David Clowes, Dominika Choroś-Mrozowska "Chinese-EU Bilateral Trade (2007-2011). »Competition & the Exchange of Technology«",
Journal of International Studies, Vol. 6, No 2, 2013, pp. 103-110. DOI: 10.14254/2071-8330.2013/6-2/9

Journal of International Studies

Chinese-EU Bilateral Trade (2007-2011). "Competition & the Exchange of Technology"

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Abstract. Eurostat sources document that Chinese bilateral trade with the European Union (EU) has quadrupled since the year 2000. While China has become the centre of attention for its trade expansion in numerous consumer and manufactured goods. A further feature concerns its trade in products more purposely suited to industrial production, transport and which contain medium and higher shares of technology. This work finds that the export of these commodities to the EU has increased rapidly as a share of total exports between 2007 and 2011, while the EU share has in fact declined. The structure and type products exchanged from this sector is categorized by the United Nations under the heading of "Machinery & Transport Equipment" and play a large role in determining the extent and nature of a country's integration into global supply and production networks. This paper questions the latter in respect of Chinese bilateral trade co-operation with the European Union.

Received:
June, 2013
1st Revision:
October, 2013
Accepted:
November, 2013

DOI:
10.14254/2071-8330.2013/6-2/9

Keywords: Bilateral Trade, China, EU

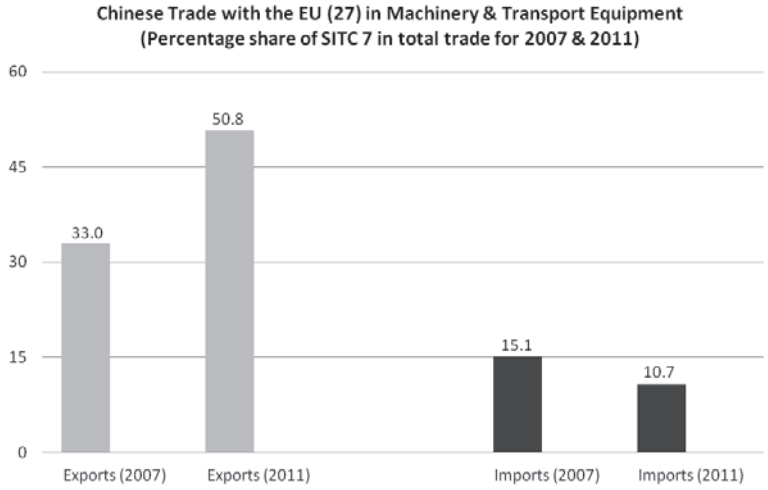
JEL classification: F10, F12, F15

INTRODUCTION

Since the year 2000 Chinese-EU bilateral trade has quadrupled, but over this period of time this has also resulted in the EU recording its largest bilateral trade deficit. China's trade surplus with the EU can in part be attributed to the growing share of machinery and transport equipment in the country's total exports, which has increased considerably since 2007. The EU meanwhile has observed a fall in the share of these items in its exports to China, which raises the question as to the very nature of the co-operation between the two partners in the exchange of these products and the conditions surrounding them.

As graph 1 shows, Chinese exports of machinery and transport equipment to the EU accounted for 33% of its total exports in 2007, but by 2011 had increased to almost 51%. Over the same time period,

however, the share of EU machinery and transport equipment in Chinese imports had fallen from 15.1% (2007) to 10.7% in 2011. It should be highlighted here that the value of Chinese exports of machinery and transport equipment to the EU totaled 149 billion Euros in 2011, while its imports were recorded at 145.6 billion – suggesting, a marginal trade deficit for the EU in this sector in its exchanges with China.



Graph 1. Trade in SITC 7 commodities in 2007 & 2011.
Source: *Eurostat, Commodity Data*, 2008 & 2012.

An interesting consideration concerns the fact that, while export-import volumes were similar in 2011, the recession did not appear to have had a significant impact on European demand for Chinese products. Hence, EU imports of machinery & transport goods grew on average by 23.7% from 2007. This further raises questions as to the type and purpose of the products being exported to the EU, which is possibly reflective of relative price differentials as well as the role of Chinese industry on the supply side (supplies of components, accessories and/or products assembled and re-exported). At the same time, while China's imports of machinery and transport equipment from the EU grew (in value terms) on average by 8.9% from 107 to 145.6 billion Euros, graph 1 shows that their share in total exports actually fell between 2007 and 2011 to 10.7%.

