's exports to Germany were "machinery, mechanical appliances", "vehicles" and "electrical machinery, equipment", accounting for 16%, 12% and 7% of Italy's exports to Germany respectively. According to these statistics, "vehicles", "aircraft, spacecraft", "machinery, mechanical appliances" and "electrical machinery, equipment" occupy an important position in the export of France and Italy to Germany. Based on the same data sources, we find that these four types of products account for more than 50% of China's and the United States' exports to Germany, but only 18% of India's exports to Germany.[10]

This reflects that Germany's imports from France and Italy are similar (competitive) to Germany's imports from China and the United States, but different (complementary) from those from India. This may be one of the reasons why the impact of imports from India is different from that of imports from China and the United States. Compared with China, the negative effect of imports from the United States is smaller. The reason may be that, for the products of the United

[10] The situation in 2010 is similar. Four kinds of products, such as "vehicles", "aircraft, spacecraft", "nuclear reactors, machinery, mechanical appliances" and "electrical machinery, equipment" play an important role in the exports of France and Italy to Germany. By comparison, these four types of products account for 50% and 43% of China's and the United States' exports to Germany, respectively, but only 24% of India's exports to Germany.

States and EU countries, the differences are mainly horizontal. The trade between them is mainly intra-industry trade based on economies of scale (Van Biesebroeck, 2011). However, for the products of China and EU countries, the differences are mainly vertical. China exports products with relatively low quality and price to EU countries, which produces a certain substitution impact for EU internal trade (Schott, 2008; Fu et al., 2012; Ito and Okubo, 2012; Bloom et al., 2016).

insert Table 6

6.5 Trade data at product level

6.5.1 The full sample

The estimation results based on product level data are shown in Table 7. Using HS 4-digit product level data, the estimation results of the whole sample are shown in columns (1) and (2). In column (1), *imshare* and *Cimshare* are negatively correlated, while in column (2), *exshare* and *Cexshare* are negatively correlated. Using SITC product level data, the estimation results for the whole sample are shown in columns (3) and (4), and are similar to results in columns (1) and (2). From the results here, we find that, whether import or export, trade links with China weakened trade links among the EU. In addition, the effects identified by data at product level (columns (1) and (2) of Table 6) are smaller than those at the country level (columns (5) and (6) of Table 3).

insert Table 7

6.5.2 Capital goods, intermediate goods and consumption goods

From the observations, we can see that the sample for intermediate goods is the largest, then consumer goods, and then finally capital goods as the smallest. The estimation results are shown in Table 8. Columns (1) and (2) are the estimation results of capital goods, *imshare* and *Cimshare* are negatively correlated, while *exshare* and *Cexshare* are positively correlated. This means that, as far as capital goods are concerned, the higher the share of import from China, the lower the share of import from EU partners, suggesting that there is a substitution relationship between the two. However, there is a positive correlation between the share of export to China and the share of export to EU partner countries, suggesting that there is a complementary relationship between them. Columns (3) and (4) are the estimation results of intermediate goods, *imshare* is negatively correlated with *Cimshare*, and *exshare* is also negatively correlated with *Cexshare*. This means that in the case of intermediate goods, whether for import or export, trade links with China weakened trade links among EU countries. Columns (5) and (6) are the estimation results for consumer goods, *imshare* is negatively correlated with *Cimshare*, and *exshare* is also negatively correlated with *Cexshare*. The coefficient of *Cexshare* in column (6) is seven times bigger than that of *Cimshare* in column (5). This means that in terms of consumer goods, whether for import or export, trade links with China weakened trade links among EU countries. Furthermore, the impact of China as an export destination was greater than that of China as an import source.