To be able to uncover the nature of the bilateral trade relationship in these types of products, this work needs to determine the volume and structure of the commodities traded with a view to revealing their share, sectors of convergence and potential areas of competition. Part one of this research introduces the theoretical side and this involves the application of the Grubel-Lloyd Index, whose results will reveal the degree of "convergence" between industries via the measurement of "intra-industry trade". The Grubel-Lloyd Index shall be applied to commodities falling under the United Nations heading of "Machinery & Transport Equipment" (SITC 7, Standard International Trade Classification (Group 7)). Part two this work will provide an empirical evaluation. The work finds that both trading partners are becoming increasingly integrated via the trade of similar products (intra-industry trade), reflecting convergence and the presence of foreign direct investment. The results further show the presence of traded commodities in different goods, which indicate comparative advantage and specialisation. These initial findings occur in the background of the de-

valued Yen, which result in a lower price of commodities exported from China, but it also takes into account China's position in terms of granting access to foreign investors in its own country.

THE GRUBEL-LLOYD INDEX & CONVERGENCE

Intra-industry trade is the exchange of goods between countries from broadly the same industries, whereas inter-industry trade represents the exchange of different goods (Grubel & Lloyd, 1975). Therefore, the measurement of trade flows between two countries reveals both the nature of trade conducted between them (inter/intra) and to what extent countries are similar in their factor endowments. For example, if trade is revealed to be more inter-industry in nature (index value < 50), then this would suggest a difference between the two countries factor endowments and could imply that one country may have a comparative advantage in the production of some commodity, reflecting specialisation. This would be consistent with Ricardian and Neo-classical schools of thought. In contrast, intra-industry trade (index value > 50), occurs as a result of two countries being similar in their factor endowments and is more characteristic of the exchange of goods that takes place, for example, among advanced EU countries where it has become the dominant form of trade (Hoekman & Djankov, 1997). The effects of regional integration as well as the wider process of globalisation has led to production plants becoming endowed with similar, but varying levels of technology over time – a process of vertical integration. This determines capital-labour ratios and, likewise, income (Aturupane et al., 1999). The necessity of investment in raising productivity and output therefore emphasises the role of income as one of the key determinants driving intra-industry trade (Balassa, 1986).

The Grubel-Lloyd index (GL-1), first introduced in 1975, was later included in a textbook publication by Mikić (1998). This particular version of the index contains a weight of 0.5 to adjust for the eventuality of trade imbalances (surplus/deficit) and does so by upwardly or downwardly adjusting the end value according to the degree of imbalance. In the absence of this weight (see GL-1), it could occur that the performance of a particular industry could well be over or under estimated. The model as introduced by Mikić and applied in this work, can also be re-written as shown in GL-2.

$$IIT = \left\{1 - 0.5\left[\sum\left|\left(\frac{x_i}{x}\right) - \left(\frac{m_i}{m}\right)\right|\right]\right\}100 \qquad \text{(GL-1)}$$

$$IIT = \left[\frac{\Sigma\left(x_i + m_i\right) - \Sigma\left(\left|x_i - m_i\right|\right)}{\Sigma\left(x_i + m_i\right)}\right] * 100 \qquad \text{(GL-2)}$$

In compiling the statistical information for this analysis, two select years have been chosen for the measurement of Chinese-EU trade flows: 2007 and 2011, thus allowing convergence as well as any significant change in industrial output to be measured over time. The data applied in this analysis is the United Nations, disaggregated 3-digit SITC (standard international trade classification), supplied by Eurostat, consistent with the WTO and focuses on the Standard International Trade Category of "machinery and transport equipment" (SITC 7).

United Nations Commodity Groups

SITC 0 = Food & live animals

SITC 1 = Beverages & tobacco

SITC 2 = Crude materials, inedible, except fuels
SITC 3 = Mineral fuels, lubricants & related materials
SITC 4 = Animal & vegetable oils, fats & waxes
SITC 5 = Chemicals & related products
SITC 6 = Manufactured goods classified chiefly by material
SITC 7 = Machinery & transport equipment
SITC 8 = Miscellaneous articles
SITC 9 = Commodities & transactions not classified in the listed SITC groups

The following table provides the results calculated for Chinese-EU bilateral trade in the exchange of machinery and transport equipment for 2011. As can be identified, sector SITC 7 can be sub-divided into ten core industrial, trade sectors at the initial, two-digit level (70, 71 etc). These sectors will be later expanded to reveal the exchange of traded commodities at the more disaggregated, 3-digit level. For reference, the codes shown in the first column of table one are defined below the table.

Table 1

Chinese Trade with the EU (€ millions) & Intra-industry trade (2011).

Industry	m_i	%	x_i	%	$x_i - m_i$	IIT_i
SITC 70	0	0.00	572 348 793	0.38	572 348 793	0.00
SITC 71	3 144 944 620	2.16	12 147 816 987	8.15	9 002 872 367	41.12
SITC 72	2 748 478 718	1.89	18 266 429 506	12.25	15 517 950 788	26.15
SITC 73	637 956 319	0.44	8 071 887 793	5.41	7 433 931 474	14.64
SITC 74	11 987 586 066	8.23	24 261 254 920	16.27	12 273 668 854	66.14
SITC 75	39 107 402 107	26.85	1 958 749 464	1.31	- 37 148 652 643	9.53
SITC 76	38 304 113 266	26.30	2 061 621 758	1.38	- 36 242 491 508	10.21
SITC 77	40 798 091 047	28.01	20 835 742 528	13.98	- 19 962 348 519	67.61
SITC 78	4 242 490 744	2.91	47 871 032 391	32.11	43 628 541 647	16.28
SITC 79	4 666 534 389	3.20	13 040 177 665	8.75	8 373 643 276	52.70
Total	145 637 597 276	100,00	149 087 061 805	100,00	3 449 464 529	

Source: *Own calculations based on Eurostat, 3-digit data*, 2011.

7 - Machinery and transport equipment
71 - Power-generating machinery and equipment
72 - Machinery specialised for particular industries
73 - Metal-working machinery
74 - General industrial machinery and equipment, n.e.s., and machine parts
75 - Office machines and automatic data-processing machines
76 - Telecommunications and sound-recording and reproducing apparatus and equipment
77 - Electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof (including non-electrical counterparts, n.e.s., of electrical household-type equipment)
78 - Road vehicles (including air-cushion vehicles)
79 - Other transport equipment

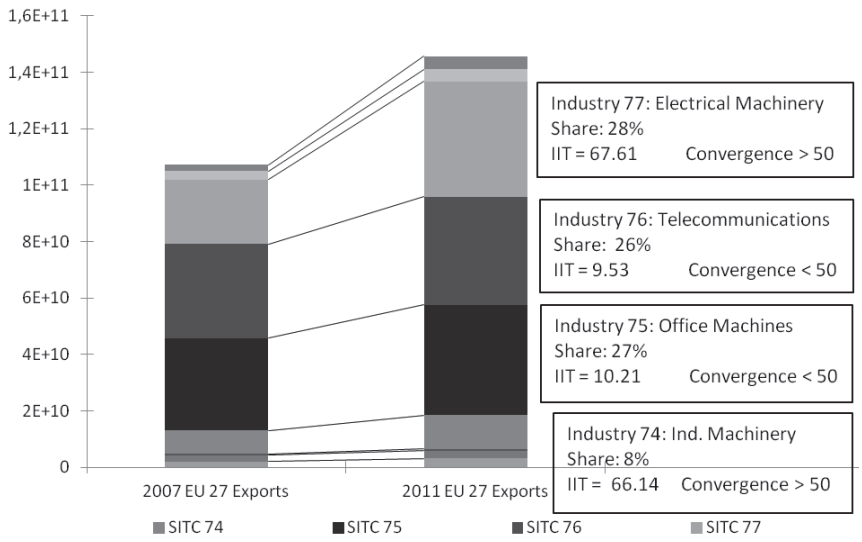
In 2011, table one shows that more than 80% of Chinese, SITC 7 imports (column 2) from the EU were made up of office machines (75), telecommunications equipment (76) and electrical machinery (77). The application of the Grubel-Lloyd Index revealed that the highest degree of Convergence (intra-industry trade) could be found in the exchange of electrical machinery and parts (77). The exchange of the latter commodities also accounted for the highest share of imports from this sector (28%). Chinese exports to the EU meanwhile were more dominant in the supply of road vehicles (78). The degree of convergence (16.2) suggests trade in different goods (inter-industry trade) and signs of comparative advantage. Chinese exports of industrial machinery and parts (74) ranked second, representing 16.2% of the outflows from the SITC 7 group. The degree of convergence of these commodities was recorded as the highest with a level of intra-industry trade at more than 66. This suggests trade in similar goods, though the lower level of imports from the EU in these commodities indicates a process of vertical-integration, the presence of assembly operations as well as the supply of component parts from Chinese soil (see Dean, Fung, Wang & Zhi, 2008). This would be consistent with the industrial development path followed by the former socialist countries of Europe and their integration into regional supply and production networks during their own earlier transition periods (Clowes & Choroś-Mrozowska, 2010) and also Brenton and di Mauro (1998). This goes hand-in-hand with the comparatively lower input costs to production, namely labour .