insert Table 8

6.5.3 Homogeneous goods, goods with reference price, differentiated goods

From the observations, we can find that the sample size from large to small is differentiated goods,

goods with reference prices and homogeneous goods (Rauch, 1999). The estimation results are shown in Table 9. Columns (1) and (2) are the estimation results of homogeneous goods, *imshare* and *Cimshare* are negatively correlated, and *exshare* and *Cexshare* are negatively correlated. This means that for homogeneous goods, the higher the share of import from or export to China, the lower the share of import from or export to EU partners, and there is a substitution relationship between them. Columns (3) and (4) are the estimation results of goods with reference prices, *imshare* and *Cimshare* are negatively correlated, and *exshare* and *Cexshare* are also negatively correlated. This means that in the case of goods with reference prices, whether import or export, trade links with China weakened trade links with EU partners. Columns (5) and (6) are the estimation results of differentiated goods, *imshare* and *Cimshare* are significantly negatively correlated, and *exshare* and *Cexshare* are also significantly negatively correlated. This means that in terms of differentiated goods, whether import or export, trade links with China weakened trade links with EU partners.

insert Table 9

7. Conclusions

Using IMF-DOTS trade data, we have examined how the EU's trade links with China affected trade among its member states. Through benchmark estimation, robustness checks and extended analyses, we draw the following conclusions:

First, the share of trade with China rose, while the share of trade with EU partners declined. This suggests that the trade links with China weakened trade links among EU countries. In terms of the magnitude, the "disintegration" effect of the export to China was stronger than that of import from China. This indicates that the influence of China as an export destination was greater than that of China as a source of import.

Second, the disintegration effect was stronger on the trade among EU core countries, weaker on the trade between EU core and periphery countries, and the weakest on the trade among periphery countries. In addition, compared to other EU countries, Britain's trade links with EU partners were less affected by its trade links with China.

Third, the impacts of EU-US trade and EU-India trade are different from the "China effect". Imports from the US weakened trade links within the EU, while the impact of exports to the US was insignificant. However, imports from India strengthened trade links within the EU, while the impact of exports to India was insignificant.

Fourth, when it comes to product level data, we find that the "China effect" depends on the types of products we are concerned with.

Fifth, whether using gross value or value added, the above conclusions remain valid.

These conclusions are very enlightening for the trade relationships between Europe and China. Particularly, they underline the role of exports compared to imports, which is something new in the literature and confirm the differences of impacts between core and periphery countries. They could affect the European strategy vis-à-vis the trade part of Belt & Road Initiative in Europe.