EMPIRICAL SUPPORT & EVALUATION

In evaluating the supply of commodities at the more disaggregated 3-digit level, this section will first deal with the EU exports to China for the years 2007 and 2011. Graph two shows that four key industrial sectors can be observed, which together accounted for 89% of the commodities exported from this sector. These are labeled on the right-hand side of the graph.

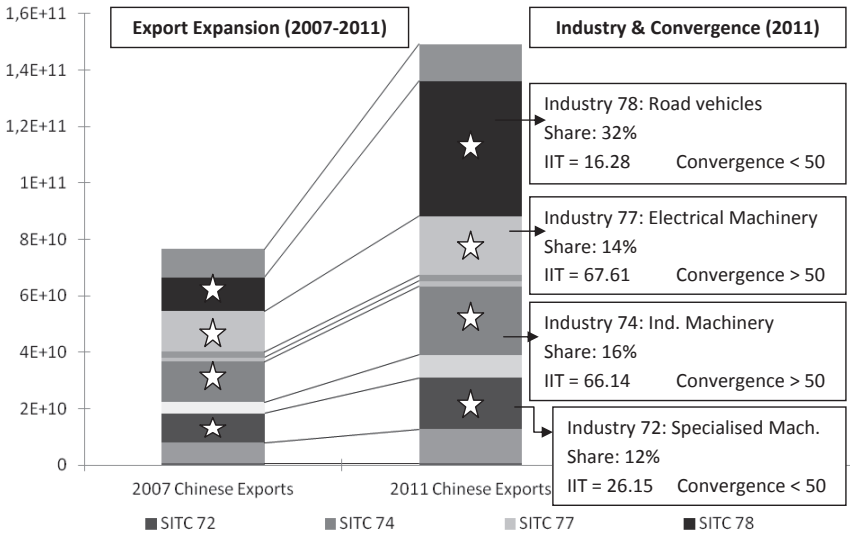
The four sectors can be sub-divided according to levels of convergence and technology. The export of electrical machinery (77) and industrial machinery (74) are more recognizably integrated with Chinese industries on account of their IIT values, which are both above 60 and suggest a fairly high degree of integration and co-operation between their respective industries. These are products endowed with low and low-to-medium levels of technology. In contrast, telecommunications equipment (76) and (75) office machines (computers and data processing equipment) are less high highly integrated, but together account for 51% of the exports from the overall sector. The lower degree of convergence (IIT) indicates comparative advantage and the supply of products embodied with more medium and medium-to-high levels of technology. The key difference separating industries (77 and 74) and (75 and 76) concerns the skill-levels employed to produce the commodities exported and re-imported. The former involves the supply of whole products as well as the supply of components for assembly operations on Chinese soil. This may involve the engagement of foreign investors at the initial stage, setup, recruitment and training (Dunning, 1993), while the latter refers to the actual supply of finished products – consistent, with the EU's comparative advantage.

EU investments in China are consistent with this and are geared towards more market- and efficiency-seeking forms of investment (Liu & Daly, 2011). These complimentary forms of investment target China's sizeable labour market, while at the same time drawing on the relatively lower costs of production for export output – a significant factor in Chinese outflows (see Weishi, Awakuse & Yuan, 2008).



Graph 2. EU 27 Exports of Machinery & Transport Eq. to China (2007 & 2011).
Source: Own calculations based on Eurostat, 3-digit data, 2011.

The following graph (3) depicts the supply of Chinese exports to the EU for the same years, revealing that four, key industrial groups also dominate supply side operations. The four key areas of Chinese export specialisation (see graph 3) accounted for 74% of its own supply of machinery and transport equipment to the EU. The export of electrical machinery (77) and industrial machinery (74) is consistent with the EU side in convergence terms and the degree of integration. The actual volume of these commodities exported however is lower at 14% and 16%, respectively as a share of the products exported from this sector. This lends weight to the process of vertical integration and the role of Chinese industry on the supply side, which reflects the comparatively lower input costs to production and the labour-side advantage. This is supported by Zhao (2004), who indicates that manufacturing industry in these fields of production is the main supplier of employment growth. It also reflects the role and impact of FDI in industrial output in the country (Zhao, Z., & Zhang, K. (2010). At the same time the export of machinery specialised for particular industries (72), reveals a low degree of convergence (IIT = 26.15) and accounts for 12% of the sector. This may indicate an initial comparative advantage. In contrast, the supply of road vehicles (78) accounts for 32% alone and is accompanied by a low degree of convergence (IIT = 16.3). This is supported not only via the supply of components and accessories to the EU, but also some of the widely known, take-over activities pursued by China in recent times, such as, to name a few, Volvo of Sweden as well as investment in other EU sectors (Hanemann & Rosen, 2012).



Graph 3. Chinese Exports of Machinery & Transport Eq. to the EU 27 (2007 & 2011).
Source: *Own calculations based on Eurostat, 3-digit data*, 2011.

The above graph reflects not only the increasing capability of China's expansion into European supply and production networks, but it also represents its key and growing areas of importance in terms of industrial specialisation and areas of interest, both at home and abroad.

In comparison to the former Socialist countries of Central & Eastern Europe, which relied heavily on the strong support of foreign investment in their own countries at the start of transition, China is also much more comparatively active on supply of investment globally.

CONCLUSION

In compiling the statistical information for this analysis, two select years were chosen to measure Chinese-EU trade flows: 2007 and 2011, thus allowing convergence as well as any significant change in industrial output and likewise exports to be measured over a longer period of time. The data used in this analysis was the 3-digit SITC (standard international trade classification), supplied by Eurostat and the WTO.

The analyses provided in this work revealed relatively high degrees of industrial convergence between China and the EU, confirmed by levels of intra-industry trade exceeding 50. At the same time sectors exhibiting low convergence are indicative of comparative advantage and industrial specialisation. An important support element connected with these two distinct paths pursued by both trading partners concerns the role of foreign direct investment, which given the geographical distance between them is a key factor driving trade and industrial expansion. Chinese overseas, foreign direct investment in the EU has increased from 20 operations from ten years ago to 573 in recent times. Geographically, China concentrates its interests mainly on the troika of the United Kingdom, France and Germany. The structure of this investment has transitioned to a broader range of industries, especially capital supply (services), manufacturing and take-over processes in the transport (car) sector, telecommunications as well as the country's interests in some of

Europe's cinema and media chains. The motives are expansionary and partially facilitated by the country's undervalued exchange rate, but also its position in Luxembourg, which provides visa access and a strong gateway to the region. Friction on the EU side, however, tied with unfavorable exchange rates and the foreign debt crisis has resulted in a slowdown in EU imports as shown in graph one, but also the slowing of EU investment outflows to China, respectively. This is occurring during a period as China moves higher up in the value chain, signaling growing competition, but also at a time in which the country's domestic, ongoing, restrictive practices towards potential investors, though expanding from the EU side, represents an area for further research.

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