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Figure 1 intra-EU Trade

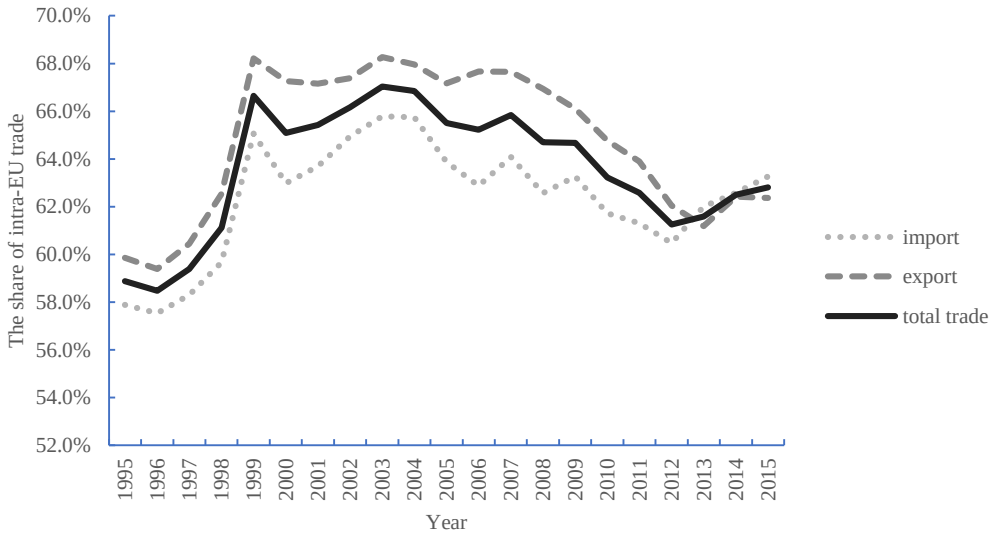

Figure 2 EU-China Trade

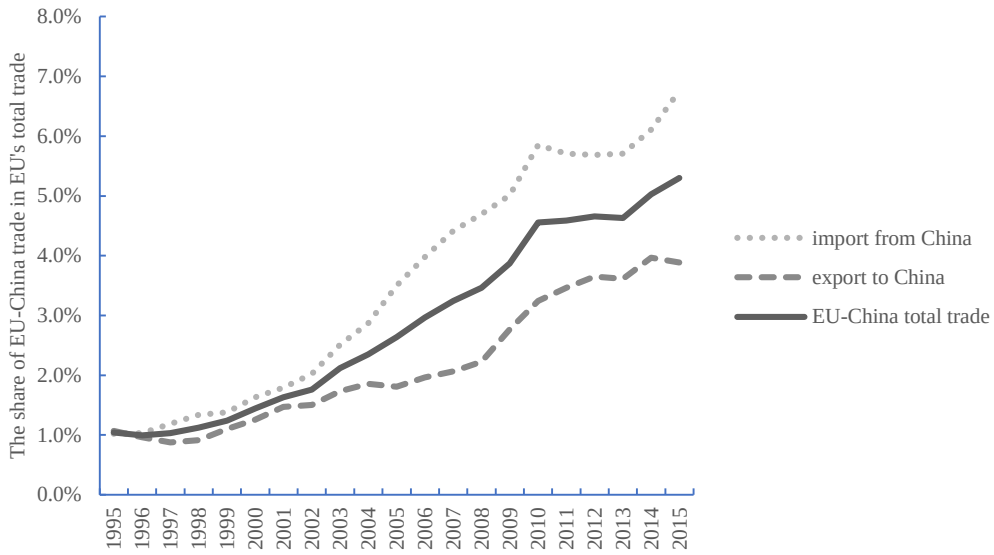

Table 1 Descriptive statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
imshare	9957	0.0297	0.0521	6.61E-08	0.4633
exshare	9954	0.0293	0.0468	8.65E-07	0.3836
Cimshare	9957	0.0497	0.0542	0.0014	0.4697
Cexshare	9604	0.0231	0.0287	0.0009	0.2101
lnGDP	9957	26.1489	1.5597	22.5254	28.9867
lnpcGDP	9957	10.1701	0.6053	8.6883	11.6416
lnPop	9957	15.9882	1.4041	12.9024	18.2287
G	9957	27.3523	1.1351	23.6204	29.5594
S	9957	-1.5779	0.9366	-5.4532	-0.6931
R	9957	0.6912	0.5253	0.0011	2.8719
lnDist	9957	7.0769	0.6684	4.0879	8.2339
Landlock	9957	0.1714	0.3769	0	1
Contig	9485	0.1077	0.3101	0	1
Comlang	9485	0.0506	0.2192	0	1
Comcur	9485	0.3363	0.4725	0	1
Comleg	9485	0.2537	0.4351	0	1
EconFree	8492	7.4701	0.3257	6.4	8.5

Table 2 The benchmark model: *imshare*

Explanatory variables	(1) *imshare*	(2) *imshare*	(3) *imshare*	(4) *imshare*	(5) *imshare*	(6) *imshare*	(7) *imshare*
$lnGDP_i$	-0.002***			-0.002***		-0.004***	
	(0.000)			(0.000)		(0.001)	
$lnGDP_j$	0.015***			0.016***		0.005***	
	(0.000)			(0.000)		(0.001)	
lnDist	-0.009***	-0.012***	-0.011***	-0.009***	-0.009***	-0.011***	-0.010***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Landlock	-0.007***	-0.006***	-0.007***	-0.007***	-0.001	-0.007***	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Contig	0.054***	0.060***	0.050***	0.053***	0.052***	0.049***	0.053***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Comlang	0.029***	0.021***	0.029***	0.032***	0.030***	0.031***	0.022***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Comcur	0.001	0.005***	0.003***	0.003***	0.003***	0.004***	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Comleg	0.007***	0.005***	0.008***	0.005***	0.007***	0.006***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.00110)	(0.001)
$EconFree_i$	0.004***	0.008***	0.003*	0.003**	0.005***	0.003*	0.002
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
$EconFree_j$	0.007***	0.007***	0.016***	0.011***	0.014***	0.017***	0.011***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$lnpcGDP_i$		-0.006***	-0.003***	-0.001			
		(0.001)	(0.001)	(0.001)			
$lnpcGDP_j$		0.012***	0.008***	-0.008***			
		(0.001)	(0.001)	(0.001)			
$lnPop_i$			-0.002***			0.002*	
			(0.000)			(0.001)	
$lnPop_j$			0.016***			0.012***	
			(0.000)			(0.001)	
$lnGDP_i$					0.006***		
$*lnGDP_j$					(0.000)		
$lnpcGDP_i$					-0.004***		
$*lnpcGDP_j$					(0.001)		
G							0.012***
							(0.001)
S							-0.001**
							(0.001)
R							-0.008***
							(0.001)
_cons	-0.321***	-0.069***	-0.311***	-0.286***	-0.304***	-0.292***	-0.321***
	(0.018)	(0.020)	(0.018)	(0.019)	(0.021)	(0.018)	(0.021)
N	8227	8227	8227	8227	8227	8227	8227
R^2	0.475	0.306	0.506	0.480	0.345	0.505	0.360
adj. R^2	0.475	0.305	0.506	0.479	0.344	0.505	0.359

Notes: 1. Robust standard errors in brackets; 2. * p<.1, ** p<0.05, *** p<0.01; 3. The year effect has been controlled in all the specifications.

Table 3 The China effect

	(1)	(2)	(3)	(4)	(5)	(6)
Explanatory	*imshare*	*exshare*	*imshare*	*exshare*	*imshare*	*exshare*
variables	Benchmark	Benchmark	Lag.1	Lag.1	IV	IV
Cimshare	-0.006		-0.008		-0.162***	
	(0.009)		(0.010)		(0.030)	
Cexshare		-0.077***		-0.080***		-0.378***
		(0.013)		(0.014)		(0.045)
$lnpcGDP_i$	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$lnpcGDP_j$	0.008***	0.006***	0.008***	0.006***	0.007***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$lnPop_i$	-0.002***	-0.002***	-0.002***	-0.002***	-0.005***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
$lnPop_j$	0.016***	0.016***	0.016***	0.016***	0.016***	0.016***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnDist	-0.011***	-0.013***	-0.011***	-0.013***	-0.011***	-0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Landlock	-0.008***	-0.004***	-0.008***	-0.004***	-0.012***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Contig	0.050***	0.046***	0.049***	0.045***	0.050***	0.046***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Comlang	0.029***	0.013***	0.028***	0.013***	0.029***	0.015***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Comcur	0.003***	0.005***	0.003***	0.005***	0.005***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Comleg	0.008***	0.005***	0.008***	0.005***	0.008***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$EconFree_i$	0.003*	0.004***	0.004**	0.004***	0.006***	0.008***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
$EconFree_j$	0.016***	0.016***	0.016***	0.017***	0.016***	0.017***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	8227	7914	8072	7759	8227	7914
adj. R^2	0.506	0.549	0.503	0.547	0.488	0.519
First stage estimates						
					Cimshare	*Cexshare*
IV2Cimshare					1.277***	
					(0.043)	
IV2Cexshare						0.693***
						(0.035)
Ctrl.					Yes	Yes
N					8227	7917
adj. R^2					0.282	0.182

Notes: 1. Robust standard errors are in the brackets; 2. * p<.1, ** p<0.05, *** p<0.01; 3. The year effect has been controlled in all the specifications.

Table 4 Core, periphery and Britain

	(1)	(2)	(3)	(4)
Explanatory	*imshare*	*exshare*	*imshare*	*exshare*
variables	Core/Peri	Core/Peri	GBR	GBR
Cimshare	-0.285***		-0.198***	
	(0.055)		(0.032)	
*Intra-Peri*Cimshare*	0.185***		0.130***	
	(0.049)		(0.047)	
*Core-Peri*Cimshare*	0.089**			
	(0.037)			
GBR*Cimshare			0.130***	
			(0.047)	
$lnpcGDP_i$	-0.000	0.001	-0.003***	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
$lnpcGDP_j$	0.011***	0.007***	0.007***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
$lnPop_i$	-0.004***	-0.003***	-0.005***	-0.004***
	(0.001)	(0.000)	(0.001)	(0.000)
$lnPop_j$	0.017***	0.016***	0.016***	0.016***
	(0.000)	(0.000)	(0.000)	(0.000)
lnDist	-0.012***	-0.013***	-0.010***	-0.012***
	(0.001)	(0.001)	(0.001)	(0.001)
Landlock	-0.011***	-0.005***	-0.012***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
Contig	0.049***	0.046***	0.050***	0.047***
	(0.002)	(0.002)	(0.002)	(0.002)
Comlang	0.030***	0.016***	0.029***	0.015***
	(0.002)	(0.002)	(0.002)	(0.002)
Comcur	0.005***	0.006***	0.006***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)
Comleg	0.009***	0.005***	0.008***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
$EconFree_i$	0.007***	0.008***	0.005***	0.006***
	(0.002)	(0.001)	(0.002)	(0.001)
$EconFree_j$	0.017***	0.017***	0.017***	0.017***
	(0.002)	(0.001)	(0.001)	(0.001)
Cexshare		-0.462***		-0.359***
		(0.056)		(0.043)
*Intra-Peri*Cexshare*		0.207***		
		(0.071)		
*Core-Peri*Cexshare*		0.122**		
		(0.049)		
GBR*Cexshare				0.171**
				(0.082)
N	8227	7914	8227	7914
adj. R^2	0.494	0.533	0.479	0.523

Notes: 1. All the estimation results are from instrumental variables analysis; 2. Robust standard errors are in the brackets; 3. * p<.1, ** p<0.05, *** p<0.01; 4. The year effect has been controlled in all the specifications.

Table 5 Trade in value added: domestic value added content of gross exports

	(1)	(2)	(3)
Explanatory variables	*VAexshare* TiVA	*VAexshare* TiVA+Core/Peri	*VAexshare* TiVA+GBR
Cexshare	-0.263***	-0.358***	-0.262***
	(0.049)	(0.050)	(0.052)
Intra-Peri		0.255**	
**Cexshare*		(0.104)	
Core-Peri		0.171***	
**Cexshare*		(0.045)	
GBR			0.008
**Cexshare*			(0.077)
$lnpcGDP_i$	0.003**	0.005***	0.003**
	(0.001)	(0.001)	(0.001)
$lnpcGDP_j$	0.011***	0.014***	0.011***
	(0.001)	(0.002)	(0.001)
$lnPop_i$	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)
$lnPop_j$	0.025***	0.026***	0.025***
	(0.000)	(0.000)	(0.000)
lnDist	-0.013***	-0.014***	-0.013***
	(0.001)	(0.001)	(0.001)
Landlock	-0.016***	-0.016***	-0.016***
	(0.002)	(0.002)	(0.002)
Contig	0.061***	0.061***	0.061***
	(0.003)	(0.003)	(0.003)
Comlang	0.019***	0.020***	0.019***
	(0.003)	(0.003)	(0.003)
Comcur	-0.002	-0.003	-0.002
	(0.002)	(0.002)	(0.002)
Comleg	0.011***	0.012***	0.011***
	(0.002)	(0.002)	(0.002)
$EconFree_i$	0.011***	0.012***	0.011***
	(0.002)	(0.002)	(0.003)
$EconFree_j$	0.033***	0.034***	0.033***
	(0.002)	(0.002)	(0.002)
N	6230	6230	6230
adj. R^2	0.564	0.566	0.564

Notes: 1. All the estimation results are from instrumental variables analysis; 2. Robust standard errors are in the brackets; 3. * p<.1, ** p<0.05, *** p<0.01; 4. The year effect has been controlled in all the specifications.

Table 6 EU-China trade, EU-US trade and EU-India trade

	(1)	(2)
Explanatory variables	*imshare*	*exshare*
Cimshare	-0.381***	
	(0.075)	
*US*imshare*	-0.129**	
	(0.055)	
*IND*imshare*	1.423***	
	(0.359)	
$lnpcGDP_i$	-0.000	-0.001
	(0.001)	(0.001)
$lnpcGDP_j$	0.008***	0.005***
	(0.001)	(0.001)
$lnPop_i$	-0.004***	-0.003***
	(0.001)	(0.000)
$lnPop_j$	0.016***	0.016***
	(0.000)	(0.000)
lnDist	-0.011***	-0.012***
	(0.001)	(0.001)
Landlock	-0.008***	-0.005***
	(0.002)	(0.001)
Contig	0.050***	0.047***
	(0.002)	(0.002)
Comlang	0.027***	0.016***
	(0.003)	(0.002)
Comcur	0.003**	0.007***
	(0.001)	(0.001)
Comleg	0.009***	0.005***
	(0.001)	(0.001)
$EconFree_i$	0.008***	0.007***
	(0.003)	(0.002)
$EconFree_j$	0.016***	0.017***
	(0.002)	(0.001)
Cexhare		-0.386***
		(0.050)
*US*exshare*		0.011
		(0.018)
*IND*exshare*		-0.081
		(0.145)
N	7707	7424
adj. R^2	0.419	0.513

Notes: 1. All the estimation results are from instrumental variables analysis; 2. Robust standard errors are in the brackets; 3. * p<.1, ** p<0.05, *** p<0.01; 4. The year effect has been controlled in all the specifications.

Table 7 Trade at product level: HS4 and SITC2

	(1)	(2)	(3)	(4)
Explanatory	HS4	HS4	SITC2	SITC2
variables	*imshare*	*exshare*	*imshare*	*exshare*
Cimshare	-0.056***		-0.057***	
	(0.000)		(0.000)	
$lnpcGDP_i$	-0.008***	-0.025***	-0.009***	-0.025***
	(0.000)	(0.000)	(0.000)	(0.000)
$lnpcGDP_j$	0.009***	0.004***	0.009***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)
$lnPop_i$	-0.006***	-0.020***	-0.006***	-0.020***
	(0.000)	(0.000)	(0.000)	(0.000)
$lnPop_j$	0.023***	0.018***	0.024***	0.018***
	(0.000)	(0.000)	(0.000)	(0.000)
lnDist	-0.007***	-0.013***	-0.007***	-0.013***
	(0.000)	(0.000)	(0.000)	(0.000)
Landlock	-0.009***	-0.026***	-0.009***	-0.025***
	(0.000)	(0.000)	(0.000)	(0.000)
Contig	0.053***	0.056***	0.052***	0.055***
	(0.000)	(0.000)	(0.000)	(0.000)
Comlang	0.036***	0.044***	0.036***	0.044***
	(0.000)	(0.000)	(0.000)	(0.000)
Comcur	0.005***	0.002***	0.005***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Comleg	0.012***	0.019***	0.012***	0.020***
	(0.000)	(0.000)	(0.000)	(0.000)
$EconFree_i$	0.007***	0.020***	0.007***	0.020***
	(0.000)	(0.000)	(0.000)	(0.000)
$EconFree_j$	0.019***	0.022***	0.018***	0.023***
	(0.000)	(0.000)	(0.001)	(0.000)
Cexshare		-0.052***		-0.077***
		(0.004)		(0.003)
N	4827005	4830462	6257447	6260893
adj. R^2	0.200	0.152	0.193	0.152

Notes: 1. All the estimation results are from instrumental variables analysis; 2. Robust standard errors are in the brackets; 3. * p<.1, ** p<0.05, *** p<0.01; 4. The year effect has been controlled in all the specifications.

Table 8 Trade at product level: BEC

	(1)	(2)	(3)	(4)	(5)	(6)
Explanatory	Capital goods		Intermediate goods		Consumption goods	
variables	*imshare*	*exshare*	*imshare*	*exshare*	*imshare*	*exshare*
Cimshare	-0.059***		-0.064***		-0.048***	
	(0.001)		(0.001)		(0.000)	
$lnpcGDP_i$	-0.010***	-0.026***	-0.011***	-0.031***	-0.005***	-0.016***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$lnpcGDP_j$	0.011***	0.002***	0.010***	0.004***	0.004***	0.008***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$lnPop_i$	-0.005***	-0.016***	-0.007***	-0.024***	-0.006***	-0.016***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$lnPop_j$	0.026***	0.015***	0.025***	0.020***	0.019***	0.016***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnDist	-0.006***	-0.010***	-0.009***	-0.013***	-0.005***	-0.014***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Landlock	-0.010***	-0.020***	-0.010***	-0.030***	-0.009***	-0.020***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Contig	0.044***	0.030***	0.056***	0.062***	0.047***	0.054***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Comlang	0.035***	0.031***	0.035***	0.034***	0.039***	0.076***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Comcur	0.006***	0.004***	0.005***	0.003***	0.003***	-0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Comleg	0.002***	0.010***	0.010***	0.019***	0.021***	0.028***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$EconFree_i$	0.003***	0.014***	0.008***	0.024***	0.008***	0.017***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$EconFree_j$	0.022***	0.019***	0.019***	0.022***	0.013***	0.028***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cexshare		0.053***		-0.084***		-0.358***
		(0.005)		(0.004)		(0.017)
N	903074	903622	3517540	3520265	1792431	1792602
adj. R^2	0.213	0.120	0.187	0.148	0.209	0.196

Notes: 1. All the estimation results are from instrumental variables analysis; 2. Robust standard errors are in the brackets; 3. * p<.1, ** p<0.05, *** p<0.01; 4. The year effect has been controlled in all the specifications.

Table 9 Trade at product level: Rauch (1999)

	(1)	(2)	(3)	(4)	(5)	(6)
Explanatory variables	Homogeneous goods		Goods with reference prices		Differentiated goods	
	imshare	*exshare*	*imshare*	*exshare*	*imshare*	*exshare*
Cimshare	-0.082***		-0.081***		-0.053***	
	(0.003)		(0.002)		(0.000)	
$lnpcGDP_i$	-0.008***	-0.031***	-0.011***	-0.035***	-0.008***	-0.022***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
$lnpcGDP_j$	0.007***	0.008***	0.013***	0.004***	0.007***	0.004***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
$lnPop_i$	-0.010***	-0.033***	-0.007***	-0.027***	-0.005***	-0.016***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$lnPop_j$	0.021***	0.022***	0.025***	0.020***	0.023***	0.017***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnDist	-0.010***	-0.012***	-0.010***	-0.014***	-0.006***	-0.012***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Landlock	-0.007***	-0.034***	-0.011***	-0.031***	-0.009***	-0.022***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Contig	0.066***	0.081***	0.058***	0.065***	0.046***	0.045***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Comlang	0.028***	0.031***	0.034***	0.032***	0.038***	0.052***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
Comcur	-0.0000	-0.004***	0.007***	0.002***	0.004***	0.001***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Comleg	0.023***	0.032***	0.011***	0.024***	0.011***	0.016***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
$EconFree_i$	0.010***	0.019***	0.010***	0.030***	0.006***	0.016***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
$EconFree_j$	0.024***	0.027***	0.019***	0.022***	0.016***	0.022***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Cexshare		-0.034***		-0.068***		-0.036***
		(0.009)		(0.007)		(0.003)
N	525872	526714	1616272	1617643	3779469	3780356
adj. R^2	0.153	0.155	0.190	0.159	0.208	0.155

Notes: 1. All the estimation results are from instrumental variables analysis; 2. Robust standard errors are in the brackets; 3. * p<.1, ** p<0.05, *** p<0.01; 4. The year effect has been controlled in all the specifications.